PROFILE OF METACOGNITION OF MACHINE TECHNOLOGY VOCATIONAL HIGH SCHOOL STUDENTS WITH LOW ABILITY AND COGNITIVE STYLE OF FIELD INDEPENDENT MODEL IN TRIGONOMETRY PROBLEM SOLVING

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ABSTRACT

One factor constituting a major concern for teachers to improve the quality of Machine Technology of vocational education is the student's ability to solve problems so that they can understand and apply the concept comprehensibly and profoundly. Understanding concepts of Trigonometry comprehensibly and profoundly facilitates the vocational high school students learn other subjects such as engineering drawings that sustains manufacturing drawing techniques subjects, lathe machining engineering, milling machining techniques, and CNC machining techniques. One of the advantages of the process involving metacognition in mathematical problem solving is the development of strong and thorough understanding of the math problems. On the basis of this phenomenon, the researchers felt the need to examine more deeply about the profile of the metacognition of the Machine Technology vocational high school students with lower ability and field independent cognitive style in mathematical problem solving in particular trigonometry. The present study was explorative with qualitative approach. It was held at the Machine Technology Department of SMK Krian 1 (a vocational high school) of Sidoarjo.The main instrument in this study was the researchers themselves as human tools. The data analysis has started from the preparation of the study until after the data collection process was complete. The further data analysis was carried out into four stages: the categorization of data, data reduction, data presentation, drawing conclusions. The results indicated that the students with poor field independent cognitive styles conducted very minimal metacognitive activity in problem solving trigonometry.

Keywords: Metacognition, Low Ability, Cognitive Style, Troubleshooting, Trigonometry

INTRODUCTION

Standard competency for vocational students for attitude domain is Having [through receiving, running, cherish, appreciate, practice] behavior that reflects the attitude of the faithful, noble [honest, polite, caring, disciplined, democratic, patriotic], confident, and responsible for interacting effectively with the social and natural environment as well as in established itself as a reflection of the nation in the association world, to the knowledge domain is Having [through knowing, understanding, applying, analyzing, evaluating] knowledge of procedural and metacognitive in science, technology, art culture with insight into humanity, nation, state, and civilization-related causes of phenomena and events [in the field of specific work] according to their talents and interests, while for the domain skills are Having [through observe, ask, trying, process, present, reasoning, creating] ability to think and act of effective and creative in the realm of the abstract and concrete as the development of learned at school independently [on specific areas of work] according to their talents and interests. (Permendikbud 54, 2013).

Based on the above, it appears that metacognitive knowledge is something that is very important and must be held for students to think about their own thinking and the ability of students to use specific learning strategy appropriately. In general, metacognition deals with two-dimensional thinking, namely: (1) self-awareness of cognition, the consciousness of a person about his thinking; (2) self-regulation of cognition, the ability of someone using awareness to organize thought processes (Brunning, Scraw and Running, 1995).

One of the goals given mathematics courses as listed on the curriculum are as a means of structuring reasoning learners. By studying mathematical, students are expected to reason and think logically, analytically, critically, creatively, and can work together. Additionally attachment Permendiknas No. 22, 2006 in the standards of the contents on 23 May 2006 (MONE, 2006: 346) states that the purpose of learning mathematics in SMK is that vocational high school students can: (1) understand the concept of mathematics, (2) use of reasoning, (3) to solve the problem, (4) communicate ideas, and (5) have an attitude appreciate the usefulness of mathematics in life.

Further, by studying mathematics, students are expected to solve any issues or problems encountered, whether the problems associated with math itself or associated with other subjects using a mathematical concept or related to everyday life in the field work according to their talents and interests.

One of the advantages of the process involves metacognition in mathematical problem solving is the awakening strong and thorough understanding of the mathematical problems that required by vocational students to solve mathematical problems well which is a requirement for other subjects so expect an increase in the quality of vocational education.

The results of further analysis to study TIMSS show that the questions used to measure the ability of learners divided into four categories: (1) low measuring capability up to the level of knowing, (2) intermediate measure the ability to level Appling, (3) high measure ability to level reasoning, (4) measures the ability to advance the level of reasoning with incomplete information. While the achievements of Indonesian children in TIMSS reports several times less so encouraging that 95% of Indonesian children only reached the middle level, while nearly 40% of learners Taiwan can achieve a high level and advanced. (Kemendikbud 2014, p 6). This shows that the mathematical ability of Indonesian children is very low.

By understanding the math thoroughly and deeply the backbone for other subjects, especially trigonometry, which is indispensable in understanding the subjects of engineering drawings that are the basis of the subjects of digital simulation that will sustain the subjects engineering manufacturing drawings, engineering machining lathe, engineering machinery frais and CNC machining techniques, in this case in particular math trigonometry is a very important basis as the support of other subjects in achieving competency standards, which is expected for students to be accepted in the world of work.

Based on this it is important for the students of vocational school in machine the field independent cognitive style to realize knowledge metacognitive abilities in order to solve mathematical problems both in the field of mathematics itself, or in its application in the subjects of specialization in accordance with their respective areas of expertise.

This is in accordance with the opinion of Ausubel, 1968, Theo van Els, and Brown, 1994 (in Mukhid, 2009) which states that a person's cognitive style may explain the success of individual differences in learning. Cognitive style is one of the characteristics of individuals who can help explain individual differences in learning success, including the ability of metacognition. This understanding shows that when people do learning activities, learning outcomes will be determined how to think of the individual concerned, how to manage, process, organize, and recall information obtained from teachers or other sources. From this sense it appears that between cognitive styles and metacognition have relevance. Therefore, when applying metacognition in mathematics learning activities, particularly learning problem solving also need to consider the cognitive styles of students in teaching.

Departing from the phenomenon, then the purpose of this study was to describe the profile of vocational students' metacognition Machining is less capable and field independent cognitive style in mathematical problem solving in particular trigonometry.

RESEARCH METHOD

Based on the research questions of this type of research is exploratory research with a qualitative approach. This research subject is class X of Vocational High School in Machining from SMK Krian 1 Sidoarjo that meet the specified criteria, namely the low capacity and cognitive style Independent field.

Criteria for selection of research subjects, namely: (1) based on Mathematical Ability Test scores, students are divided into three groups of ability, namely the subject of highly capable, medium, and low. Subject said highly capable, if given a score above 87, the subject is capable of being, if it obtained a score of 67-87; and the subject is said to be less capable, if obtaining a score of 0-66, (2) by the score test results GEFT, of each category of the ability of students divided into two groups of cognitive style, namely: for students who are less capable, if the score GEFT> 9 then students, including low-ability groups of subjects whose cognitive style field independent if the score 0-9 GEFT between the low-ability students include a subject field dependent cognitive style, and (3) if the low capability of the category field independent cognitive style in item (2) at least there one subject who meets, then the next step is to ask the teacher a consideration of whether the subject has a score that is elected in accordance with the daily capability in its class and can express opinions verbally or in writing. If the subject is selected according to considerations Teachers do not have scores Ability Test Math accordance everyday functioning or cannot express opinions verbally or in writing it will have other subjects that meet the criteria in ways ranging from the selection of classes until at getting subjects selected according to criteria which is determined.

To browse the in-depth profile of vocational high school (SMK) in machining students' metacognition is less capable and field independent cognitive style in mathematical problem solving, conducted through in-depth interviews, so that key data used in this study is data from interviews. To collect data from interviews were absolutely accurate and can reveal the profile metacognition vocational students Machining is less capable and stylish cognitive field independent in solving mathematical problems can only be conducted by researchers themselves and can not be replaced by other instruments or cannot be delegated to others. Therefore, in this study, the researcher said to be the main instrument. In addition to researchers as the main instrument in this study required auxiliary instrument, namely: (1). Instruments Help I (Mathematical Ability Test / TKM); (2). Aid Instrument II Group Embedded Figures Test (GEFT). (3). Aid Instrument III (Tasks Troubleshooting). (4). Aid Instrument III (Interview Guide).

Data analysis is the process of searching for and compiling a systematic data obtained from interviews, field notes, and other materials with a way to organize data into categories, describe into the units, synthesize, organize into a pattern, choose which one important and that will be studied, and make conclusions so easily understood by oneself or others. Analysis of the data in this study include: (1) Analysis Data Test Capabilities Mathematics (TCM), (2) Data Analysis Group Embedded Figures Test (GEFT), (3) Data Analysis Task Troubleshooting (TTM), and (4) Data Analysis Interview.

RESULTS AND DISCUSSION

Mathematical problem solving contextual performed by the subject begins with the failure to recognize the problem, this is because the subject of the difficulty in interpreting the information given in the matter due to forget given the circles and trigonometry formulas that have been taught in the past period. The failure of the problem-solving process becomes blocked and undirected.

Under these conditions, it was agreed to terminate the process of solving the problem and continued the next day, so students can see the back of his book on trigonometry and circle, in order to do problem solving trigonometry. According to our view, the granting of this opportunity needs to be done so that the process of metacognition when students solve the problems, can be observed.

Problem solving process of the subject the next day is the subject was able to understand the problem well. Where the subject has been informed about angles in

trigonometry, circumference formula, the formula area of a circle, and the length of the tire machine compared with the length of the string.

At this stage of understanding the subject matter of the activities metacognition which includes planning is to seek long-tire machine, subjects seek a second circumference of a circle is then added to the length of tangents equations outside both circles, even though the subject is still ignoring the given angle calculations.

At the stage of making plans problem solving, metacognition activity of the subject is still minimal, namely the planned settlement of problems that still less than perfect due to lack of awareness of the subject of the image and the ability to translate a given angle. Phase troubleshooting implement the plan of the subject just looking around the circle drive pulley and driven pulley circumference of the circle and then summing the circumference of a circle with no attention given to calculate the angle of circular section which will be passed by the tire machine. While tangents equations outside likened tire machine is not counted by the subject but just drawn it.

Phase recheck the results of the troubleshooting performed by the subject is already re-examine the results is done and realized that the results were done by the subject incomplete and imperfect, because it confused to apply formulas which owned.

These results indicate that the subjects in solving mathematical problems contextual still be minimal metacognitive activity, this is due to lack of understanding subject to the meaningfulness of mathematical formulas that exist or subject only to memorize the formula without understanding the meaning and usefulness. Besides subjects also lack a good space spatial ability, that he failed to understand the picture drill machine provided. This resulted in a subject can see how long it takes the machine tires.

CONCLUSIONS AND RECOMMENDATIONS

In the contextual mathematical problem solving, metacognition activity performed by the subject is still very minimal. It can be seen from at least the type of metacognitive activity carried out by subjects at each stage of problem solving. Involving activity metacognition is needed in learning, especially in solving the problem, because the activity involves metacognition students will be used to involve all the knowledge and manage it well, so it will grow critical thinking, active, creative, and controlled which resulted in the establishment of understanding thoroughly and deeply.

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