Searching of Student’s Metacognition Consciousness in Learning of Numbers Theory through Behavioral Learning Model

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Abstract: The purpose of this study is to trace the metacognition of students in studying number theory based on behavioral learning theory approach. The steps of approach of behavioral learning theory consists of 5 phases, namely: (1) Cooperative selection as learning approach, (2) The Prepare the material of number theory on a particular topic in paper form, (3) Presentation of term paper by group member in front of class, (4) Responses of other group members to the material presentation of the designated group, and (5) Summarizing or asserting the material as well as positive reinforcement and negative reinforcement. While the student’s metacognition review in studying the Theory of Numbers consists of 4 levels, namely: (1) tacit use, (2) aware use, (3) strategic use, and (4) reflective use. The subject of this research is the students of Mathematics Education Department who are studying the Theory of Numbers, consisting of 56 students. The results of this study show that in general the level of awareness of metacognition of students of Mathematics Education Department is at level 1 (tacit use), and a small part Level 4 (reflective use).

1. INTRODUCTION

At first, the process of learning number theory using direct learning model, but the results of student learning is less satisfactory. Then, using the group approach, but this model not all group members participate actively. Activity in a group is dominated by high-ability students, while low-ability students cannot be involved either in group discussions or when presenting their duties in front of the class.

Beginning in 2014, the learning process approach Theory of Numbers applies behavioral theory by modifying cooperative learning model type Numbered Head Together (NHT). This approach is named Behavioral Learning Model. The syntax of behavioral learning model can be seen in table 1.

Table 1: The syntax of behavioral learning models in studying the theory of numbers[3]

| Phase 1, Cooperative selection as a learning approach | Activities |
|------------------------------------------------------|------------|
| a. The cooperative approach is defined by the type of NHT, |
| b. The lecturer divides the group and assigns a number to each member of the group, |
| c. Lecturers share the subject matter on a particular topic to the group and each group can share the material with each member of the group. |
Phase 2, The Prepare the material of number theory on a particular topic in paper form

- Each member of the group is assigned to study the lecture material that has been determined by the lecturer.
- Each member of the group who has been assigned to study the lecture material is obliged to account for it in the preparation of the paper.
- Before the course material is prepared in the form of papers first discussed in groups, so the contents of papers that have been compiled is the result of shared thinking by members of the group.

Phase 3, Presentation of term paper by group member in front of class

Each member of the group presents lecture material that has been assigned in rotation in front of the class.

Phase 4, Responses of other group members to the material presentation of the designated group

- The response of the other group members is addressed to the same number of presenters.
- The response of the other group members is addressed to a different number of presenters.
- Feedback by members of the presenter group in accordance with the material presented, and may be assisted by other members of the presenter group.

Phase 5, Summarizing or asserting the material as well as positive reinforcement and negative reinforcement

- The lecturer gives a summary and affirmation of the material as well as straightening the wrong material presentation.
- The lecturer gives positive reinforcement to the presenter when the dish is satisfactory and the negative reinforcement when the dish is less satisfactory. Similarly, to other group members who responded.

The result of the application of the behavioral learning model, when viewed from the learning process that all students participate actively, both at the time of preparation of the material in a paper, the presentation of a topic in front of the class, as well as responses from other groups. But the mastery of the concept of this material as a whole has not been satisfactory. Based on observations from the learning process it is seen that there are still many students in presenting the mathematics material has not understood the concept of the material and only memorize the material already available in the book or teaching materials. The Implementation of this behavioral learning model that appears only the process of participation and activity of students in following the learning process. However, the process of understand the content of the material and how to present the material in front of the class is still a lot of problems [3].

Based on the above facts, in this paper would like to see the process of metacognition awareness of students in understanding the concept of number theory, especially in presenting papers in front of the class. Metacognition awareness is one of the mental processes that occur when a person knows what he thinks, including the knowledge he possesses and the consciousness to do something or is aware of the reason for it[4].

The metacognition awareness level was introduced by Swartz and Perkins in 1989 and was adapted by several experts, Fisher [1] and Hinkle [2]. The metacognitive levels according to Swartz and Perkins [7], consist of: (1) Tacit use: The individual does a kind of thinking, say decision making, without thinking about it; (2) Aware use: The individual does that kind of thinking conscious that and when he or she is doing; (3) Strategic use: The individual organizes his or her thinking by way of particular conscious strategies that enhance its efficacy; and (4) Reflective use : The individual reflect upon his or her thinking before and after, or even in the middle of, the process, pondering how to proceed and how to improve.

Based on the above description, this paper presents the awareness of students' metacognition in learning number theory based on behavioral learning theory. The problem is: How the level of awareness of metacognition of students in studying the theory of numbers based on behavioral learning theory.
2. METHOD
The subject of this research is the students of Mathematics Education Department who are studying the Theory of Numbers. Of the 56 students can be grouped into 7 groups and each group member consists of 8 students. This lesson is conducted for 7 weeks (7 meetings), and each meeting consists of 1 group of presenters and 6 other groups as participants who will respond to the material presented by the presenter group. The presenter group rotates at each meeting until all groups are selected as the presenter group.

Indicators to track the level or level of metacognitive students, following adaptation of Lauren's [4] as follows:
- **Tacit use**: namely, the student cannot explain what is known, the student cannot explain what is asked, and the student cannot explain the problem clearly.
- **Aware use**: namely, students have difficulty and confusion because thinking about concepts (formulas) and how to calculate to be used, students only explain part of what is written, and students understand the problem because it can express clearly.
- **Strategic use**: namely, the student understands the problem because it can reveal clearly, the student does not have difficulties and confusion to find the formula and how to calculate, and the student can explain most of what is written.
- **Reflective use**: namely: students know how to solve problems, students are able to explain the strategies used to solve problems, students understand the problem well because it can identify important information in the problem, and students can explain what is written on the answer sheet.

3. RESULTS AND DISCUSSION
Based on the result of metacognition awareness from 7 groups of students in presenting the number theory material in front of the class, can be seen in table 2.

| Group | tacit use | aware use | strategic use | reflective use |
|-------|-----------|-----------|---------------|----------------|
|       | Σ | % | Σ | % | Σ | % | Σ | % |
| Group 1 | 6 | 75 | 1 | 12.5 | 1 | 12.5 | 0 | 0 |
| Group 2 | 3 | 37.5 | 3 | 37.5 | 1 | 12.5 | 1 | 12.5 |
| Group 3 | 3 | 37.5 | 2 | 25 | 2 | 25 | 1 | 12.5 |
| Group 4 | 5 | 62.5 | 2 | 25 | 1 | 12.5 | 0 | 0 |
| Group 5 | 3 | 37.5 | 3 | 37.5 | 1 | 12.5 | 1 | 12.5 |
| Group 6 | 5 | 87.5 | 1 | 12.5 | 1 | 12.5 | 0 | 0 |
| Group 7 | 6 | 75 | 1 | 12.5 | 1 | 12.5 | 0 | 0 |

The results in table 2 show that most students in groups 1, 4, 6, and 7 are at level 1 (tacit use), and no group member reaches level 4 (reflective use). While the group members who reached level 4 are groups 2, 3, and 5.

While the level of awareness of metacognition of students of Mathematics Education Department as a whole, can be seen in table 3.

| Awareness of Metacognition | students | Percentage |
|---------------------------|----------|------------|
| Level 1: tacit use        | 32       | 57.14%     |
| Level 2: aware use        | 13       | 23.22%     |
| Level 3: strategic use    | 8        | 14.28%     |
| level 4: reflective use    | 3        | 5.36%      |
| Total                     | 56       | 100.00%    |
Results in table 3, shows that most (57.14%) of the students' metacognition awareness level is at level 1 (tacit use), and a small part (5.36%) is at level 4 (reflective use).

The results of this study indicate that the application of behavioral learning model should be able to motivate students to study together, and think together problems on certain topics in number theory. However, student’s metacognition awareness to process and analyze the matter of number theory still remains different from each group member. This suggests that in-depth review of the content of number theory material is still dominated by one group member. This is evident from the results of this study that the awareness of metacognition of students at a high level (strategic use and reflective use) of each group is very low.

The low level of awareness of students' metacognition is generally caused by the students have not been accustomed to study their own teaching materials given by lecturers. Students are not used to expressing their thinking (thinking alone) because they are still not confident in front of the class. This is in the opinion of Schoenfeld [5] that more specifically there are three ways to explain metacognition in mathematics learning, namely: (1) confidence and intuition; (2) knowledge of thought processes; and (3) self-awareness (self-regulation). Thus, the results of this study show students' confidence, intuition, and self-awareness to study the material of number theory is still low.

However, this behavioral learning process has provided motivation and learning to students about how to process the subject matter from studying the content of certain topics to the content of the topic to others. This is in accordance with opinion of Solso [6] that the level of consciousness begins with our unconsciousness of what is around us. When we pay attention, then consciousness will arise so that we will take action. Consciousness occurs when we are "jerked" for being reminded or knowing something has happened.

In addition, in the lecturers' learning process has given strengthening in the form of additional value for participants who are active in the discussions both the presentation group and the group of participants. So that students are motivated to perform better and can provide a more detailed response again. However, it has not affected the level of awareness of students' metacognition in understanding the topic of number theory.

4. CONCLUSION
Based on the results of the research and discussion above, it can be concluded that generally the level of awareness of metacognition of the students of Mathematics Education Department in studying the theory of numbers through the theory of learning behavior is still low, that is 57.14% is at level 1 (tacit use) and only 5.36% 4 (Reflective use).

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