

## Differences in Mathematic Connection Abilities and Self-Efficacy between Students Given Approaches Realistic Mathematics with the Approach Inquiry at Senior High School 2 Tanjung Morawa

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### Abstract

*This study aims to determine how the difference between mathematical connections and self-efficacy between students who are given a realistic mathematics approach with an inquiry approach at Senior High School 2 Tanjung Morawa. The sample used in this study was Senior High School 2 Tanjung Morawa. With the method of collecting literature study data. The method used is literature study. The results of this study indicate that the overall approach to mathematics is realistic and inquiry, each of which has advantages and disadvantages, but in this study a good approach to use in students' ability to solve math problems is the inquiry approach, because with the inquiry approach students can be more active, and have ideas in solving math problems.*

### Keywords

mathematical  
connection ability; self  
efficacy; realistic  
mathematical  
approach; inquiry  
approach



## I. Introduction

Mathematics is the basis of science and is one of the subjects of the National Examination (UN). Mathematics with its various roles makes it a very important science, and one of the roles of mathematics is as a thinking tool to deliver students to understand the mathematical concepts they are studying. Based on its development, the problems faced in learning mathematics are increasingly complex and require a more perfect analytical structure. So in learning how to construct and create a mathematical model is needed to be a good problem solution.

Higher-order thinking skills cannot come instantly, but it requires effective and efficient management of human resources. This can be done through education (Ni'mah, Setiawan and Oktavianingtyas, 2017). In fact, many schools have low thinking ability of students. For example, students feel confused about grouping known elements in the problem, the initial steps in solving the problem, errors in performing mathematical operations, and monotony of the sample questions given by the teacher.

In an era that is completely modern and sophisticated, nowadays it is very demanding for quality human resources (HR) in all aspects. Quality human resources is a necessity that cannot be negotiated. According to Darmadi (Marliani, 2015: 15) to advance science and technology, it is necessary to have a strong understanding of mathematics from an early age. Given the importance of mathematics for the development of the world, it is very concerning if we look at the condition of students who are not very good at mathematics.

Mathematics has an important role in life, in practice some students still think of mathematics as a difficult subject. This is evident from the results of the Trends in Mathematics and Science Study (TIMSS) survey and the Program for International Student Assessment (PISA) in the following table:

**Table 1.** Results of Survey Trends in Mathematics and Science Study (TIMSS)

Year	Rating	Score
1999	34 from 38 Country	403
2003	35 from 46 Country	411
2007	36 from 49 Country	397
2011	38 from 42 Country	386
2015	46 from 51 Country	397

**Table 2.** Results of the Survey Program for International Student Assessment (PISA)

Year	Rating	Score
2000	39 from 41 Country	367
2003	38 from 40 Country	360
2006	50 from 57 Negara	397
2009	61 from 65 Country	371
2012	64 from 65 Country	375
2015	69 from 76 Country	386

Table 1 and Table 2 show that although the scores obtained by Indonesian students fluctuate from year to year, the rankings are always almost the last in the world. (PPPPTK Featured News, 2015). This shows that Indonesian students still find mathematics difficult.

This makes the basis for the importance of mathematics being taught at all levels of education. This is because, through mathematics students are trained to be skilled in solving problems in everyday life related to mathematical calculations. Mathematics can also train students in developing students' mathematical abilities, for example the ability to think logically, creatively, critically, carefully, effectively, problem solving, representation, connection, communication and so on. This is confirmed by Hendriana and Soemarmo (2014) who state that "... everyone in their life activities will be involved with mathematics, starting from simple and routine forms to very complex ones. In line with what Cokroff expressed (Abdurrahman, 2009: 253), he stated that:

"Mathematics needs to be taught to students because (1) it is always used in all aspects of life; (2) all fields of study require appropriate mathematical skills; (3) is a strong, concise and clear means of communication; (4) can be used to present information in a

variety of ways; (5) improve logical thinking skills, accuracy, and spatial awareness; and (6) provide satisfaction with the effort to solve challenging problem.

Based on this thought, a study entitled "the difference in mathematical connection ability and self-efficacy between students who are given a realistic mathematics approach with an inquiry approach in SMA Negeri 2 Tanjung Morawa.

## **II. Review of Literatures**

### **2.1 Mathematical Connection Capability**

Mathematics learning formulated by the National Council of Teachers of Mathematics (NCTM, 2000) emphasizes that students must learn mathematics through understanding and actively build new knowledge from previous experiences and knowledge. There are five standard processes in learning mathematics, one of which is learning to link ideas (mathematical connections). Mathematical connection aims to help students see mathematical ideas as related to one another. As argued by Arlianti (2010), mathematical connections require students to be able to understand the existence of internal mathematical relationships including relationships between topics in mathematics itself, while external relationships include relationships between mathematics and other subjects and relationships with everyday life.

Without a mathematical connection, children must learn and remember too many isolated skills and concepts instead of recognizing general principles that are relevant from multiple areas of knowledge. When daily math ideas are connected to their experiences, both inside and outside of school, children will become aware of the uses and benefits of mathematics. This is in accordance with NCTM (in Arlianti, 2010) which states that through mathematical connections, students' knowledge will be expanded, students will see mathematics as a complete unit not as stand-alone material, and students will realize the usefulness and benefits of mathematics both in school and outside of school. Thus, students do not only rely on one mathematical concept or material being studied, but indirectly students acquire a variety of different concepts / areas of knowledge, both in mathematics and outside mathematics. So it is very important that students can make connections between these knowledge ideas, which in turn will improve the quality of student learning outcomes.

The ability of a person to relate between topics in mathematics, to associate mathematics with other sciences, and with life is called the ability of mathematical connections. In accordance with the opinion of Mikovch and Monroe (in Ruspiani, 2000), 'In mathematics, at least three kinds of connections are particularly beneficial: connections within mathematics, across the curriculum, and with real word contexts.'

### **2.2 Self Efficacy**

According to Bandura (1997) self-efficacy is a form of trust that a person has in their respective abilities to improve their life achievements. Self-efficacy can be in the form of how a person feels, how to think, self-motivation, and the desire to have something. Self-efficacy in social cognitive theory is a central construct that a person has.

Self-efficacy refers to the belief or perception that a person is able to organize and take the actions needed to be successful when given a task. Students who have low self-efficacy are more likely to give up in doing academic activities than students with high self-efficacy. The level of a student's self-efficacy is influenced by his success or failure in the past which will then have an impact on his success or failure in the future.

## **2.3 Self-Efficacy Function**

Self-efficacy that has been formed will affect and give function to individual activities. Bandura (1994) describes these effects and functions, namely:

### **a. Cognitive Function**

In carrying out academic tasks, individuals set behavioral goals and objectives so that individuals can formulate appropriate actions to achieve these goals. This personal goal setting is influenced by the individual's assessment of his cognitive abilities. Cognitive function allows individuals to predict everyday events that will have repercussions in the future. The assumption that arises in this cognitive aspect is that the more effective an individual's ability is in analysis and in practicing expressing personal ideas or ideas, it will support individuals to act appropriately to achieve the expected goals. Individuals will predict events and develop ways to control events that affect their lives. This skill requires effective cognitive processing of various kinds of information.

### **b. Motivation Function**

Individual motivation arises through optimistic thinking from within him to realize the expected goals. Individuals try to motivate themselves by establishing confidence in the actions to be carried out, planning actions that will be realized. There are several kinds of cognitive motivation that are built from several theories, namely causal attributions that come from attribution theory and expectation of results formed from the value-expectation theory. Self-efficacy affects causal attributions, where individuals who have high academic self-efficacy rate their failure to do academic tasks due to a lack of effort, while individuals with low self-efficacy rate their failure due to a lack of ability.

Expectation value theory views that motivation is governed by the expectation of the outcome (outcome expectation) and the outcome value. Outcome expectation is an estimate that certain behavior or actions will cause special consequences for individuals. It contains beliefs about the extent to which certain behaviors will have certain consequences. Outcome value is a value which means the consequences that occur when a behavior is carried out. Individuals must have high outcome values to support the outcome expectation.

### **c. Affection Function**

Affection occurs naturally in individuals and plays a role in determining the intensity of emotional experiences. Affection is aimed at controlling anxiety and depressive feelings that get in the way of proper thought patterns to achieve goals. Affection function is related to the ability to cope with emotions that arise in oneself to achieve expected goals. An individual's belief in his abilities affects the level of stress and depression experienced when facing a difficult or threatening task. Individuals who believe that they can control threats will not generate disturbing thought patterns. Individuals who do not believe in their abilities will experience anxiety because they are unable to manage these threats.

### **d. Selection Function**

The selection function is related to the individual's ability to select the appropriate behavior and environment, so as to achieve the expected goals. The inability of individuals to make behavioral selections makes individuals insecure, confused, and easily gives up when facing problems or difficult situations. Self-efficacy can shape an individual's life through choosing the type of activity and environment. Individuals will be able to carry out

challenging activities and choose situations they believe they can handle. Individuals will maintain competence, interests, social relationships on the choice made.

From this description, it can be concluded that the self-efficacy process includes the cognitive process, the motivation process, the affection process, and the selection process.

## **2.4 Realistic Mathematical Approach**

The new paradigm of education today places more emphasis on students as humans who have the potential to learn and develop. This new paradigm demands that teachers are no longer as sources of information but as study partners. Students are seen as active beings and have the ability to build their own knowledge. Through this new paradigm, it is hoped that in the classroom students will be active in learning, active in discussions, dare to convey ideas and accept ideas from others and have high self-confidence. To support the learning process in accordance with the changes and objectives of mathematics education, it is necessary to develop mathematics subject matter that is focused on applications in everyday life (contextual). In addition, it must be adjusted to the cognitive level of students, as well as the use of integrated evaluation methods in the learning process not only in the form of tests at the end of learning.

Judging from the new educational paradigm, the realistic mathematics approach is one of the learning approaches that are appropriate to these changes. The Realistic Mathematical Approach (PMR) was first introduced and developed in the Netherlands in 1970 by a group of mathematicians from the Freudenthal Institute, Utrecht University in the Netherlands. This approach is based on Freudenthal's concept which argues that mathematics is a human activity. The main idea is that students should be given the opportunity to reinvent mathematical ideas and concepts with adult guidance.

## **2.5 The Inquiry Approach**

Inquiry which in English means inquiry, or examination, investigation. Sanjaya (2006: 194) Inquiry learning model is a series of learning activities that emphasize critical thinking processes and analysis to find and find answers to a question in question. Gulo (Trianto, 2007: 135) Inquiry strategy means a series of learning activities that involve maximally the entire ability of students to search and investigate systematically, critically, logically, analytically, so that they can formulate their own findings with confidence.

# **III. Research Method**

## **3.1. Types of Research**

In writing this thesis the researcher used the Library Research research method. The point is a literature study. This type of research is used by the author to obtain theoretical data as a basis for scientific theory, namely by selecting and analyzing literature relevant to the title to be studied. According to Muhamad Nazir, literature study is a data collection technique by conducting study studies of books, literature journals, notes and reports that have a relationship with the problem to be solved. according to Danial Endang AR. Literature study is research conducted by researchers by collecting a number of books, journals, magazines, leaflets, which are related to the problem and research objectives. Books and journals are used as a source of data to be processed and analyzed as has been done by many historians, literature and language experts.

Based on the above understanding, it can be concluded that the literature study method is research carried out by researchers by examining and analyzing books, journals, literature, magazines, notes and reports regarding the problem to be studied by means of books. ,

literature, magazines, notes, and reports are used as data sources to be processed and analyzed.

### **3.2. Object of Research**

This research is devoted to Senior High School 2 Tanjung Morawa which is located on Jl. Pendidikan, Limau Manis, Tj. Morawa, Deli Serdang Regency, North Sumatra 20362

## **IV. Discussion**

### **4.1 Description of the Difference in the Ability of Mathematical Connection and Self Efficacy between Students Given a Realistic Mathematical Approach with an Inquiry Approach According to Experts' Understanding**

The main emphasis in the inquiry-based learning process lies in the ability of students to understand, then identify carefully and thoroughly, then end with providing answers or solutions to the problems presented. The main purpose of inquiry learning is to help students develop higher order thinking skills by asking motivational questions, getting answers based on curiosity, and being able to conclude and give meaning to their findings (Sadia, 2014: 124).

Inkuri learning aims to help foster motivation and enthusiasm for students in thinking because students are satisfied with the results of their own efforts through the thought process. In addition, inquiry-based learning aims to encourage students to be more courageous and creative in their imagination. With imagination, students are guided to create discoveries, both in the form of refinement of what already exists, or creating ideas, ideas, or tools that have never existed before. Therefore, students are encouraged not only to understand the subject matter, but also to be able to create an invention. In other words, students will no longer be in a telling science learning environment but will be encouraged to do science.

### **4.2 Description of the Difference in the Ability of Mathematical Connection and Self Efficacy between Students Given a Realistic Mathematical Approach with an Inquiry Approach According to the Journal**

Research with the title difference in mathematical connection ability and self-efficacy between students who are given a realistic mathematical approach with an inquiry approach has been carried out by several previous researchers who have been poured into journals, this can help researchers to find out the difference between realistic mathematical approaches and the inquiry approach that was carried out. Previous researchers serve as a reference for current open studies.

Several previous studies that have conducted research with the same title have obtained different results, such as one of the leading researchers. According to Nursiddik, Noto and Hartono (2017), in the results of this study there is an effect of using realistic mathematics learning on students' mathematical understanding abilities in 7<sup>th</sup> grade of Junior High School 14 Cirebon. This can be seen in the results of students' mathematical understanding abilities who use realistic mathematics learning which is higher than the mathematical comprehension abilities of students who use conventional learning. The self-confidence of seventh grade students of Junior High School 14 Cirebon City towards learning realistic mathematics which is applied to the rectangular flat shape material is a strong criterion. This means that realistic mathematics learning provides strong self-confidence in students in learning activities. This is indicated by the average percentage of the 20 students' self-confidence questionnaire scale of 66.58%. From this study we see the results that the ikuiri approach has increased students



'confidence in solving a math problem, then according to research According to Hendrik, Ani Minarni (2017) has conducted research at Sinar Husni High School with the results showing that the increase in students' conceptual understanding and self-efficacy skills who were given Discovery Learning significantly better than students who were given the conventional approach. In addition, there is a difference in the increase in the ability to understand the concept between high, medium, and low for students who are given Discovery Learning, where because there is no difference in the increase in students' Self Efficacy.

Badjeber and Fatimah (2016) the improvement of the mathematical connection ability of students who received the Alberta model of inquiry learning was significantly better than students who received conventional learning. Alberta model of inquiry learning can be used as a learning model that can be used to improve students' mathematical connection skills, the results of this study also state that students who get an inquiry learning approach are better than students who get conventional learning, the inquiry approach can improve students' mathematical connection skills.

From the explanation above, we can see that the two approaches have their respective weaknesses and weaknesses, this is a lesson for teachers in choosing an approach that will be used in the teaching and learning process, but overall the inquiry approach is better used, because it has more advantages.

## V. Conclusion

This study aims to determine differences in mathematical connection abilities and self-efficacy between students who are given a realistic mathematical approach with an inquiry approach. Based on the research results, the following conclusions can be drawn:

1. The realistic mathematical approach to the inquiry approach has both advantages and disadvantages, so here it is demanded that the teacher be able to read the situation in the classroom to find out what methods are suitable to be applied in the classroom.
2. In general, seeing from the theory of experts and several previous studies, a more effective approach to be applied is the inkuri approach, this is because in the inquiry approach students are required to be active, independent in solving problems, so that students can find new ideas in researchers of mathematical problems.

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