

## METACOGNITIVE ACTIVITIES IN GROUP DISCUSSIONS OF ELEMENTARY SCHOOL STUDENTS MATHEMATICS MULTIPLICATION MATERIAL

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### Abstrak

Metakognitif siswa hanya berfokus terhadap individu, belum dikaitkan dengan pemosisian siswa dalam kelompok. Ada kelompok pemosisian yang perannya berubah, sehingga perlu mengkaji lebih mendalam terkait karakterisasi metakognitif siswa dalam menyelesaikan masalah perkalian pada diskusi kelompok ditinjau dari pemosisian siswa. Penelitian ini bertujuan untuk mendeskripsikan aktivitas metakognitif siswa, peran siswa selama proses diskusi, dan kemampuan metakognitif siswa yang terkait dengan peran siswa selama diskusi kelompok pada materi perkalian matematika siswa kelas 6 di salah satu sekolah dasar negeri di Indonesia. Tidak hanya mengetahui konsep agar siswa dapat berpikir kritis dan belajar secara mandiri dari siswa tanpa bantuan guru, tetapi juga siswa harus dilatih dalam memecahkan masalah. Penelitian ini menggunakan deskriptif kualitatif sebagai metode penelitian. Ditemukan bahwa kesadaran terutama ditemukan pada posisi ahli dan fasilitator, regulasi ditemukan pada siswa ahli dan fasilitator, dan evaluasi ditemukan pada semua peran siswa. Karakteristik metakognitif yang muncul dalam diskusi kelompok adalah siswa ahli sebagai pemicu (stimulus) dan pengatur (kontribusi), siswa fasilitator sebagai pengatur (kontribusi) dan pengikut (pasif), dan siswa pemula sebagai pengikut (pasif).

**Kata kunci:** Diskusi kelompok; metakognitif; perkalian

### Abstract

Student metacognition only focuses on individuals, not yet associated with student positioning in the group. There are positioning groups whose roles change, so it is necessary to examine more deeply the characterization of students' metacognition in solving multiplication problems in group discussions in terms of student positioning. This study aims to describe students' metacognitive activities, students' roles during the discussion process, and students' metacognitive abilities related to students' roles during group discussions on multiplication material in mathematics of grade 6 students in one of the public elementary schools in Indonesia. Not only knowing the concept so that students can think critically and learn independently from students without teacher assistance, but also students must be trained in solving problems. This study used descriptive qualitative as the research method. It was found that awareness was mainly found in expert and facilitator positions, regulation was found in expert and facilitator students, and evaluation was found in all student roles. The metacognitive characteristics that emerged in group discussions were expert students as triggers (stimulus) and regulators (contribution), facilitator students as regulators (contribution) and followers (passive), and novice students as followers (passive).

**Keywords:** Group discussion; metacognitive; multiplication



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## INTRODUCTION

Mathematics requires logical, systematic, reflective thinking, diligence, thoroughness, and earnest effort, according to which students' abilities in learning mathematics. Developing the ability to think and reason is needed in an increasingly competitive era. Mills et al. (2020) and Siagian (2016) emphasize that mathematics is considered very important in education, from basic education to higher education, especially in developing patterns of thinking and reasoning through problem solving as a characteristic in learning mathematics.

Problem solving is an attempt to find a way out of a difficulty to achieve a goal (Polya, 1973). Problem solving is often related to higher-order thinking skills, where students still need to develop strategies that can be directly used to solve them (Sa'diyah et al., 2019). In problem solving, they must understand the problem, plan, execute the solution, and re-examine (Polya, 1973). In this case, the problem-solving process often involves thinking "about what has been thought", which is called metacognition.

Metacognition is thinking and organizing thoughts (Branigan & Donaldson, 2020). Metacognitive skills that are important to teach to elementary school students include learning planning, concept understanding, problem solving strategies, monitoring and problem solving progress, and evaluation. Metacognitive activities can be classified into awareness, regulation, and evaluation, the three metacognitive activities are interrelated. After going through this process, students learn what they already know and don't know, so it is expected to be an improvement for students in the future. This activity can provoke students to collaborate skills in the form of creating learning

strategies to solve certain problems with a balance of skills through the discussion method (Baten et al., 2017).

Research states that the process of social metacognition leads to a discussion or exchange of ideas about possible ways to complete the task. In the discussion, students will have separate roles, for example, one student works on the answer sheet, one is in charge of finding ideas, and another calculates and checks the results of the discussion (Dewi, 2019; Williams & Svensson, 2020). From the interaction during the discussion, it can be seen how students' process in solving problems. Good problem solving is associated with high levels of metacognitive activity (Magiera & Zawojewski, 2011). This is also supported by opinions stating that collaboration in developing motivation with discussion learning can create a significant metacognitive shift with student monitoring learning activities in discussion learning (Destan et al., 2014; C. Roebbers, 2017).

Based on math learning observations, students are very enthusiastic to learning in groups. Some students actively asked about how to solve the problem and vice versa, only depending on their smart friends. There are students who finish first with all correct answer, there are those who finish working for a long time and get less than optimal results, and students who are mediocre. Most students have not been able to plan, monitor, and evaluate the completion of the math problem or problem they are working on (Amir & Kusuma W, 2018). Of course, this is supported by surrounding motivation such as teachers and parents to develop student's thinking systems in managing and solving problems so that metacognitive shifts occur (Tian et al., 2018).

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In previous research, students position themselves through interactions between group members, which means that students explicitly identify their roles or intend to position themselves in a certain way. Within the group it will be seen that there are bright, average and less intelligent students. Previous research has revealed that social contexts (e.g., small group modeling) have the potential to spontaneously elicit metacognitive activity (Magiera & Zawojewski, 2011). The more often they succeed in solving problems can make students more confident, especially if students can look back and be aware of the process they have gone through. Self-confidence is related to self-esteem. Thus, increased self-confidence due to success related to metacognitive abilities can maintain student self-esteem. Conversely, a lack of self-confidence will affect students' low metacognitive abilities.

Previous research on metacognition by (Tarrant & Holt, 2016) shows that mathematics learning using metacognitive skills in students has several characteristics, including identifying problems (questions), finding ways to solve problems, students sequencing the flow of problems, talking (dialoguing) with friends to recall lessons that have been learned. writing what is known from the story problem, students try not only once, students read the problem repeatedly, students discuss between group members, so that students become actively involved, writing what is known from the story problem, students use more than one way to solve the problem (problem), students try not only once, students read the problem repeatedly, students discuss between group members, so that students become actively involved, students concentrate more because they

repeatedly read the problem, students imagine the story problem. Thus, students can experience metacognitive development when characteristics (special characteristics) related to the metacognitive process appear. The renewal of this research is not only examining students' metacognitive activities and students' roles in the discussion process. However, it also analyzes how students' metacognitive activities are viewed from the role of students during group discussions. So that the relationship between the two will be seen. Through the phenomena in the field, researchers intend to analyze learning independence and students' higher order thinking skills in solving group discussion problems.

## **METHOD**

This research uses descriptive qualitative research, in which the researcher is the main role in analyzing the object to be studied. The participants in this study were grade 6 elementary school students totaling 13 students, consisting of 4 male students and 9 female students. The subject used in this study is mathematics. The research instruments used in this research are interviews, observation, and documentation. The first is observation activities carried out on grade 6 elementary school students. Second, the source of the interview is 6th grade students. Data analysis used by researchers is data reduction, data presentation, and conclusion drawing. To check the validity of the data used in this study using data triangulation, examination of supervisors, and 6th grade teachers. This study uses data validity criteria to obtain the truth of research data, namely the degree of trust (credibility) or the credibility test of qualitative data and the dependability test or audit.

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The data instrument used in this study is in the form of group discussion questions or problems that are solved, then the researcher makes gradual observations of the implementation of group discussions. Data analysis was carried out before entering the field and while in the field. When data collection takes place and after data collection is complete. Data analysis was carried out since the start of data collection, in the form of observation activities, interviews with sources, and documentation related to the research. In qualitative research, the level of data validity is emphasized on data acquisition. From this, it can be said that the research data has a significant effect on the success of qualitative research.

## RESULTS AND DISCUSSION

Research results show that not all students experience metacognitive activity, and each student experiences the process differently. That is due to several supporting factors, both external and internal. Metacognitive activity is related to the role of students during the group discussion process. This statement is supported by the expert opinion, which states that group learning using specific models can measure students' metacognitive activities using discussion or problem-solving systems based on particular learning (Yuwono, 2014).

Metacognitive abilities are crucial for the development of children in terms of thinking or behavior to solve problems. That aligns with metacognitive, which is vital in developing thoughts and behaviors to solve problems according to context (Lei et al., 2020). According to metacognitive abilities, there are three processes (Branigan & Donaldson, 2020) : awareness, regulation, and

*evaluation*. The three metacognitive indicators, which researchers have developed in various statements, show that not all metacognitive processes are experienced by all students. Several students demonstrated awareness of metacognitive abilities in the three groups studied, including students R, S, B, I, Y, A, F, and Va. Students from the three groups who showed the process of regulation included students R, B, I, A, and F. Meanwhile, in the evaluation process, all students experienced, although not the same, at least they could reflect on themselves. The following is an illustration of the student's awareness process.

There was a conversation that talked about R indicating that solving the problem could be done through multiplication. However, it was opposed by B who had another way to solve the problem. B said that to solve this problem through addition and subtraction. B indicated that in the problem it was known that the shop owner bought stock, and someone then bought instant noodles. If you buy it, then the result will be reduced.

From the conversation above, after reading the question once, R indicated that he immediately understood the problem in the problem. Even R confidently explained to group members the meaning of the problem, from one sentence to the following several sentences contained in the problem, making other members also understand the problem. Then student B adds input related to the problem he already understands. Awareness experienced by students includes understanding the question, remembering related concepts to be used, and understanding what steps must be taken to solve the problem. Even though students had to read the

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questions repeatedly and found it difficult at first, this awareness process was demonstrated by several students.

Each group shows the process of *regulation*. According to the indicators (Barenberg & Dutke, 2019), the regulatory activities experienced by students, namely, students can determine the goals of problem-solving, have ideas and choose the strategy to be used. The absence of help from teachers or *smartphones* makes students more creative. The acquisition of these ideas comes from the students and has nothing to do with teacher assistance. Students can collaborate (Sumitro et al., 2019) in line with the opinion which states that students' abilities can develop more by solving problems in groups and support from the environment so that students' mindsets develop (AL-Baddareen et al., 2015; Aminah et al., 2018). Collaboration activities found in students include students being able to work well with each other with their group members.

Disagreements arise between members when planning goals and working out problem-solving. It happened because there were differences of opinion during the discussion. That is what the conversation looks like.

#### Disputes of Opinion 1

R invited B to calculate  $25 \times 50$ , and B rejected the invitation, because B had another way to solve the problem, which was to add all the numbers, then subtract, and multiply

#### Disputes of Opinion 2

There was a conversation by R, S, and B who had different ways to solve the problem. R states that each set is 1 set, while B and S have different opinions, namely by adding up first.

From disagreements during regulation, in the end, the group can still decide which method or strategy to use to solve the problem.

In the evaluation process, students reflect on themselves, such as the difficulties during the discussion. For example, when working on math problems, finding solutions varies with addition, subtraction, and division; students also need clarification with long math story problems. According to (Rismawati, M. & Asnayani, 2019), the mathematical difficulties experienced by students are because of the need for more students to master the concept. That is in line with the opinion that the difficulty of mastering concepts to solve particular problems is due to the lack of support from oneself or others to find strategies and describe mindsets in solving mathematical problems (Raymond, 2019). The following is an overview of group conversations when self-reflecting.

In the conversation Va asked Vi, 300 exactly divided by what value, and Vi answered that it seemed to be divided by 16. However, no students can *pogapit* (tiered division), then F provides a solution by trying to multiply  $12 \times 16$ , and so on so there is no need to *pogapit*.

The conversation above shows that the group found it challenging to solve the problem and admitted that each needed to be proficient in the arithmetic division. This limitation makes the group unable to solve problems efficiently. However, from these limitations, the group tried another strategy. That is in line with solving problems using several strategies that can improve students' mindsets in learning and support metacognitive shifts and the development of problem-based math skills (Faradiba et al.,

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2019). This opinion is supported by a statement stating that metacognitive structures can be adapted to learning mathematics literacy with group strategies using various methods (Artuso, 2019). Therefore problem-solving must use different methods with learning variations and the support of peers or teachers in groups.

The types of students' roles in the discussion process were seen from the indicators (Lei et al., 2020) : experts, beginners, and facilitators. Of the three groups studied, not all of these roles appear. Group one experienced all roles, including R as an expert, S as a beginner, and B as a facilitator. Group two acted as experts, namely student I, and beginners, namely student Y, while the role of facilitator did not appear. In group three, student A was the expert, the VA student was the beginner, and student F was the facilitator. Student roles can be found automatically and can change or increase with the length of the discussion (Magiera & Zawojewski, 2011). Students can be said to be experts if they understand and understand the material so that they can explain it to their friends. That is following (DeJarnette & González, 2015), the measure that can be said of an expert in understanding the material. Beginner students can easily recognize their characteristics, including asking many questions because they do not know or because their knowledge is not too deep. Novice students will also be good listeners. Beginner students behave like that because they believe in experts who understand the material better than beginners. Novice students will rely on experts. That follows the expression that beginners submit to experts and seek expert advice (Lei et al., 2020). The facilitator is the role of students in facilitating their friends.

Facilitating in question includes organizing group activities and provoking information-digging (Lei et al., 2020). According to these indicators, the researcher found student actions that could be classified as facilitators, namely students offering ideas or strategies for working on questions, asking their group mates about the next thing, directing them to write on the answer sheet, directing them to double-check their answers before collected, and control the discussion process, as well as mediating.

Group 1 discussion showed the roles of experts, beginners, and facilitators. At specific minutes, interactions are formed between experts and beginners, causing awareness stages, experts and facilitators causing awareness stages, experts and beginners causing regulatory processes, and experts and beginners causing evaluation stages. Moreover, conversely, beginners interact with experts to form awareness stages, facilitators to experts form awareness stages, facilitators to beginners cause awareness, facilitators to experts cause regulations, facilitators to beginners cause regulations, and facilitators to beginners form an evaluation stage. This stage can be seen as students' metacognitive shifts through their interactions. It is in line with the effectiveness of learning with discussion stages by their respective roles can shape the development of students' mindsets according to competency achievements to solve problems (Álvarez-Bueno, 2017). In line with the process of metacognitive movement, students can be formed by controlling the emotions and mindset of learning in the form of group communication according to their respective portions (Yilmaz, 2011).

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According to this, it can be seen that the process of cognitive development is carried out without awareness of the problems individuals or groups face.

Group 2 discussion emerged the role of experts and novices. The interaction between experts and beginners causes awareness stages; experts and beginners lead to regulation stages. Furthermore, conversely, beginners towards experts lead to stages of awareness. That is in line with the opinion that students' metacognitive development can develop in a complex way with the help of significant interaction with the help of peers and tutors according to their respective portions (Dindar et al., 2020). to solve problems according to their respective abilities (Jagals & Van Der Walt, 2016). Based on this, it can be seen that group 2 upholds learning interactions that can improve students' mindsets so that they become individuals who develop in solving problems, causing a shift in mindset. Of course, supporting problems can be seen like Polya's problem-solving as a method in which students plan and monitor solving problems, resulting in a shift in mindset assisted by the interaction between individuals for learning (Hastuti et al., 2016; Udil et al., 2017). Of course, problem-solving helps increase student awareness of solving related problems to mathematics.

The results of group 3 show the roles of experts, beginners, and facilitators. There is interaction from expert to beginner forming awareness stages, expert to facilitator forming awareness, expert to beginner forming regulation, expert to beginner forming evaluation, and vice versa from beginner to expert forming awareness, beginner to facilitator forming awareness, facilitator to expert forming

awareness, facilitator for beginners to form awareness, facilitators for experts form regulations, facilitators for beginners form regulations, facilitators for beginners form evaluations. This evaluation can be used as material to develop students' metacognitive processes in particular learning (Rukminingrum et al., 2017; Sa'dijah et al., 2018). The connection between metacognitive and cognitive learning can be increased with group discussions forming three roles according to particular needs (Sasongko et al, 2017). Of course, this opinion is supported by the statement that metacognitive is a shift in mindset with three categories: awareness, regulation, and evaluation of learning (Sasongko et al, 2017). Therefore, a shift in mindset using a learning system with three discussion roles can improve students' mindsets and metacognitive development without realizing it.

In the process of group discussions solving math problems will lead to interactions between students so that positioning in group discussions and metacognitive activities emerge. Table 6 describes the relationship between student positioning, metacognitive activity, and metacognitive characteristics in group discussions.

Metacognitive activity in terms of the role of students in the discussion process. The metacognitive ability of the student is an expert consciously; he feels able and understands the problem being presented. In addition, he can also take the steps that should be done, as stated (Dirgantoro, 2018); the excess of metacognitive abilities is that students are more active in learning. Regulatory expert students' metacognitive abilities are superior to other positions because they can think critically, such as knowing goals, planning strategies, and

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sorting out the strategies to achieve their goals, namely solving problems. Expert students solve problems quickly because they know the attitude to take. In line with (Arifin et al., 2019; Inggriyani, F., & Fazriyah, 2018; Sa'dijah et al., 2020; Sa'dijah et al., 2023), the characteristics of students who think critically can take solutions and attitudes towards problems. In evaluation, expert students have metacognitive abilities to reflect and assess results. Then the expert student can understand his abilities, so he can make assumptions about whether what he has done has brought results or not. This process is supported by expert opinion, which states that the association between metacognitive and student independence can develop the ability to think according to the learning needed to solve particular problems (Roebers dkk, 2012). Based on these facts, students' metacognitive processes can be formed through discussion and developing problem-solving thinking skills. Of course, this learning must be balanced with good collaboration between students and teachers in solving problems (Sa'dijah et al., 2020). That is in line with the statement that the process of metacognitive shift can develop with student independence and surrounding support to solve math problems (Hastuti et al., 2016).

Students act as beginners and metacognitively have an attitude of awareness but must try harder than expert students, like having to read/observe the problem repeatedly. Even though a novice student understands the problem, he is only sometimes able to solve the problem because he needs to figure out what to do. From that, beginner students tend to realize that they cannot yet, so curiosity causes them to ask expert students often

and listen carefully. This statement is inversely proportional to the explanation (Magiera & Zawojewski, 2011) that beginners have a submissive character to experts.

Beginner students show an attitude of evaluation, including being able to assess the difficulty of problems and being able to assess their incompetence. If expert students can judge from self-strength and weaknesses, novice students tend to see self-deficiencies. This self-assessment closely relates to *self-esteem*, meaning I can and am valuable. Learning mathematics requires *self-esteem*. According to (Verdianingsih, 2017), *self-esteem* is a self-assessment based on the belief that one can solve mathematical problems.

Students who act as facilitators have metacognitive abilities in awareness, regulation, and evaluation. It is the same with expert students. The difference is conceptual knowledge and facilitating abilities. Of course, these results are supported by expert opinion, which states that student learning exploration can be used as a facilitator to change the process of students' metacognitive shifts so that they become more developed, especially in solving problems (Brown, 2015). However, the facilitating student needs to gain knowledge and concepts compared to the expert student. At the same time, student facilitators are better at facilitating. Consciously, the student facilitator understands the problem and has various strategic ideas. Therefore, student facilitators can legally lead discussions better, just like moderators. Facilitator students provide direction during the discussion, making suggestions, giving suggestions, mediating, and managing discussion time. Following the indicators of

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metacognitive regulation (J. Smith, 2014), the ability to regulate can control the performance of oneself and others or collaborative. The realm of student facilitator evaluation is assessing what has been done right or wrong and reflecting on his abilities.

The awareness process most often occurs in students who act as experts and facilitators. That is because expert students have more in-depth knowledge regarding problems while facilitating students can be said to be facilitators if they can facilitate their friends. One of the requirements to be able to facilitate is to express opinions (Budiono & Abdurrohman, 2020) actively. These results align with the opinion that the problem-solving process in learning is adjusted to students' abilities to understand and solve problems, so a sense of awareness and metacognitive development is needed (Jagals & Van Der Walt, 2016). Thus, students who can express opinions must first understand the problem.

The learning process by forming these groups can provoke students to cultivate their awareness in solving problems related to the material being taught. This methodology can be used as a way for students to develop a mindset through age-appropriate discussion method facilities and competency achievements (J. M. Smith & Mancy, 2018). In line with discussion-based learning, it can change the learning system and students' mindsets so that significant metacognitive shifts and development occur (Lei et al., 2020). Based on this, the development of students' mindsets is formed through a discussion learning process with the support of team division in groups so that it can improve students' metacognitive processes in a positive direction.

## CONCLUSION

Based on research conducted on 6th-grade elementary school students, metacognitive abilities include awareness, regulation, and evaluation. The roles emerged during the group discussions, among others, as experts, beginners, and facilitators. Not all metacognitive activities appear in every student. Consciousness can arise in all student positions. However, much awareness arises in students who act as experts and facilitators. Then, many regulatory activities appear in students who have positions as experts and facilitators. Evaluation activities are experienced by all roles, even though the number of evaluation activities for each student is not the same. Sometimes only one activity appears that is included in the realm of evaluation, such as understanding difficulties during the problem-solving process. The awareness process most often occurs in students who act as experts and facilitators. The relationship between metacognitive activity in group discussions gave rise to metacognitive characteristics, namely expert students as triggers (stimuli) and regulators (contributions), facilitator students as regulators (contributions) and followers (passive), and novice students as followers (passive). Researchers suggest that teachers increase student activity during group discussions, developing students' creative and metacognitive thinking abilities to apply familiar problem-based learning with students. Additionally, suggestions to conduct further research by looking in more detail at the causes of the intensity of student positioning in each group are required to develop students' critical thinking skills. Furthermore, it needs more profound observation of each student when solving problems.

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