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The Effect of Inquiry Learning Model on Mathematical Ability Connection And Habit of Mind of Eighth-Grade Students at MTs Ma'arif NU 09 Kutawis Purbalingga

Hawa Hidayah[1], Maria Ulpah[2]
[1,2]Tadris Matematika, UIN Prof. K.H. Saifuddin Zuhri Purwokerto

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ABSTRACT

Mathematical connection ability and habit of mind are essential aspects of mathematics learning; however, they remain low among eighth-grade students at MTs Ma'arif NU 09 Kutawis. Conventional learning methods tend to be less effective in encouraging students to think critically and connect mathematical concepts. The inquiry learning model is believed to enhance these aspects by actively engaging students in exploration and problem-solving processes. This study aims to determine the effect of the inquiry learning model on students' mathematical connection ability and habit of mind. The research method used was a quasi-experimental design with a Nonequivalent Control Group Design. The study sample consisted of two classes: the experimental class, which applied the inquiry learning model, and the control class, which implemented teacher centered learning -based instruction. Data were collected through mathematical connection tests and habit of mind questionnaires, then analyzed using the N-Gain Score to assess mathematical connection ability and habit of mind. The results showed a positive effect of the inquiry learning model on students' mathematical connection ability and habit of mind. The average N-Gain in the experimental class for mathematical connection was 0.723 (high category), while in the control class, it was 0.46 (medium category). For habit of mind, the average N-Gain in the experimental class was 0.5 (medium category), whereas in the control class, it was 0.416 (medium category). Thus, the improvement in students' mathematical connection ability and habit of mind in the experimental class was higher than in the control class.

Corresponding Author:
Hawa Hidayah
UIN Prof. K.H. Saifuddin Zuhri Purwokerto
JI. A. Yani No.40A, Karanganjing, Purwanegara, Purwokerto Utara, Banyumas Jawa Tengah 53126
Email: 214110407061@mhs.uinsaizu.ac.id

1. INTRODUCTION

Mathematics education is not only aimed at making students able to calculate or solve problems technically, but also to train logical, systematic, and critical thinking. In everyday life, such abilities are needed to solve problems, make decisions, and understand information rationally. One of the main goals of learning mathematics is for students to be able to connect the mathematical concepts they learn. This means that students do not only understand the material separately (for example, only understanding fractions or only understanding equations), but can link one concept to another in mathematics lessons, although mathematics learning aims to develop thinking skills and connect concepts, in reality many students still have difficulty in this regard. They often only

focus on memorizing formulas or procedural steps, without really understanding the basic concepts underlying the formula and also connecting them to real situations in everyday life (external connections).

For example, connecting the concept of percentage with discounts when shopping, or using an understanding of graphs to read weather data. This ability is called mathematical connection ability. In the context of learning in Indonesia, this ability is included in the expected competencies in the Merdeka Curriculum and the previous curriculum. Based on the results of observations and preliminary interviews with the eighth grade mathematics teacher, Mrs. Ulfa Farida, S.Pd., MTs Ma'arif NU 09 Kutawis, it was obtained that most students still have difficulty in connecting the mathematical concepts they have learned with real situations or problems in everyday life. This condition indicates that students do not yet have adequate mathematical connection skills. In fact, mathematical connection skills are essential skills in mathematics learning because they allow students to see the relationship between concepts, integrate knowledge comprehensively, and apply it applicatively in various life contexts.

Without strong mathematical connection skills, students will tend to see mathematics as a collection of separate formulas and procedures, without complete meaning or clear relevance to the real world. This has an impact on weak conceptual understanding and low ability to solve complex problems. In addition, in the learning process in the classroom, it was also found that some students showed a passive attitude and were less actively involved in discussions or exploratory activities. This lack of participation has implications for the underdevelopment of critical, reflective, and flexible thinking skills needed in high-level mathematical thinking processes. Many students tend to rely on teacher explanations and only focus on solving problems with the formulas taught. Students rarely show initiative to explore problems, ask questions, or develop alternative approaches.

Even when given contextual problems, many of them are confused about connecting the information given with relevant mathematical concepts, various problems are still found related to students' attitudes and learning habits, many students give up easily when they encounter difficulties, and are not used to using systematic thinking strategies in solving problems. In addition, some students also seem less able to manage their emotions, tend to rush in answering questions, and show less empathy when discussing with friends. These problems indicate the need to strengthen the habit of mind aspect in students. The habit of mind is a set of attitudes and habits of thinking needed to face challenges in the learning process and everyday life, such as the ability to think critically, be persistent, flexible, and be able to work together and evaluate oneself. According to him, this shows the weak mastery of mathematical connections and the low habit of mind of students, especially in the aspects of perseverance, curiosity, and flexibility of thinking.

To overcome these problems, innovation is needed in learning models that can encourage active student involvement while fostering a constructive habit of mind. One relevant approach is the inquiry learning model. This model emphasizes the process of actively discovering knowledge through observation, asking questions, exploration, and proof. Through inquiry learning, students are not only invited to understand concepts, but are also trained to think independently, be responsible for their learning process, and build meaningful connections between concepts. The inquiry process also indirectly encourages the growth of habit of mind, because students are accustomed to asking, trying, failing, evaluating, and trying again.

The researcher is interested in studying the influence of the inquiry model on the mathematical connection skills and habits of mind of class VIII students of MTs Ma'arif NU 09 Kutawis Purbalingga, in order to provide alternative solutions in improving the quality of mathematics learning that is not only oriented towards cognitive results, but also on the development of students' thinking character.

1.1 Definition of Entreprenuership: An Islamic Insight

1. Inquiry Learning Model

The inquiry model is a learning approach that emphasizes the process of searching and discovering knowledge by students actively and independently through observation, asking questions, collecting data, analyzing information, and drawing conclusions based on evidence. In this model, the teacher acts as a facilitator who guides students to build their own understanding of a concept, not as the only source of information. This model involves the stages of orientation, formulating problems, designing experiments, conducting experiments, analyzing data, and concluding.

2. Mathematical Connection Ability

Mathematical connection ability is the ability of students to connect various concepts in mathematics, both between materials (internal) and with real-world contexts (external), so that students can understand and apply mathematics more meaningfully. Mathematical Connection Ability Indicators:

a. Intramathematical Connection: Students' ability to connect mathematical concepts with each other in mathematics subjects.
b. Concept Application: Students' ability to apply mathematical concepts in various types of problems.
c. Extramathematical Connection: Students' ability to connect mathematical concepts with everyday life situations or contexts outside of mathematics.

3. Habit of Mind

Habit of mind is a habit of thinking that reflects an individual's tendency to respond to problems intelligently, reflectively, and productively. This concept was introduced by Arthur L. Costa and Bena Kallick, who defined habit of mind as a pattern of intellectual behavior used when someone faces a situation or problem whose answer is not immediately known. Habit of mind is not just cognitive ability, but also includes attitudes, values, and habits of thinking that help someone think critically, creatively, and responsibly.

a. *A research journal published in 2022 by Yan Verico, Lois, et al., entitled "The Effect of the Connected Mathematics Project Learning Model on Students' Mathematical Connection Abilities at SMP Negeri 9 Pematangsiantar in the 2022/2023 Academic Year". The research journal has similarities with the author's research, which lies in the mathematical ability studied, namely mathematical connection ability. While the difference lies in the learning model used and the learning materials.*

b. *Research conducted by Nur Baeti and Mikrayanti entitled "The Effect of the Inquiry Based Learning Model on Junior High School Students' Mathematics Learning Outcomes" in 2021. This research was conducted with the aim of determining the level of student learning outcomes using the inquiry based learning model. The conclusion obtained from this study is that the use of the inquiry based learning model has a positive influence on students' mathematics learning. The achievement of student learning outcomes, namely in the experimental class, an average score of 28.7 was obtained, while the average score of student learning outcomes using conventional learning or the control class was 7.12.*

1.2 Framework of Thinking

Mathematical connection skills are important in learning because they allow students to link mathematical concepts and apply them in various contexts. To develop this ability optimally, a learning approach is needed that encourages active involvement and critical thinking, one of which is the inquiry learning model. The inquiry model guides students through systematic stages, starting from facing contextual problems that trigger curiosity. This process involves habits of mind such as curiosity, and supports mathematical connections as students begin to link real problems with concepts that have been learned. When students formulate problems and hypotheses, they develop representations and alternative solutions, supported by habits of mind such as flexibility of thinking and perseverance. Thus, the inquiry model, habits of mind, and mathematical connection skills support each other in creating deeper, more meaningful, and more applicable mathematics learning.

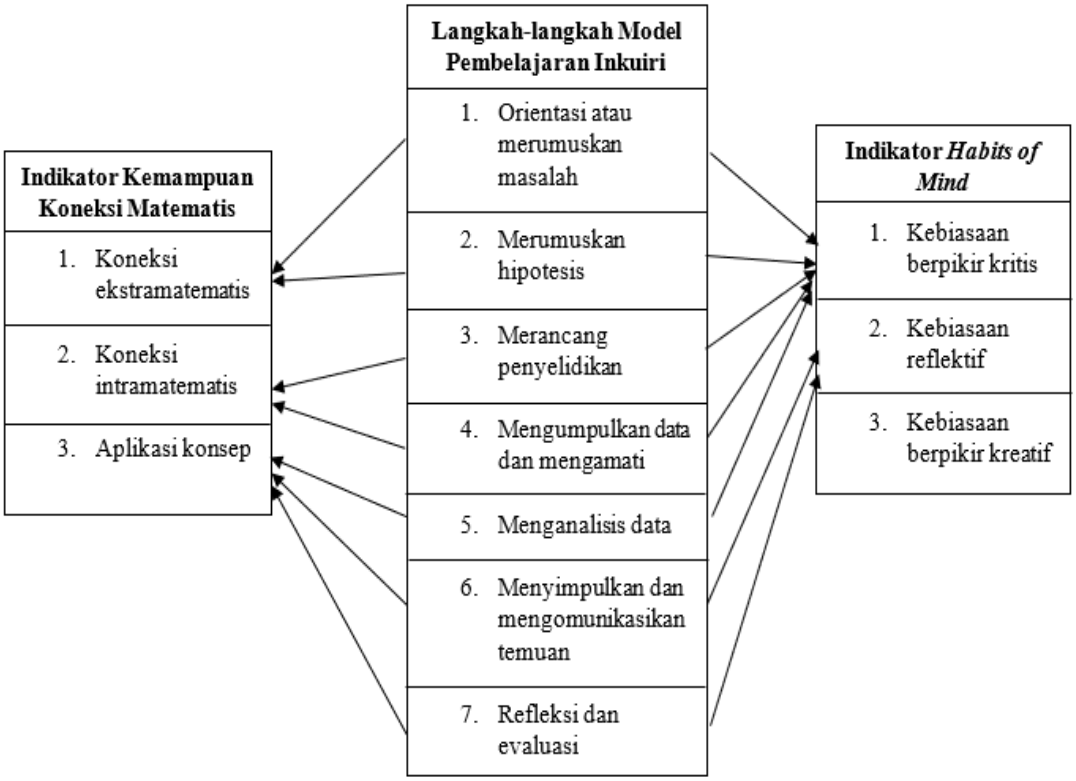

Figure 1

a. Orientation or Formulating Problems

This can affect the indicators of mathematical connection abilities, namely extramathematical connections and habit of mind indicators, namely critical thinking habits. The orientation or problem formulation stage is an important initial step in solving mathematical problems. At this stage, students try to understand the context of the problem and determine relevant information. This process encourages students to build extramathematical connections, namely connecting real-world situations with appropriate mathematical concepts.

b. Formulating Hypotheses

This affects two indicators, namely mathematical connection abilities which include extramathematical connections and critical thinking habits which are part of the habit of mind. The problem formulation stage in mathematics learning affects two important indicators, namely mathematical connection abilities, especially extramathematical connections, and critical thinking habits as part of the habit of mind. At this stage, students are required to understand problems that often come from real-world contexts, so they must connect the situation with relevant mathematical concepts. This is what forms extramathematical connections.

c. Designing Investigations

This affects two indicators, namely mathematical connection skills that include intra-mathematical connections and critical thinking habits that are part of the habit of mind. When designing an investigation, students need to connect various mathematical concepts, for example, linking data with certain graphical representations or formulas. This process shows the presence of intra-mathematical connections, because students integrate concepts in mathematics to understand and solve problems.

d. Collecting Data and Observing

This affects two indicators, namely mathematical connection skills that include intra-mathematical connections and critical thinking habits that are part of the habit of mind. When students collect data or make observations, they must link the information obtained with relevant mathematical concepts, such as linking statistical data with certain formulas or graphs. This creates intra-mathematical connections, where various concepts in mathematics are interconnected to produce a more comprehensive understanding.

e. Analyzing Data

At this stage, students compare the results of observations with the proposed hypothesis. This process encourages students to examine the relationship between mathematical concepts in various types of problems. This can affect the mathematical connection ability indicator, namely the application of concepts and can affect the habit of mind indicator, namely the habit of critical thinking, reflective habits and creative thinking habits.

f. Summarizing and Communicating Findings

This can affect the mathematical connection ability indicator, namely the application of concepts and the habit of mind indicator, namely reflective habits. When students conclude the results of an investigation or experiment, they not only summarize the information that has been found, but also apply relevant mathematical concepts to explain the findings. This process strengthens students' ability to connect theory with practice, which is part of the application of concepts in mathematical connections.

g. Summarizing and Communicating Findings

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1.3 A. Type of Research

This type of research is quantitative. Quantitative research is a type of research that uses data in the form of numbers or statistics to test hypotheses or explain certain phenomena. Many say that this research is research that involves numbers as a whole. Quantitative research is objective, systematic, and can be measured quantitatively. The true experimental design used in this study uses a pretest-posttest control group as the design of this research. In this design, the research begins with a preliminary trial in the experimental and control classes to determine the mathematical connection skills and habits of mind of students before being given treatment. Both classes are then given treatment in the form of different learning, with the experimental class using an inquiry learning model and the control class using a regular learning model. After completing the entire series of learning, a posttest was given to both classes to determine the improvement in mathematical connection skills and habits of mind.

Sample is a small part of the population selected by applying a sampling method. In the context of this study, the sample consists of 2 classes selected by the researcher from the population of class VIII MTs Ma'arif NU 09 Kutawis. Sampling was done using cluster random sampling. Cluster Random Sampling (group random sampling) is a sampling technique in which the population is divided into groups or "clusters" that are usually natural (eg based on geographic area, school, class, or other units), then several clusters are selected at random, and all members in the selected clusters are sampled. In relation to the number of samples used in this study, there were 53 students with details of 26 students from class VIII B, and 27 from VIII C. In the context of this study, class

VIII B was used as the experimental class, while class VIII C was used as the control class. Determining the role of each class is an important part of the research design that will be used.

2. RESULTS AND DISCUSSIONS

This study was conducted to determine whether there is an influence of the inquiry learning model on mathematical connections and habits of mind of class VIII students of MTs Ma'arif Nu 09 Kutawis. In this study, the population was all class VIII students consisting of 3 classes starting from class A-C. Sampling was carried out randomly, so that class VIII B was obtained as the experimental class and class VIII C as the control class. In the implementation of the study, the experimental class was given a treatment in the form of an inquiry learning model while the control class was given a teacher-centered learning treatment. The application of the treatment was given through the material on linear inequalities of one variable that was taught during the study both in the experimental and control classes. The material on linear inequalities of one variable is included in the material taught in the even semester of the 2024/2025 school year. The things studied in this study were the mathematical connection abilities and habits of mind of class VIII students.

It is hoped that the mathematical connection abilities and habits of mind of students in the experimental class are higher than the mathematical connection abilities of students in the control class. In the experimental class research, the learning process uses an inquiry model by implementing the following steps. The first step starts from problem orientation where the teacher starts by giving an interesting problem about the material of linear inequality of one variable. The teacher asks questions and directs students to formulate questions, then students provide responses to the questions. The second step is formulating a hypothesis, the teacher explains what a hypothesis is and helps students formulate a logical and testable hypothesis. such as "I think if the price of a pencil is multiplied by the number of pencils it should not be more than 10,000." Then students put forward a hypothesis based on their initial knowledge and explain the reasons behind their guesses.

The third step is designing an investigation, at this stage students plan the steps to be taken to test the hypothesis and decide what method to use by collecting data. The fourth step is collecting data and managing it, at this stage the teacher presents sources for data collection in the form of books and monitors and guides the data collection process. While students conduct experiments by reading and recording the data found systematically. The fifth step is analyzing data, the teacher directs students to process data and relate it to the hypothesis, while students analyze data by compiling reports. The next learning step is to draw conclusions, the teacher guides students to draw conclusions that are in accordance with the data and hypotheses, and provides feedback on students' arguments or conclusions. Meanwhile, students draw conclusions based on the evidence collected and present the results of these conclusions. The last step is for teachers and students to evaluate learning. Based on the results of the study, it is in accordance with the steps of the inquiry learning model.

This study used a test instrument in the form of 4 descriptive questions containing indicators of students' mathematical connection abilities and 15 statement items for each test on the habit of mind. Before being used, the instrument had passed validation testing by experts and SPSS, namely validity and reliability tests which aim to determine the validity and suitability of the instrument with the material being taught so that the instrument can be used or not. The experts in question are the supervising lecturer and the mathematics teacher of MTs Ma'arif Nu 09 Kutawis class. The results of the validation of the research instrument showed that the three questions and 15 statements that had been made were valid and could be used to measure students' mathematical connection abilities and habit of mind. During the implementation, students were given two tests, namely an initial ability test (pretest) and a final ability test (posttest), which were carried out before being given treatment and after being given treatment.

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