

# Interaction Pattern of Inquiry Learning on Data Collection and Presentation Material at SDN 13 Ampenan

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**Abstract** This study aims to describe the inquiry learning interaction patterns on data collection and data presentation in terms of metacognitive activities. Interaction in inquiry learning allows children to help one another and learn from one another in constructing mathematical knowledge. Researchers observed the learning process of the fifth-grader at SDN 13 Ampenan Mataram, West Nusa Tenggara. This research is descriptive qualitative research. The subjects in this study consisted of 30 fifth graders involved in small groups of classrooms learning and interaction. Data collection is done through classroom observation and the entire learning process recordings. The researcher also made field notes during the learning process. The results of the analysis show that there are three interaction patterns formed. There are 1) interaction patterns between students and teachers, 2) interaction patterns among students and learning resources, 3) interaction patterns among students, teachers, and learning resources. The interaction pattern between students and teacher occurred dominantly at the orientation and conclusion stages. The interaction pattern between students and students and learning resources predominantly occurs at the stage of problem-solving. The interaction pattern between students and students, teachers, and learning sources were more dominant in the stages of preparing hypotheses, data collection, and data analysis. Through inquiry learning, students are able to construct their own knowledge better through meaningful learning where they are fully involved in observing and measuring activities with their friends in a group. In-group inquiry learning also encourages the emergence of students' metacognitive activities.

**Keywords** Learning-Interaction, Inquiry Learning, Metacognitive Activities, Elementary School

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## 1. Introduction

Interaction is an important component of learning activities. Interaction is a reciprocal process between students and the learning environment in order to achieve the desired learning goals (Wagner, 1994; Kahveci & Imamoglu, 2007; Wang, Chen, & Anderson, 2014). Based on Vygotsky's theory, learning interactions between students in groups and interactions between students and learning resources are believed to be able to awaken children's thought processes. Interaction of peers presents unique context for students to attempt new ideas, experiment or to make new challenges or new problems (Beltran, 2017). There are three types of learning interactions; interactions between students and students, interactions between teachers and students, and interactions between students and learning resources (Chen, 2004; Sutarto & Syarifuddin, 2013; Sutarto, et al, 2019).

Interaction in inquiry learning allows children to help one another and learn from one another in constructing mathematical knowledge. Moreover, group discussions in inquiry learning encourage students to work together in inquiry and discovery activities. Student's social interactions that occur in inquiry learning are designed to resemble the activities of a scientist, where students engage in problems related to the content, question, analyze ideas, strategies, and discuss the result and its significance (Ellwood & Abrams, 2018). Research conducted by Mulyeni, Jamaris and Supriyati (2019) also present that factors contributing toward inquiry learning model are the use of work sheets, interaction between peers and teachers. Therefore, the aim of this research is to describe patterns of

interaction in inquiry model in encouraging the metacognitive skills of Elementary students. The description from the patterns of interaction in inquiry learning is able to be a reference in conducting research in metacognitive activity in learning. Student discussions in inquiry learning often have a cycle, in which students propose ideas, repeat them, explore and evaluate them (Elbers, 2003). This cyclic process allows many students to participate in discussions and to adjust what other students have found. The ideas introduced by some students are adopted and developed by others. The atmosphere of collaboration and mutual trust of each other will enable children to participate in the process of constructing mathematical knowledge. Students share ideas and evaluate each other's opinions expressed by their friends. The atmosphere of collaboration in inquiry learning will improve the quality of individual performance and allow children to present their ideas and comment on others' ideas freely.

Interaction in collaborative inquiry learning also encourages children's metacognitive activities. Hastuti et al. (2016;2020) explain that the influence of group discussions results in a shift in metacognitive activity, a condition in which students construct or rebuild their thinking in solving problems. There are three types of metacognitive activities; awareness, regulation, and metacognitive evaluation (Magiera & Zawojewski, 2011: 490). Social metacognition requires reciprocal relationships and the involvement of group members to solve problems together. Research conducted by Chiu and Kuo (2010) revealed that social metacognition has many benefits, one of which is to encourage the emergence of a reciprocal scaffold.

Metacognitive activities become the main goal of learning activities. The learning process that emphasizes the ability to think metacognitive now is not only involved in middle and high school students. Tarrant & Holt (2017) in his book explains how to develop a metacognitive approach in elementary school students. Children will have metacognitive abilities if they have been accustomed to engaging in metacognitive activities starting from the lower class. Even the Minister of Education and Culture Regulation No. 20 Year 2016 explains that the metacognitive aspect is an important component in the standard of graduate competence of basic education.

Based on the theoretical background states that metacognitive aspects become one of the important components in the standard of graduate competence of basic education, the researchers consider it is very important to describe the patterns of inquiry learning interaction based on metacognitive activities both in classical and in group learning processes. An inquiry is chosen based on model development. This is in line with Arends' statement (2012) that inquiry learning is a learning model that aims to create how students think where metacognitive thinking is included. In addition, there is still very little research involving the classroom learning process that focuses on students' social interactions in the

inquiry learning model (Ellwood & Abrams, 2018). Therefore, the aim of this research is to describe patterns of interaction in inquiry model in encouraging the metacognitive skills of Elementary students. The description from the patterns of interaction in inquiry learning is able to be a reference in conducting research in metacognitive activity in learning. If the interaction patterns of inquiry learning in terms of metacognitive activities can be clearly described, this will be a source of reference for teachers in developing learning plans that can enhance students' metacognitive activities.

## 2. Materials and Methods

### 2.1. Research Design

This research is descriptive qualitative research. The subjects in this study were 30 students of fifth-graders at SDN 13 Ampenan, West Nusa Tenggara with heterogeneous abilities. The researcher observed the teacher's activities in class when implementing the inquiry-based learning lesson plan that the researcher has prepared in the data collection and presentation. Observations were made through video recording during the learning process of collecting and presenting data using three cameras. The first camera focuses on the teacher, the second camera focuses on groups, and the third camera focuses on the classroom. Next, the researcher analyzes the pattern of inquiry-based learning interactions in terms of the students' metacognitive activities. In addition to the lesson plan, the instrument used was an inquiry-based student worksheet on data collection and presentation material.

### 2.2. Research Instrument

The instruments used in this study consisted of an inquiry-based lesson plan on data collection and presentation material, inquiry-based student worksheets, and field notes.

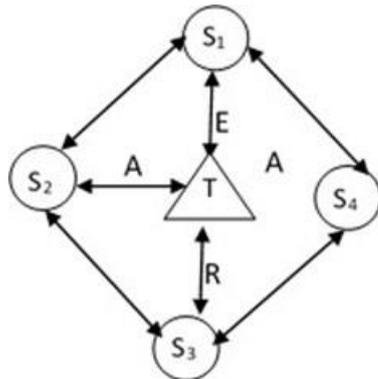
### 2.3. Data Analysis

After the data is collected, the researcher conducted a qualitative analysis that refers to the interactive analysis technique adopted from Miles & Huberman (1994). The technique consists of data collection, data reduction, data presentation, and drawing conclusions. The results of data analysis are presented using descriptive qualitative methods to describe the interaction patterns of inquiry learning.

### 2.4. Discussion

The results of this study will be described based on the stages of the inquiry learning model that consist of 1)

orienting, 2) presenting problems, 3) formulating hypotheses, 4) collecting data, 5) analyzing data, and 6) concluding. Next, a description of the inquiry learning interaction pattern at each stage will be described further. In the orientation stage, the teacher began the class with greetings and asked one of the students to lead the prayer. Before starting the lesson, the teacher did the apperception, associating the material to be studied with the previous material that is about presenting data in the form of bar charts in like what they have learned in the fourth grade. At this stage, the teacher needs to stimulate students' curiosity about the topic of collecting and presenting data through the implementation in daily life such as quick counts in the election and to find out how many students have passed the minimum criteria. Before discussing the topic, students receive information about the basic competencies and learning objectives to be achieved, the scope of the material, the learning steps, and the stages of the inquiry learning method. The interaction that occurs in the orientation stage is the interaction between students and teachers where the activity of preparing students physically and psychologically through apperception can also encourage the emergence of metacognitive activities. Elbers (2003) also states that interaction in classroom learning encourages the reflection process.

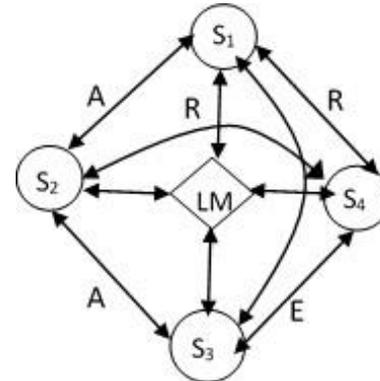


S<sub>1</sub>: Student 1, A: Awareness  
 S<sub>2</sub>: Student 2, R: Regulation  
 S<sub>3</sub>: Student 3, E: Evaluation  
 S<sub>4</sub>: Student 4, T: Teacher

Figure 1. Interaction Pattern between Student and Teacher

At the problem-solving stage, students were given problems to collect all data related to body weight, height, shoe size, and age of all students in class VA. Classes were divided into four groups and students were asked to collect and present data about weight, height, age, and shoe size. Next, students were asked to work in a group of three or four. After the grouping was done, the teacher asked them to study the data collection and presentation materials in groups in their mathematics books. Group one's duty was to collect the weight data of its members. Group two's duty was to collect age data from its members. Group three's duty was collecting shoe size data from its members. Group

four's duty was collecting height data from its members. The teacher asked the students to work with their groups first. In line with research conducted by Ellwood & Abrams (2018), student interactions especially in-group discussions will provide mutual feedback and increase student's motivation and achievement results. At this stage, the formed interaction pattern is the interaction pattern among students and learning resources.



S<sub>1</sub>: Student 1, A: Awareness  
 S<sub>2</sub>: Student 2, R: Regulation  
 S<sub>3</sub>: Student 3, E: Evaluation  
 S<sub>4</sub>: Student 4, LM: Learning Material

Figure 2. Interaction Pattern Among Students and Learning Resources

At the developing hypotheses stage, there were lots of questioning activities arose among group members, such as asking about how to know, to collect data and to present weight, height, shoe size, and age data from all students in class VA effectively. Students could ask their classmates or even their teacher. After questioning activity, students will make hypotheses about how to collect data on body weight, age, shoe size, and height. The interaction that occurs at this stage is the interaction between students and students, students with learning resources (textbooks, media and measuring instruments), and students with teachers, in which these interactions encourage the emergence of metacognitive activities. Metacognitive activities arose as students learned to question and evaluate the opinions of peers in groups. In line with Chiu & Kuo's research (2010), social metacognition in group discussions can construct students' knowledge and strategies so that they can help students learn and evaluate strategies. Moment of structured learning through peer interaction is able to occur in various tasks finished collaboratively (Kibler, 2017). Hypotheses made by students including data collection on body weight and height were collected by measuring techniques using scales and data on age and shoe size were collected through interviews. Student social interactions that occur in inquiry learning, such as engagement in discussion, questioning, and analyzing ideas will increase motivation and critical thinking (Ellwood & Abrams, 2018). Research conducted by Mulyeni, Jamaris and Supriyati (2019) also present that factors contributing

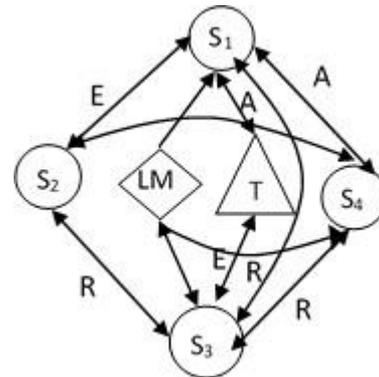
toward inquiry learning model are the use of work sheets, interaction between peers and teachers..



**Figure 3.** Students' Activity in Data Collection and Data Presentation

Then at the data collection stage, members of group one started collecting weight data by measuring the weight of each group member and then write down the results. Members of group two began collecting age data by conducting interviews with each member and then taking notes. Group three members started collecting shoe size data by interviewing each member and write down the results. Group four members started collecting height data by measuring the height of each member using a height meter and then record it. During the observation of this activity, it was found that there were some difficulties experienced by the group, for example, group one had difficulty reading numbers in the scales and group four had difficulty using the height meter. The rest, children are enthusiastic about this activity and when they found difficulties, they asked the teacher. The students overcame these difficulties by asking the teacher. Based on observations and interviews, children are more enthusiastic to learn because they feel they were involved more in measuring and interviewing peers. The interaction that occurs at this stage is the interaction between students and students, students with learning resources (textbooks, media and measuring instruments), and students with teachers, where these interactions encourage the emergence of metacognitive activities. In line with Elbers'

(2003) findings, interactions in inquiry learning will stimulate children to construct mathematical knowledge and encourage children to do the reflection process.



S<sub>1</sub>: Student 1, A: Awareness  
 S<sub>2</sub>: Student 2, R: Metacognitive Regulation  
 S<sub>3</sub>: Student 3, E: Metacognitive Evaluation  
 S<sub>4</sub>: Student 4, T: Teacher  
 LM: Learning Material

**Figure 4.** Interaction Pattern between Students and Students, Teachers, and Learning Resources

Then in the data analysis stage, students began to group, organize and present data. At this stage, children found it difficult to present the data because children were more likely to ask the teacher than to read data presentation material from their textbooks and most of them forget the data presentation material in the form of diagrams like what they have learned in the fourth grade. At this stage, the assistance provided by the teacher is very important so that students could present data accurately and properly. However, this assistance was only a directive that did not directly give students the correct answer. Interactions that occur at this stage were interactions between students and students, students with learning resources, and students with their teachers, where this interaction encouraged the emergence of metacognitive activities. From the findings, the group presented data in the form of tables, bar charts, line charts, and pictograms. There was group two presented the height data in tabular form improperly so that it caused them to present it in the form of a bar chart incorrectly as well. The following are the initial results of their work before being revised

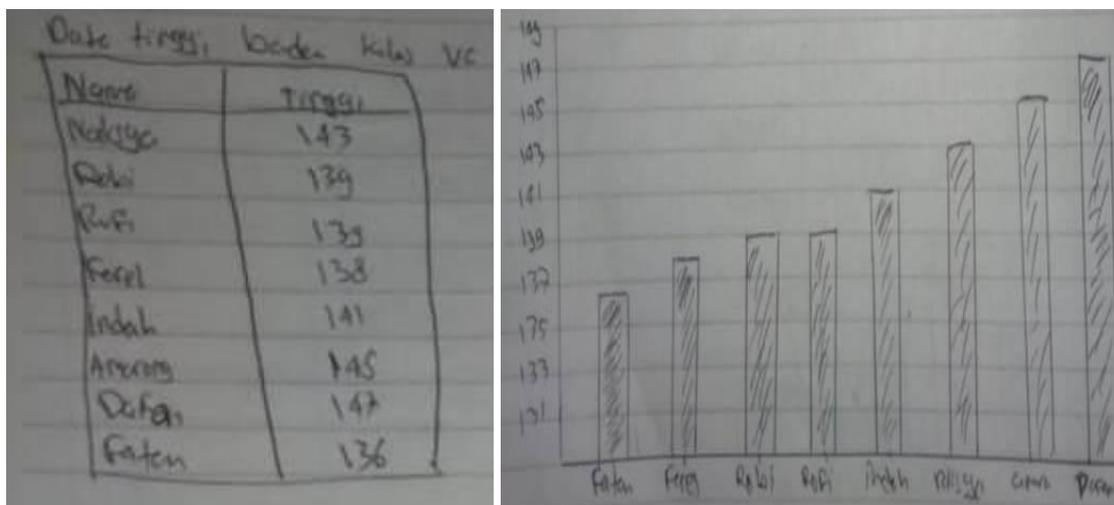


Figure 5. Results of Students' Work Before Revision

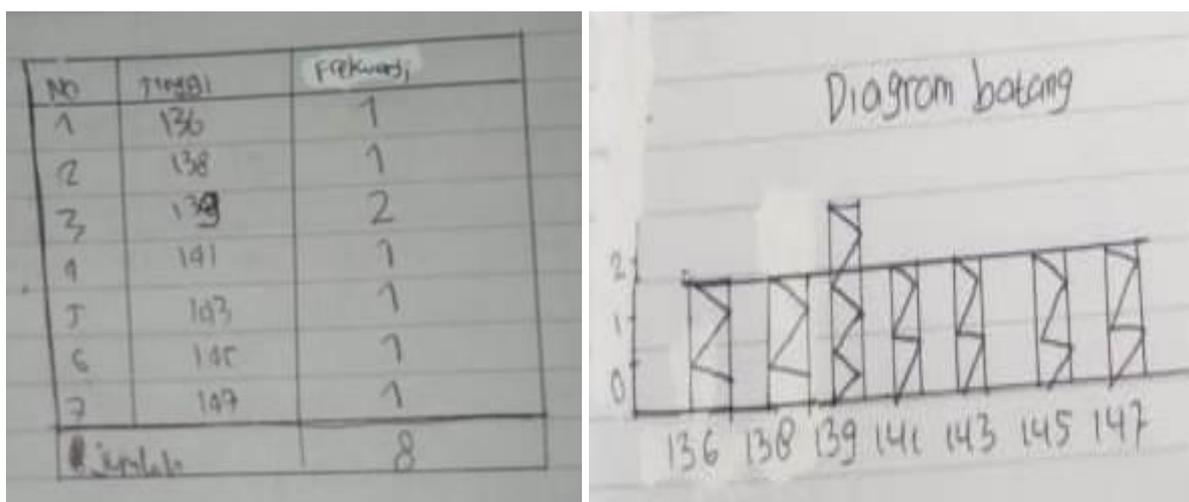


Figure 6. Results of Students' Work After Revision

Furthermore, there was input from one of the group members that the work results in Figure 5 were not quite right so they revised it again as shown in Figure 6.

In this case, the student was engaged in metacognitive activities, where he re-evaluated and rethinking the input from his friends then he changed his initial answer. This is in line with research done by Hurme, Marenluoto, & Jarvela (2009) that metacognition arises more when it occurs in group discussions where one group member contributes and influences other members so that other members in the group respond and develop it.

After students recorded their findings, they present their results. In that presentation, there was something unique explained by group three. They presented shoe size data only in the form of tables, bar charts, and pictograms and did not present it in the form of line charts. Their reason was that shoe size data from friends in their group did not reflect growth or development over time. During group presentations, the teacher also provided questions to check student understanding, such as; who has the biggest shoe size in group three, who is the oldest in group two, who is

the heaviest in group one, and who is the highest in group four? Students answered those questions correctly. This means students have already understood that the data presented will make it easier for us to know who is the tallest, the heaviest, and the youngest.

At the conclusion stage, students concluded that data collection could be done in two ways, which are by interviewing and by direct observing (measurement). Weight data could be done by direct observation, age data could be obtained from interviews, shoe size data could be gained from interviews, and height data can be collected from direct observations or measurements. Then in the reflection stage, students made a summary of the material that has been studied in their notebooks. At this reflection stage, students were also asked to describe the difficulties encountered and how to overcome them. Most students revealed that they had difficulty in using the height meter and read numbers on the weight scales since they did not know yet the proper procedure to use them. After given direction from the teacher, they knew how to use the height meter and weight scale properly.

### 3. Conclusions

The results of the analysis show that there are three patterns of interaction formed in inquiry learning; 1) interaction patterns between students and teachers, 2) interaction patterns between students and students and learning resources, and 3) interaction patterns between students and students, teachers, and learning resources. The interaction pattern between students and teacher occurred dominantly at the orientation and conclusion stages. The interaction pattern between students and students and learning resources predominantly occurs at the stage of problem-solving. The interaction pattern between students and students, teachers, and learning sources were more dominant in the stages of preparing hypotheses, data collection, and data analysis. Based on the findings, students are better able to construct their own knowledge through meaningful learning through inquiry learning where they are fully involved in observing, measuring, and sharing with their friends in one group. In-group inquiry learning also encourages the emergence of students' metacognitive activities.

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