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Theme : Education Innovation in Globalization Practice

22 September 2020
Postgraduate School - Universitas Negeri Medan

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Schedule of The 5th Annual Internatioanal Seminar on Transformative Education and Educational Leadership (AISTEEL) 2020
Postgraduate School, Universitas Negeri Medan

22 September 2020

(Indonesian time)	Activities	PIC/Moderator
07.00 – 08.30 (am)	Preliminaries	committee
08.30 - 08.45 (am)	**Opening Ceremony** 1. MC Speech 2. Indonesian National Anthem 3. Pray 4. Chairperson Report 5. Welcoming speech of Director of Postgraduate School 6. Welcoming speech and official opening of Rector of Universitas Negeri Medan 7. Photo session	MC (Dr. Anni Holila Pulungan, M.Hum & Sofianto Gultom, S.Pd)
08.45 – 09.25 (am)	Keynote Speech 1: **Prof. Dr. Syawal Gultom, M.Pd** (Universitas Negeri Medan– Indonesia)	Dr. Rahmad Husein, M.Ed
09.25 – 10.05 (am)	Keynote Speech 2 **Prof. Emmanuel Manalo** (Graduate School of Education, Kyoto University, Japan)	Prof. Amrin Saragih, PhD
10.05 – 10.45 (am)	Keynote Speech 3 **Dr. Susan Ledger** (Head of Education, Murdoch University - Australia)	
10.45 – 11.25 (am)	Keynote Speech 4 **Prof. Dr. Ekkarin Sungtong** (Dean of Faculty of Education Prince of Songkla University - Thailand)	Mangara Simanjorang, PhD
11.25 – 12.05 (am)	Keynote Speech 5 **Assoc. Prof. Yuri Uesaka** (The University of Tokyo - Japan)	
12.05 – 13.30	**Break**	
13.30 – 15.30 (pm)	**Parallel Session 1** **(divided to 19 parallel rooms)**	Moderator/Operator
15.30 – 15.35 (pm)	Break	
15.35 – 17.00 (pm)	**Parallel Session 2** **(divide to 19 parallel rooms)**	Moderator/Operator
17.00 – 17.10 (pm)	Cloossing	committee

Proceedings of the 5th Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2020)

Preface

The fifth Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2020) was held by virtual seminar on 22 September 2020. This seminar is organized by Postgraduate School, Univesitas Negeri Medan and become a routine agenda at Postgraduate program of Unimed now.

The AISTEEL is realized this year with various presenters, lecturers, researchers and students from universities both in and out of Indonesia participating in, the seminar with theme "Educational Innovation in Globalization Practice".

The fifth AISTEEL presents 4 distinguished keynote speakers from Universitas Negeri Medan - Indonesia, Kyoto University - Japan, Murdoch University – Australia, Prince of Songkla University – Thailand and from The University of Tokyo - Japan. In addition, presenters of parallel sessions come from various Government and Private Universities, Institutions, Academy, and Schools. Some of them are those who have sat and will sit in the oral defence examination. The plenary speakers have been present topics covering multi disciplines. They have contributed many inspiring inputs on current trending educational research topics all over the world. The expectation is that all potential lecturers and students have shared their research findings for improving their teaching process and quality, and leadership.

There are 180 articles submitted to committee, some of which are presented orally in parallel sessions, and others are presented through posters. The articles have been reviewed by double blind reviewer and 104 of them were accepted for published by Atlantis Press indexed by International Indexation, while 54 papers are published by digital library indexed by google scholar..
The Committees of AISTEEL invest great efforts in reviewing the papers submitted to the conference and organizing the sessions to enable the participants to gain maximum benefit.

Grateful thanks to all of members of The 5th Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2020) for their outstanding contributions. Thanks also given to Atlantis Press for producing this volume.

The Editors

Bornok Sinaga
Rahmad Husein
Juniastel Rajagukguk

Table of Content

Analysis of the Ability of Metacognition of Students of SMAK Country Samosir in Solving Problems Apply Learning Guided Discovery

Siita Tamba, Bornok Sinaga, Syafari
Universitas Negeri Medan
Medan, Indonesia

***Abstract*- This study aims to analyze: 1) the ability level of metacognition of students in problem-solving, 2) the difficulty of metacognition experienced by students in solving mathematical problems. This research is a descriptive qualitative research that aims to describe the ability of metacognition of students in solving problems apply learning guided discovery. The subject in this research is a class XI-MIA SMAK Country Samosir. While the object of this study is the ability of metacognition of students in solving problems apply the learning model of guided discovery. Variables Based on the analysis of research data, the results showed that: 1) Students who are at the level of the mathematical problem-solving ability high be at the level of the ability of metacognition Reflective Use. Students who are on the level of mathematical problem-solving ability are at the level of the ability of metacognition Strategic Use, and Students who are at the level of the mathematical problem-solving ability low ability level metacognition Aware Use. 2) the Difficulty of metacognition that experienced by students in solving mathematical problems including the difficulty of facts, concepts, principles, and procedures.**

Keyword: Analysis, The Ability Of Metacognition, Problem Solving, Learning, Guided Discovery

I. Introduction

Mathematics is one of the exact science and organized systematic underlying other sciences in developing the technology. This means that mathematics is the basic science that supports the development of other sciences that play an important role as knowledge help in interpreting the various ideas and conclusions. Mathematics is one of the subjects taught at all levels of education, from basic education to higher education. According to [1], mathematics is one of science help a very important and useful in everyday life as well as in supporting the development of human resources as well as load means of thinking to develop the mindset of a logical, systematic, objective, critical and rational as well as very competent in forming a person's personality that need to be learned of every person and must be fostered from an early age. Through the exercises in solving pedagogic problems, mathematics can be used to develop clear thinking, meticulous, precise, and consistent (consistent).

According to [2] teaching students to solve problems will enable students to become more analytical in making decisions in life. That is, students trained in problem-solving will be able to make a decision because he has skills in how to collect relevant information, analyze the information, and realize how much need to re-examine results that have been obtained. Thus, someone who can resolve the issue will be alive with productive and able to understand complex issues related to the global community. According to [3] troubleshooting using (transferring) the knowledge and skills that already exist to answer the question or situation is left unanswered. The same thing was also said by [4] "Problem-solving provides an important context for students to learn. Numbers and other mathematical terms and problem-solving ability is enhanced when students have opportunities to solve problems themselves and to see problems being solved".

Problem-solving is at the center of the learning objectives of mathematics, and metacognition is viewed as one of the five major components that are interrelated to achieve the ability to solve problems [5]. Metacognition ability is very important because it can train students in learning mathematics. Build mathematical Understanding requires a cognitive element and metacognition, learners "construct knowledge of mathematics" using metacognition, and they guide, regulate, and Evaluate their Reviews using metacognition [6]. Metacognition has advantages in which someone tried to contemplate how to think or contemplate doing the cognitive process. Metacognition is also a process in which a person thinks about thinking about developing a strategy to resolve the problem. According to Meichenbaum [7] suggests that metacognition as "the awareness people will be the engine of knowledge itself and how that machine works".

The student is said to have the ability in metacognition problem solving if the student can fulfill the following steps: (1) develop a plan of action, (2) monitor the actions of solving the problem, and (3) evaluate the actions of the problem solving [8]. However, based on observations early in the SMAK Country Samosir fact shows that students have the ability of metacognition in problem-solving is low. Low ability can be seen from the results of the diagnostic tests that there is an error in the process of metacognition students ' answers which will produce errors in problem-solving. As for the mistakes made by students in metacognition are: (1) at the

development stage plan completion, the student does not show awareness of the previous knowledge that will help solve the problem, (2) at the stage of doing the problem solving, the students did not show awareness to describe the process of resolving the issue and does not indicate a high confidence that the results obtained accurately in solving problems, and (3) at a stage after carrying out problem-solving, the student does not show awareness to describe the reason for the settlement process using by good, the students do not understand how to check the answer with true, and not yet able to conclude what they learn through problem-solving that is done. The low ability students in metacognition also have an impact on students ' problem-solving becomes less good finishes Such as Boekaerts, et al [9] which states that "students who have the skills of metacognition high perform better in math (including problem-solving) than students who have the ability of metacognition low.

The findings of the study also showed that the low ability of metacognition in problem-solving due to the learning model used by teachers is not the right target. The Model used is direct instruction that is not focused to train the ability of metacognition in problem-solving. Many models of learning can be used to develop the ability of metacognition of mathematics students in solving problems. The learning Model used should be able to make students active in learning activities, creating meaningful learning, and able to train students into metacognition are familiar in solving the problem. One of the learning models that allegedly will be in line with the characteristics of mathematics and the expectations of the curriculum valid at the time of this is the learning model is problematic. According to the opinion of Arends [10] is a teaching based on the problem is a learning approach in which students work on the problem authentic to build their knowledge. Develop investigation of that sort, and thinking skills a high level, develop self-reliance and self-confidence. The application of this model seeks to develop the ability of metacognition of students in the Indonesian student mathematical problem-solving start working on the given problem, connect the problem to be investigated by looking at the problem from many aspects, investigating authentic to find the solution of a real problem into a real problem, make the product in the form of a report to shown to other friends, cooperate each other to develop social skills and thinking skills. Based on this description, by applying the model of guided discovery is expected to be an alternative to teaching and learning to improve the metacognition of students in solving the problem.

Metacognition has advantages in which the students try to reflect on how to think or contemplate doing the cognitive process. According to Flavell [11], the Ability of metacognition is the awareness of people about how he learned, the ability to rate the difficulty of a problem, the ability to observe the level of understanding itself, the ability to use a variety of information to achieve goals and ability to assess their learning progress. Meanwhile, [12] stated, "the Ability of metacognition is the skill to organize and control the process of thought ". In conjunction with learning, that students who use metacognition correctly will be critical thinkers, problem solvers, and decision-makers who better than those who do not use metacognition. Teachers can increase the use of strategies metacognition in discussing a new concept with given what is already known to students. In conjunction with the completion of math problems, a person's success in resolving the problem is also influenced by the activity of metacognition [13].

Problem-solving in mathematics is a complex mental process that requires visualization, imagination, manipulation, analysis, abstraction, and collection of ideas. In the process of mathematical problem solving, the interaction between the cognitive and metacognition activities. The relationship between cognitive activity and metacognition in the model referred to as the activity model metacognition during the process of problem-solving. This Model describes how the cognitive activities starting from the observed problem to find the answer. Then to build the metacognition activities learners need to identify the purpose and process of cognitive activity. Based on some expert opinion, the ability of metacognition is the ability to recognize, manage, and control the process of their thinking. The indicator is based on the ability of metacognition [8], namely: (a) develop a plan of action, (b) regulate or monitor the action, and (c) evaluate the action. Furthermore, [6] gives a guide about the three components of metacognition, some of which are as follows:

When You develop a plan of action, ask yourself:
- what is the initial knowledge to help in this task?
- Why I read (part of) this choice?
- How long do I accomplish this task?

When You set or monitor the actions, ask yourself:
- How do I do that?
- Am I on the right track?
- What to do if I do not understand?

When You evaluate your action, ask yourself:
- How well do I do that?
- What did I learn?
- Do I get the results I want?

In this study, the questions metacognition modified and used as an aid to building students' metacognition in solving the given problem. Furthermore, [14] suggests that the ability of metacognition of students in solving can be divided into four levels, namely: 1) the Use of Tacit is the use of thinking without awareness. This type of thinking in connection with deciding without thinking about the decision. 2) Use the Conscious is the use of the mind with consciousness. The type of thinking associated with students ' awareness about what and why students think. 3) Strategic Use of is the use of strategic thinking. This type of thinking is related to individual settings in the conscious thought processes by using specific strategies that can improve the precision of his thinking. 4) the

Use of Reflective is the use of thinking reflective. This type of thinking associated with the reflection of the individual in his thought process before and after, or even during the process of considering the continuation and improvement of the results of his thoughts. Furthermore, the problem of completion based on the fulfillment of four indicators, namely: i) understand the problem, ii) plan, iii) execute the plan, and iv) Look back at problem-solving [15].

II. RESEARCHMETHODS

This research is descriptive qualitative research. This research is a type of research that aims to describe the ability of metacognition of students in solving mathematical problems apply learning guided discovery.

Subjects in this study were students of class XI-MIA SMAK Country Samosir school year 2019/2020, totaling 28 people. Then based on the results of the test of problem-solving ability in completing mathematical problems that tested students will be taken of the subject of the interview. The object of this research is the problem-solving ability of students in solving problems by applying the learning guided discovery. problems on mathematics in the material Row of Arithmetic and Geometry, among others, can be seen from the test results, namely the ability of answer sheets of the students, and through the interview is a transcript from a tape recorder and field notes, obtained by the researcher from the interview process, both from the interviews with students and interviews with teachers during the study.

The main instrument in this research is the researcher itself, which means that the position of the researcher is key (determinant) in the crawl and analyze data. As described [16] "qualitative research, which becomes an instrument or tool of research is the researchers themselves ". Also, the researcher as the main Instrument in the research will be developed a simple instrument to enhance and complement the research data. Instruments include test problem-solving ability, interview, and triangulation of data. Interviews were conducted on the selected subject directly (face to face) between the researcher and the information in the dialog, question and answer and discussion. Interview techniques used unstructured interviews (not structured). In the form of this interview, the researcher is not bound strictly to the guidelines for the interview. The implementation can be done anywhere and anytime as long as the phenomenon of p research focus. The type of interview used in this research is the interviews extensive and in-depth.

Triangulation is a technique that utilizes the examination of the validity of the data with any outside data, to check or as a comparison with the data [17]. Triangulation techniques are the most widely used in the examination through other sources. Concerning the triangulation, triangulation in this study serves to:

1. Comparing the results of the research with the data, the answer sheets of a test interview subject and Problem-solving abilities the ability of metacognition of students.
2. Comparing the results of the interview subject with the nanny with the datasheet answer the test and the problem-solving ability the ability of the metacognition of students.

Students are said to have been completed in solving the problem if obtaining the test scores of problem-solving skills ≥ 66,75 from a scale of 0 - 100. Furthermore, to determine the level of metacognition in solving the problem based on the score results of the test the ability of metacognition refers to the following table:

TABLE I. LEVEL TEST RESULTS THE ABILITY OF METACOGNITION OF STUDENTS

No	Level Ability Scores Metacognition	Level
1	0 ≤ TSKM < 33	*Tacit Use*
2	33.00≤ TSKM< 65	*Aware use*
3	65 ≤ TSKM< 85	*Strategic Use*
4	85 ≤ TSKM ≤ 100	*Reflective Use*

TABLE II. INSTRUMENT DIFFICULTY SOLVING MATH PROBLEMS

No	The difficulties experienced by students	Indicators	No question
1	The fact	• Students can not interpret the symbol or emblem of mathematics in problem-solving. • Students are not able to understand the use of symbols in mathematical problem-solving. • Students do not present the symbols for designing the mathematical model of the given problem	
2	The concept	• Students are not able to apply the concept of problem-solving.	
3.	The principle	• Students are not able to present the steps of problem-solving it correctly and properly. • Students are not meticulous in the presentation of the completion of the troubleshooting. • Students are not able to devise problem-solving strategies effectively and efficiently.	
4	The procedure	• Students are not able to use formula-formula rules –the rules of mathematics in solving problems. • the student does not connect the concepts given to resolve the problem.	

III. RESULTSAND DISCUSSION

The purpose of this study is to obtain information about mathematics learning by instilling an awareness of thinking (metacognition) students in solving mathematical problems apply learning guided discovery. Based on the results of data analysis obtained the following results:

A. The Level Of Problem Solving Ability Mathematics Students

After applying the learning guided discovery on the Row material of Arithmetic and Geometry for 3 (three) meetings to continue the test on students to see students' mathematics problem-solving ability. The answer sheet of the students corrected based on the guidelines for assessment is assessed based on the principle that valid, objective, fair, integrated, comprehensive and sustainable, systematic, criteria, accountable (Permendikbud No. 23, Chapter IV, Article 5,

2016). From the results of tests already corrected presented the level of problem-solving ability mathematics students

TABLE III. THE LEVEL OF MATHEMATICAL PROBLEM SOLVING ABILITY OF STUDENTS

No	Score Level Problem Solving Ability	Total Students	Percentage	Criteria
1	0 ≤ SKPM < 65	8	28,57%	Low
2	65 ≤ SKPM < 80	11	39,29%	Medium
3	80 ≤ SKPM ≤ 100	9	32,14%	High

Note: *SKPM: Score Level Problem Solving Ability*

The table above shows that of the 28 students it turns out that the level of mathematical problem-solving ability of students with ability levels of low, medium and high.The level of mathematics problem-solving ability of students with low ability as much as 8 people (28,57 %),the problem-solving ability is is a total of 11 (39,29%) and problem-solving ability high is a total of 9 (32,14%).

B. The Ability Level Of Metacognition Of Students

The ability level of metacognition of students in solving mathematical problems derived from the results of the tests is given after applying the learning guided discovery. The results are as follows:

TABLE IV. THE RESULTS OF THE TEST THE ABILITY OF METACOGNITION OF STUDENTS

No	Level Ability Scores Metacognition	Total Students	Percentage	Level
1	0 ≤ TSKM < 33	0	0 %	*Tacit Use*
2	33.00≤ TSKM< 65	9	32,14%	*Aware use*
3	65 ≤ TSKM< 85	14	50,00 %	*Strategic Use*
4	85 ≤ TSKM ≤ 100	5	17,86%	*Reflective Use*

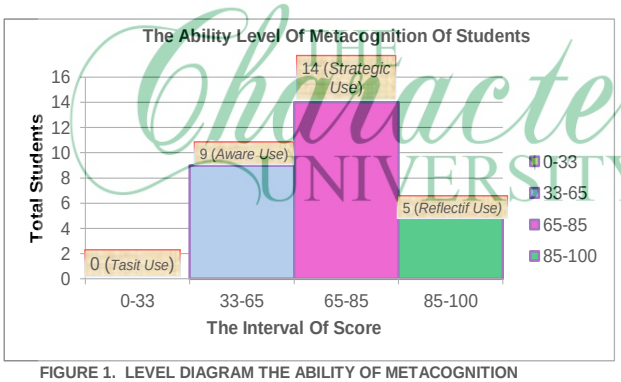

FIGURE 1. LEVEL DIAGRAM THE ABILITY OF METACOGNITION

Based on the table shows that no (0%) have a level of metacognition Tacit Use, (32,14%) have a level of metacognition Aware Use, (50,00%) have a level of metacognition Strategic Use and (17,86%) have metacognition Reflective Use.

C. The Implementation Of The Interview

Interview implementation was held on the subject of each pattern of classification responses that are asked through the lens of the indicator (high, medium, low), a lot of mistakes, and unique answers. Analysis of difficulties in solving mathematical problems students will find the level of thought awareness tools (metacognition) students of mathematics. The results of interviews with subjects related to conscious thought (metacognition) through the questions asked approached exactly with the response written.

1. The analysis of the Difficulty of Metacognition in Problem Solving in Students of High Ability

Students with high ability in problem-solving ability have good awareness in some stages of metacognition. Based on the results of the interview, show that: 1) the Phase of developing the settlement plan. students do not have the fact of difficulty, which can be understood and used as the symbol of the right to be represented by the student's math problems. This can be seen from the mathematical model that the students. 2) in the stage of monitoring, At this stage students do not have difficulty in understanding the concept, it seems that students can design a mathematical model of the problem correctly. Students also understand the principle that can apply the formula row of arithmetic and geometry in problem-solving. 3) the Stage of evaluation of the action solving the problem. At this stage, students also do not experience difficulties in the procedure of mathematics. This can be seen from the steps in solving the problem of students who are tried and true and have done the calculations correctly. Based on the triangulation of data obtained from the description the answer sheet and interview on students with a score settlement category is low, then the characteristics of consciousness of thought are as follows: 1) the Subject is aware of the capabilities it has, 2) the Subject generally know what they are doing, 3) the subject can provide an argument to support his thinking, and 4) the subject can give a convincing explanation about what they create. Based on these characteristics, subjects with a score of high settlement on the category of Reflective Use.

2. The analysis of the Difficulty of Metacognition in Problem Solving in Students of Medium Ability

Students with abilities are in problem-solving skills have good awareness in some stages of metacognition. Based on the results of the interviews showed that: 1) the stage of development of the settlement plan. At this stage, it appears that the students do not have the fact of difficulty, which can be understood and used by students in the appropriate symbols to represent mathematical problems. It is seen from the students can change the given mathematical problem into a mathematical model. 2) at the stage of monitoring. At this

stage, students do not have difficulty in understanding the concept, it seems that students can design a mathematical model the problem correctly. In terms of the principles of mathematics, students have difficulty in doing the calculation in the operation of the integer, resulting in solving a problem that has not been done the students correctly. 3) the Stage of evaluation of the action solving the problem. At this stage of students experiencing difficulty in the procedures of mathematics. This is evident from the inaccuracies of the student in presenting the problem solving that solving the problem is not obtained effectively and efficiently. Based on the triangulation of data obtained from the description the answer sheet and interview on students with a score of the breakdown of the categories of being, then the characteristics of consciousness of thought are as follows: 1) the Subject is aware of the capabilities it has, 2) the Subject can give an explanation convincing about what they make, 3) the subject is aware of his weaknesses when solving problems. 4) the Subject starts to know what is not realized. Based on these characteristics, then the students in the ability level of metacognition are included at the level of Strategic Use.

3. The analysis of the Difficulty of Metacognition in Problem Solving in Students of Low Ability

Students with low performance on problem-solving skills have good awareness in some stages of metacognition. Based on the results of the interviews showed that: 1) Phase plan of completion. This stage of the difficulty the students know and understand the facts in mathematics, namely difficulty in understanding the use of symbols in mathematics. Students do not have the fact of difficulty, in which students are not able to understand and use the appropriate symbols to represent mathematical problems. This is evident when students can't change the math problem given into a mathematical model. 2) the Stage is set or monitor resolution. At this stage, students have difficulty understanding the concept, it seems that students are not able to devise a mathematical model of the problem correctly. Thus also in terms of the principles of mathematics, students have difficulty in doing the calculation in the operation of integer, resulting in the completion of the students ' problem that has not been done correctly. 3) The phase evaluates the actions of the settlement of the problem. At this stage, the student has difficulty in the procedure of mathematics. This is evident from the inaccuracies of the student in presenting the problem of solving the problem that was not obtained effectively and efficiently. Based on the triangulation of data obtained from the description the answer sheet and interview on students with a score settlement category is low, then the characteristics of consciousness of thought are as follows: 1) the Subject is less aware of its capabilities, 2) the Subject has a weakness in explaining to convince about what he created, and 3) the subject is less conscious of his weakness when completing a problem. Based on these characteristics, a subject with a score completion of the low category on the level of metacognition Aware Use.

IV. Conclusions

Based on the analysis and discussion in this study, put forward some conclusions as follows:

1. The ability level of metacognition of students in mathematical problem solving of 28 students is as follows:
   a) Students who are on the level of problem-solving ability mathematical high to be at the level of the ability of metacognition Reflective Use.
   b) Students who are on the level of problem-solving ability mathematically is at the level of the ability of metacognition Strategic Use.
   c) Students who are on the level of problem-solving ability mathematically low are at the level of the ability of metacognition Aware Use.
2. The difficulty of metacognition experienced by students in solving mathematical problems is:

The difficulty the fact that difficulties in understanding the use of symbols in mathematical problem solving, as well as the difficulty in representing the symbols of mathematics to design a mathematical model of the given problem. The difficulty of the concept, namely difficulties in applying or implementing the concept in problem-solving in completing the sola on the row material of arithmetic and Geometry. The difficulty of the principle, namely the difficulty in applying the formulas and rules in mathematics as well as the difficulty in connecting the concept of the concept is given to solve the problem. The difficulty of the procedure, namely the difficulty in presenting the problem-solving steps for cascading and correct, the inaccuracy in the presentation of problem-solving, as well as difficulties in drawing up the strategy of solving the problem effectively and efficiently.

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