Working Memory in Students with Mathematical Difficulties

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\textbf{Abstract.} Learning process is the activities that has important role because this process is one of the all factors that establish students success in learning. Oftentimes we find so many students get the difficulties when they study mathematics. This condition is not only because of the outside factor but also it comes from the inside. The purpose of this research is to analyze and give the representation how students working memory happened in physical education students for basic statistics subjects which have mathematical difficulties. The subjects are 4 students which have a mathematical difficulties. The research method is case study and when the describe about students working memory are explainated deeply with naturalistic observation. Based on this research, it was founded that 4 students have a working memory deficit in three components. The components are phonological loop, visuospatial sketchpad, dan episodic buffer.

1. Introduction

Learning process is the activities that has important role because this process is one of the all factors that establish students success in learning. One of the most important things as an outcome from learning process is an observable change of individuals in terms of knowledge, attitude, skill, and behavior as a result from their interaction with surrounding environment. Thinking process occur in learning activities. Someone can be called as a thinker when he does mental activity and someone who learn mathematics always do the mental activity. So the result that in their thinking activity, someone can configure the relationships between a part of information as an interpretation and then arrange the conclusion. In learning process, the information will be processed and saved in their memory. Atkinson dan Shiffrin (1968) are submitted a theory or a modelling about memorys’ processing in human memory which explain that information is processed and saved in 3 stages. They are sensory memory, Short-term Memory, and Long-Term Memory (Woolfolk, 2004).

Based on the preliminary research and the result of observation to the 2\textsuperscript{nd} grade physical education students in singaperbangsa karawang university, there are 4 students that indicates have a mathematical difficulties. They are normal students who have a mathematical difficulties because the researcher find that the students still confuse make certain about the contents of the question, they still not understand yet the concept about the topic, they don’t give the attention and the students don’t have motivation to study mathematical content especially basic statistic. The students who don’t have motivation for study in mathematical content will feel so hard to study mathematics. That students
don’t show disorder or peculiarity. They still can be invited to discuss about another things besides mathematics and the relationship from each other look normally and general.

As we know, when we study mathematics there will involve cognitive aspects especially in working memory. It was studied in previous researches. Ashcraft (2001) researched about the relationship between working memory, mathematic anxiety, and performance that produced the relationship between mathematic anxiety with performance specifically in mathematic tasks as a working memory temporary disturbance. De Smedt (2009) researched about working memory and individual differences in mathematics achievement that produce the individual differences related with students mathematic achievement that is shown with uniquely in working memory component that is in visuospatial and verbal.

Besides that, there is John Munros’ article, University of Melbourne examined “The role of working memory in mathematics learning and numeracy” and the content from that article to verify the role of working memory in specific mathematic assignment, the procedure to diagnose working memories’ role in mathematical difficulties and the intervention strategic to increase working memories, process in mathematic learning. Working memory is an active, easy to access, and can be used to cognitive tasks in variation aptness (Cowan, 2000; Hassin 2004; Pickering 2006). This cognitive tasks are happened when the student face to face with mathematic. Cognitive stage begin from the entry of new information through study and then it will be processed in working memory and be saved in long-term memory. This collaboration between working memory and long term memory are used when finish mathematic problems in order to produce the output like a mathematics performance (Ormrod, 2008).

The research result of Ashcraft and Kirk (2001), Kane and Engle (2000) showed the capacity of someone’s working memory give an influence to someone’s ability to do some task in the same time. If it is linked with the case about mathematical difficulties that was described before, working memory is the cognitive area that has the role and influence in processing the knowledge that was gotten from mathematics learning. working memory maintain information in active condition with concise so that we can do something toward that information. Working memory is a mental work step when the information is manipulated and collaborated to help us understanding discourse and verbal language, make a decision and problem solving.

2. Methodology
This research employed qualitative approach with case study method and when the describe about students working memory are explained deeply with naturalistic observation. The population in this research are the 2nd grade physical education students in singaperbangsa karawang university and the subjects are 4 students which have a mathematical difficulties. Data collections were done through observation sheets. Observation was done in learning process in the class, when the teacher extend the material about basic statistic that are not learned yet before. The indicators that are measured as a subjects turn up respond based on verbal related something, notes result and the picture that is made, subjects ability to relate a topic and his knowledge, present his knowledge according to verbal or picture, and also his ability to solve the problem. Researcher conducted interview to some students to know the opinion of the student about their difficulty in mathematic learning.

3. Result and Findings
Students learning difficulties can be caused by some factors, not only because of the outside factor but also it comes from the inside like physiology, social factor, phaedagogic factor. We find that there is students mathematic difficulties as:

3.1. Difficulty in use the mathematics concept.
The students got a concept instruction, but not dominate yet. It is caused missing some or all memory of the mathematic concept. This missing mathematic concept can be caused by the
students forget the objects name, the students inadequate explain the terminology in mathematic concept.

3.2. Difficulty in learning and use the principle
When we analyze mathematic learning difficulties in use the principle, we find that generally it is caused by the students don’t have concept that can be used to develop the principle as an important knowledge, poor of basic concept is the cause of mathematical difficulties, and the students don’t understand with the principle of mathematic

3.3. Difficulty solve the verbal mathematics problem
- solve the verbal mathematical problem is mean that the students have to apply their knowledge in accordance with theoretical to solve the real problem. The successful in solve the verbal mathematics problem suspended to verbal understanding ability, that is the ability to understanding the narrative question and the ability to change verbal question be mathematic modelling, generally in equation modelling appropriate with the situation in the question. There is the causes that students get difficult to solve verbal mathematic problem: They don’t understand what they read, it is caused less knowledge about concept or some unknown mathematical term.
- Student not change the verbal question to mathematical modelling and their relation
- The three memory stages: first when students change information be a code or representation that can be received by memory and placed that. The second stage when the information is saved to memory. The third stage when we recall the information, and that stage called retrieval. Remembering and forgetting continous with learning and memory process. Processing information:

Information kind
Brain will choose positive memory or negative memory. The positive memory will be saved and then will be processed as an intermediate memory meanwhile a negative memory when the brain refuse to accept that information. Three factors labeling that the memory is positive or negative:

- The information for safety life. This information will be saved in long-term memory so that can make high our memory
- The information that can make raise emotion. The information that consist more emotion possibly will be recorded in memory
- Real and meaningful information. This information has a relevance with personal experience or previous experience.

3.4. The use of memory’s technique
Memorys’ technique is a skill to memorize information in according with brains’ working. Something brain like are ekstrim, full color, sensori motor, humor, emotion involve, music, active learning, three dimension picture, use association, imagination, symbols, number.

3.5. Attention, fokus, and concentration
Many research and textbook said that attention, fokus and concentration cannot separated from memory. In order to some information can be accepted by the human so they have to aware/attention about the information that they get.
There are 3 components in deficit working memory:

3.6. Phonological loop
Phonological loop related with the students understanding about sense of number, basic operation in mathematic, and the basic knowledge in descriptive statistic. For example how students can understand what is the differences about mean, median, and modus. In phonological loop process save the limited number from the voice, and the trail of memory get the damage for about 2 seconds except you repet that topic again. Because of the material in phonological loop is code according to acoustics, the same heard of sound make confuse with the others and easier to forget.

3.7. Visuospatial Sketchpad
Visuospatial Sketchpad related to how to write present the descriptive statistic data on the table, graph, or picture. As similar as phonological loop, the capacity of visuospatial sketch pad is limit. The students try to solve about graph of descriptive datas statistic in a small paper and just any heady, so that they did some mistake. As similar as when there is so many items entered into sketch pad, they can’t repeat it accurately as a good repeating. However, the capacity of phonological loop dan visuospatial sketch pad is exist by itself, it means that they work separate and independent.

3.8. Episodic Buffer
Episodic Buffer related with students ability to interpret that mean, median and modus in the graph are a part that data in descriptive statistic can be described by verbal, numeric, or picture so that the students can connect statistic concept with anything they know. From the result of observation that they cannot explain another something that related with basic statistic, they cannot descibe what is the meaning of the statistic graph.

4. Conclusion
Working memory involve personal experience. The memory about event in human life oftentimes contains much emotion. Memory can hold out for a long time. Working memory refers to how we hold on to and work with information stored in short-term memory. Kids use working memory to learn and follow directions. Working-memory boosters can be built into your child’s daily life. Someone skill to make a decision is influenced by his working memory capacity. Working memory capacity give the influence to how many item can still online in one focus and influence the kind of strategies that will be used when someone do the task.

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