



Metacognitive Skills of High School Students Based on Interest in Learning Mathematics

Rizki Desiana Suandi^{1*}, Siska Firmasari¹, Jajo Firman Raharjo¹

¹Mathematics Education Department, Universitas Swadaya Gunung Jati, Cirebon, Indonesia

*Correspondence: rizkidesianasuandi@gmail.com

Abstract

Important metacognitive skills are possessed by students because then the student can control his or her mind in learning. The student who can control himself or herself in learning has been able to sort out appropriate learning methods for himself or herself so that the student can come to know his or her interest in learning. Interest in learning is one of the internal factors that will affect the results of learning, not only will interest in learning also affect students' metacognitive skills. The goal of this study is to analyze the characteristics students have of the metacognitive skills covered by the interest in studying mathematics and not only is it to describe the metacognitive skills covered by the interest in studying mathematics. This research uses a qualitative approach with descriptive methods with research subjects 6 students majoring in accounting, who was selected following the research conducted random selection. The tools used in the study are observation of metacognitive skills and interest in learning, interviews that also include metacognitive and interest in learning, and finally, a test problem containing an indicator of metacognitive skills. This study suggests that for students who have an interest in learning high math, their metacognitive skills will be high by meeting all the available indicators, along with the results of learning by a test with good results. Students who are not interested in learning, then during learning will not be maximized because a major key to learning is interest.

Keywords: An Interest in Studying Mathematics; Mathematics Learning; Metacognitive Skill

Abstrak

Keterampilan metakognitif penting dimiliki setiap siswa karena dengan begitu siswa dapat mengendalikan pikirannya sendiri dalam belajar. Siswa yang dapat mengontrol dirinya sendiri dalam belajar maka ia sudah bisa memilah cara belajar yang sesuai untuk dirinya sendiri dan sudah dapat mengetahui minatnya dalam pembelajaran. Minat belajar termasuk faktor internal dan berdampak pada hasil belajar, minat belajar juga berdampak kepada keterampilan metakognitifnya. Tujuan penelitian yaitu menganalisis karakteristik yang siswa miliki terhadap keterampilan

metakognitif yang ditinjau dari minat belajar matematika penelitian memiliki tujuan mendeskripsikan keterampilan metakognitif yang ditinjau dari minat belajar matematika. Penelitian ini menggunakan pendekatan kualitatif dengan metode deskriptif dengan subjek penelitian 6 siswa jurusan akuntansi, yang dipilih secara acak. Instrumen yang digunakan yaitu observasi untuk keterampilan metakognitif dan minat belajar, wawancara yang mencakup keterampilan metakognitif dan minat belajar, dan soal tes yang memuat indikator keterampilan metakognitif. Hasil penelitian ini menunjukkan bahwa siswa yang memiliki minat belajar matematika yang tinggi maka keterampilan metakognitifnya akan tinggi memenuhi semua Indikator yang ada, didukung juga dengan hasil belajar yang baik. Siswa yang minat belajarnya sedang maka keterampilan metakognitifnya juga akan sedang dimana pada setiap indikatornya sudah cukup memenuhi, didukung dari hasil belajar yang memperoleh cukup baik dalam menyelesaikan soal tes. Untuk siswa yang memiliki minat belajar rendah metakognitifnya akan rendah pada setiap indikatornya siswa tersebut kurang memenuhi, didukung juga dari hasil belajar sebatas untuk menuliskan apa yang diketahui dan apa yang ditanyakan siswa masih belum mampu. Siswa yang tidak minat dalam belajar, maka selama pembelajaran tidak akan maksimal dikarenakan sebuah kunci utama pembelajaran yaitu minat.

Kata Kunci: Keterampilan Metakognitif; Minat Belajar Matematika; Pembelajaran Matematika

Introduction

A student can become aware of the appropriate learning method for himself and be able to formulate a plan for the way his study starts at the age of 12-15 (Sary, 2017). At the age of 12-15, at the turn of the first high school to high school or secondary school, at this point, the student is beginning to understand what they want, and what is of interest in each other as when the student chooses to go on to high school or high school. Just as learning may be, if learning is out of line, students can never learn at a maximum (Jainuddin, Salim, & Sirajuddin, 2020)

Students who are not interested in learning will not learn as much as they could because an interest is a crucial factor in learning. One of the fewer students will be of interest in math, as many students consider it difficult, will and depend on further study to be acquired (Widyastuti & Widodo, 2018). Interest is one of the internal factors that influence learning, where learning has an active nature which means if students are unable to change behavior during the learning process activity signals that students have no interest in learning mathematics. Stimulating students' learning interests in any learning is essential, especially when the implementation of mathematical learning is often difficult, it hampered the students' ability to do math (Apriyanto & Herlina, 2020).

The metacognitive skills are the students' skill on the way and outcome as well as their ability to control and evaluate the way they think (Fitrih, Ardiana, & Pratiwi, 2018). Metacognitive skills have three components of the reference in

planning, monitoring, and evaluation (Fitrih et al., 2018; Ilmiah et al., 2016). The first component is the planning skill which this process requires students to demonstrate good in planning when students are about to begin learning. Both are monitoring skills in which the students will demonstrate well assessing the ongoing learning of their ability. Finally, there is the evaluation skill which is where a student will be good at evaluating their success in learning (Kodri & Anisah, 2020).

Interest in learning has a greater sense of likes or pleasure in an activity, without any compulsion in students. Interest also enriches students with a desire for the student's desires that engender a good activity of attitude, skill, and knowledge (Jainuddin; et al., 2020). This interest in learning has several indicators used to review students' interest in fun, student engagement, student and attention (Widyastuti & Widodo, 2018).

Basic metacognitive skills can be seen from a student's learning ability when engaging in activities: 1. Deflating the study activity plan, 2. Identifying strengths and deficiencies with the learning activity, 3. Using modern technology as a source of learning, 4. Participate in the discussion, 5. Learn and take advantage of experience, 6. Understanding the contributing factor (Dirgantoro & Kurnia, 2018). It can be said that a person's interest in learning can be influenced by their metacognitive skills (Irmayani, Nyeneng, & Viyanti, 2013). If each student study activity applies the already mentioned activity then the student's interest in learning is present and will easily improve their cognitive skills. Metacognitive skills are gained from knowledge of their thinking in general and their students' consciousness such as an indicator of interest in learning which one of the students exists during learning.

There have been many previous studies that discuss metacognitive skills, interest in learning mathematics, and research on vocational students. One of the studies that discussed the analysis of metacognitive skills was research from (Purba, Ardiana, & Harahap, 2021) concluded that students' metacognitive skills in understanding mathematics learning in class VIII junior high school students were in the moderate category. Furthermore, research from (Jainuddin; et al., 2020) concluded about student interest in learning and discipline with cognitive style on learning outcomes states a considerable influence. This research was conducted with the subject of class X vocational students. In the discussion of learning interest, there is research (Widyastuti & Widodo, 2018) that states that the success of students in learning mathematics can be characterized by the focus on the factors of learning interest and student activeness in learning so that learning objectives can run smoothly, regularly and effectively, the subject used in the study was by grade X vocational students.

Based on the background above, therefore the researcher proposes a problem regarding metacognitive skills in terms of interest in learning mathematics with the object of research of class X vocational students. The results of this study are expected to improve metacognitive skills and also interest in learning mathematics.

Method

The context of the research has a goal of examining the metacognitive skills derived from an interest in learning by using a qualitative approach with a descriptive method. A qualitative approach is used to examine the metacognitive skills covered by student learning interests, while a descriptive method is used to describe the characteristics of the metacognitive skills covered by student learning interests containing from the data being analyzed. The approach used by researchers is a qualitative approach with descriptive methods with participants in class X Accounting students of SMK Negeri 1 Lemahabang as much as one class which was previously observed for learning interest and also metacognitive skills and then categorized into high, medium, and low categories. After that, 6 students with 2 students with high categories, 2 moderate students, and 2 students with low categories.

This study utilized observation methods, interviews, and writing tests to gather data. The observation sheet includes indicators for metacognitive skills and study interest, which are scored on a scale of 15 points. A good score receives 3 points, a fair score receives 2 points, and a poor score receives -1 point. Based on observations obtained, students will be grouped into three categories of interest in learning and metacognitive skills (Fraenkel, Wallen, & Hyun, 2012). Interviews were conducted to learn more in-depth information about the metacognitive skills covered by student study interests. This study had 18 questions for the metacognitive skill indicator and 23 questions for the interest indicator to learn. The written test was given to 6 people who had been selected according to the category and given questions about exponent and logarithm material with 3 description questions that would strengthen the observation results. The instruments used by researchers for observation sheets and study interest interview guidelines were lifted from the research (Irawati, 2018; RUSTAN, 2014; Sulistiyono, 2014). Meanwhile, the observation sheet and interview guidelines for metacognitive skills were taken from the research (Rizkia, 2020; Zulfiani et al., 2018).

Data gathered from the field aids researchers in better comprehending the topic under study. On the other hand, data analysis is a rigorous process that evaluates all previously performed activities. Researchers conducted data analysis

which included three activities, namely data reduction, data presentation, and conclusion drawing (Kurniawan, Nugraheni, Purwaningsih, & Wibowo, 2019; Purba et al., 2021). In this study, the selection of data used is mainly the selection of more detailed interview guidelines related to metacognitive skills in terms of learning interest, then the data obtained is further analyzed. At the data reduction stage, the researcher presents the data that has been compiled according to the reduction results, namely presenting interview guidelines with predetermined research subjects, describing data in by indicators of metacognitive skills in terms of student learning interest, analyzing data by thoroughly reviewing metacognitive skills in terms of student learning interest. The final step in analyzing data in qualitative research is concluding. Conclusions are drawn from the data that has been analyzed by researchers, which will obtain the results of the analysis of metacognitive skills in terms of mathematics learning interest of vocational students.

Result

The study analyzes the process of students obtaining additive skills based on their interest in learning mathematics by describing data obtained from the field. The first stage carried out in this study was to observe learning interest and metacognitive skills as a whole to one class of 36 students to determine 6 participants who fit the categories as in the following table 1:

Table. 1 Finding of Students' Learning Interests and Metacognitive Skills

Student Name	Interest in Learning	Metacognitive skills
Student 1	Higher	Higher
Student 2	Higher	Higher
Student 3	Medium	Medium
Student 4	Medium	Medium
Student 5	Low	Low
Student 6	Low	Low

Interest in learning was directly proportional to students' metacognitive skills, where students who had a higher interest in learning will have higher metacognitive skills as well, the same happens to a lower interest in learning will have an impact on their metacognitive skills.

Table 2. First-Day Observation Result of Interest in Learning Mathematics

Student Code	Aspects observed															Score	Value	Category
	Indicator 1			Indicator 2				Indicator 3				Indicator 4						
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o			
Student 1	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	44	73	Higher
Student 2	3	3	3	3	2	3	2	3	3	3	3	3	3	3	3	43	71	Higher
Student 3	2	2	1	3	3	3	1	1	3	3	3	3	3	2	1	34	56	Medium
Student 4	2	1	2	3	1	3	1	1	2	2	2	3	2	1	3	29	48	Medium
Student 5	2	1	2	2	1	2	1	1	1	2	2	2	1	2	1	23	28	Low
Student 6	1	1	2	2	1	2	1	1	1	2	1	1	1	2	2	21	35	Low

Table 3. Second-day observation of interest in learning mathematics

Student Code	Aspects observed															Score	Value	Category
	Indicator 1			Indicator 2				Indicator 3				Indicator 4						
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o			
Student 1	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	44	73	Higher
Student 2	3	3	3	3	2	3	2	3	3	3	3	3	2	3	3	44	73	Higher
Student 3	3	2	2	3	3	3	1	3	2	2	3	1	1	2	3	35	58	Medium
Student 4	3	2	3	3	1	3	1	1	2	2	3	3	1	2	1	31	51	Medium
Student 5	2	1	2	2	1	2	1	1	1	2	2	2	1	3	1	24	40	Low
Student 6	2	2	2	2	1	2	1	1	1	2	1	1	1	2	2	23	38	Low

The first high student, during the two-day observation of the different students 1 fell into the high category of each observation, the student scored 73 on the first and second days of the observation of interest learning. Student 1 had a good score and only a few scores were working on math problems in front of the class on their initiative.

Student 2 of the high category, had the same keen interest in learning on the observation of student 2 of the value attainment on the first and second days was 73 whereas the student with the score entered the high category. Student 2 scored moderately on the engagement indicator, where students will ask the teacher when they feel difficulty.

The third student is included in the moderate category of observation of learning interest, for the score obtained by student 3 on the first day, namely 56. Student 3 scored less on the indicator of feeling happy, in that part of the section students did not do all the exercises during the lesson. On the second day, student 3's interest in learning obtained results that were not much different from before, namely the score obtained by student 3 was 58 with the indicator of student participation still at a low point in the part of doing math problems in front of the class voluntarily. The other indicator, which pertains to student attraction, revealed that Student 3 favored longer hours of duty and received accurate answers, as

opposed to working quickly but with fewer fulfilling answers. However, this indicator also demonstrated that Student 3 scored lower on a significant number of questions related to the material being taught.

During the study, it was observed that Student 4 had a moderate interest in learning. On the first day of observation, the student received a score of 48 points and had the lowest involvement score when completing a math problem independently or without the help of a friend in front of the class. On the second day, the student's interest score increased to 51 points, which was an improvement of 3 points compared to the previous day. However, the student's lack of confidence in mastering the material was still evident as they frequently asked for help from a friend to complete tasks.

Student 5 was placed in this particular category based on the results of the observation of their learning interest. On the first day, the student's score was 38 points, which was below the expected score on each indicator, including the joy indicator when doing math exercises. On the second day, the student's interest score improved slightly to 40 points. However, the student's involvement scores remained the same as the first day as they continued to rely on the teacher for help with math exercises. The student showed no initiative in seeking assistance when facing difficulties and preferred to ask a friend instead.

The results of the observation for learning interest revealed that Student 6 obtained the lowest score of 35 on the first day. The student received significantly lower scores on each interest indicator compared to their peers, particularly on the pleasure indicator. This was reflected in the student's behavior of paying attention to the teacher while explaining math material and completing all math exercises, which resulted in a two-point decrease in their score. During the second day of observing Student 6's learning interest, their score increased significantly to 38, which was a significant improvement from the previous day. However, the student's lower scores persisted on the same indicator and section. For instance, the student continued to ask the teacher for help when faced with math problems, which resulted in a lower engagement score. Similarly, the student's attention and attraction towards the subject matter remained low, which led to the same low score as on the first day of observation.

Table 4. The First Day of Observation of Students' Metacognitive Skills

Student Code	Aspects observed															Score	Value	Category
	Indicator 1					Indicator 2					Indicator 3							
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o			
Student 1	3	3	3	3	3	3	3	3	3	2	1	3	3	3	3	42	70	Higher
Student 2	3	3	3	3	3	3	2	3	3	2	2	1	3	3	3	40	66	Higher
Student 3	3	2	1	3	3	3	2	3	2	1	2	3	1	2	2	34	56	Medium
Student 4	1	1	3	3	3	3	3	3	3	2	1	1	2	2	3	33	55	Medium
Student 5	2	1	1	2	2	2	1	2	1	2	1	2	2	1	1	23	38	Low
Student 6	1	1	1	2	2	2	2	2	1	1	1	1	2	2	1	22	36	Low

Table 5. The Second Day of Observation of Students' Metacognitive Skills

Student Code	Aspects observed															Score	Value	Category
	Indicator 1					Indicator 2					Indicator 3							
	a	b	c	d	e	f	g	h	I	j	k	l	m	n	o			
Student 1	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	43	73	Higher
Student 2	3	3	3	3	3	3	3	3	3	1	3	1	3	3	3	41	68	Higher
Student 3	3	2	2	3	3	3	1	3	3	1	2	1	1	1	2	33	55	Medium
Student 4	1	1	3	3	3	3	2	3	3	2	1	1	2	2	3	33	55	Medium
Student 5	1	1	2	2	2	1	2	1	2	2	1	1	2	2	2	24	40	Low
Student 6	2	1	1	2	2	2	1	2	1	2	1	1	1	2	2	23	38	Low

For a student 1 metacognitive skill with a high category with two observations had a value on the first day of 70 and on the second day of earning 73. Student 1 was observed twice and scored 70 and 73 on the first and second days respectively. The student's metacognitive skills are excellent, except for two indicators that show some difficulty. These indicators reveal that Student 1 struggled with tasks that were not similar to those demonstrated by the teacher and had difficulty identifying which part of the task was being evaluated.

During the first observation of student 2's metacognitive skills, the score was lower than student 1's but still considered high. Student 2 performed well in all areas except for the indicator that shows the difficulty in doing tasks outside the given example and the lack of awareness of errors. Therefore, this indicator resulted in a lower score.

On the first day of observation, student 3 had some positive progress in their learning interest, but their score for the learning interest indicator was close to 56. Student 3 achieved a score of 56, which was similar to the value of learning interest. However, the student struggled with the monitoring and evaluation indicators, which suggest difficulty in working out problems beyond those given by the teacher and in recognizing errors in their work. On the second day of observation, student 3

scored 55, with the same weaknesses observed in the monitoring and evaluation indicators.

On the first day of observation, student 4 scored 55 marks in the equivalency skills category of metacognitive skills, which falls under the moderate category. The student scored lower in the planning indicator, which requires remembering previous mathematical materials. The cause for this was the student's lack of review of the materials before the learning session.

In the following observation on metacognitive skills, it was found that Student 5 scored 38 on the first day, with lower scores on all indicators. The initial indicator, which pertains to planning, involves students recollecting prior mathematical knowledge and being cognizant of alternative resources to solve mathematical problems. Later on the second day with the observation of the metacognitive skills student 5 scored 40 with each less score on all the same indicators and sections as the first day. Student 5 was not used to preparing math lessons before learning began and so student 5 still could not remember what materials were learned at the previous meeting. Student 5 was also not accustomed to asking teachers about the difficulties experienced during learning and student 5 does not use modern technology by accessing the Internet to make it easier for the performance of duty, he would rather see his friend's answers than search on the Internet.

In the subsequent observation of metacognitive skills, Student 6 scored 36 on the first day, with insufficient scores in all indicators, particularly the planning indicator, which involves recalling prior mathematical knowledge. On the second day of observation, Student 6's score improved to 38, an increase of two points from the previous day. However, the score on the second day remained the same as the first day in terms of the planning indicator.

Discussion

According to the findings from both observations and interviews, students with a strong passion for learning demonstrated remarkably high levels of metacognitive skills. As research (Amaliyah, 2022) indicates that interest in learning has a positive effect on metacognitive skills. The student who has an interest in studying is always preparing before the study begins. The student who has a high interest is the student who always notes what their teacher presents during learning and is not uncommon for the student with a high interest in learning to have a broader knowledge because the student is more likely to be practicing in their spare time and always explore his or her knowledge of math. When a student is struggling

with a question or another reference, the student in this category can also review what has been learned or done during the study (Chrissanti & Widjajanti, 2015). It is also reinforced by research (Irmayani, Nyeneng, & Viyanti, 2020) that students who have high-interest show that students' metacognitive skills can help them understand learning and good task work with the sequence of planning, monitoring, and evaluation learning.

Students in the moderate category of interest in learning turned out to have moderate metacognitive skills, students in this category did not always prepare before learning because students prepared only on the material they were good at. The knowledge of students in this category is quite good because students always try to find or explore if they feel difficulties in learning mathematics, and students in the medium category, they rarely do exercises in their spare time, only on certain materials, this category of students will do it in their spare time. Different from the previous category, in this category if a student is having trouble he will try to ask and look for other references but with this category, it is much easier for students to give up when asking but still not get the way out. For the part that reconveys what has been learned or done, a student in this category might explain if they write down what his teacher is presenting, or what he is doing on his own. This is similar to research (Andini & Azizah, 2021) which suggests that students have been able to accomplish what is in the moderate category of mathematical learning.

Furthermore, students with low interest in learning turned out to have low metacognitive skills, because the student in this category never prepares before the learning starts the student is not at all interested in math, the student in this category is also more difficulty to focus on his or her time in class. According to (Prayanti, Sadra, & Sudiarta, 2014) students who fall into this category are students who are unable to control or control their activities during the study period. Whereas the knowledge of the student in the lower category is poor, for the student only relies on what the teacher teaches and also when the work of the student only sees the outcome of the student's task and duplicates it. Students in this category tend to remain silent when they encounter difficulties, rather than actively seeking to understand the problem. Even when they do ask questions, they may not pursue the issue further and simply accept the first answer they receive, without attempting to deepen their understanding. This harmonizes with research (Irmayani et al., 2020) that indicates that a serious lack of students' curiosity about mathematical learning can be seen from the margin of students paying attention to learning, not really doing their duty, and often copying their friend's answers.

Conclusion

Students with high learning interests have high metacognitive skills where students have been able to fulfill each indicator in metacognitive skills, such as planning, monitoring, and evaluating students have fulfilled all these indicators. As in planning indicators, students always cover material or tasks previously taught, at monitoring indicators students are able to look for other references when faced with difficulties, and for student evaluations, this category is already able to review or reexplain what is already learned during learning. Students who have a moderate level of interest in learning also have a moderate level of metacognitive skills. The students perform sufficiently in each indicator of metacognitive skills, including planning, monitoring, and evaluation. Regarding the planning indicators, students in this category are capable of reviewing materials or tasks taught earlier, although they tend to focus on materials that they already understand. In terms of monitoring, students are adept at seeking additional references when encountering difficulties. Meanwhile, the student evaluation section is also satisfactory in terms of restating what has been learned, but students in this category could benefit from referring to their notes. Finally, students who have low interest in learning also exhibit poor metacognitive skills, as evidenced by their performance on various metacognitive skill indicators. For instance, in the planning category, such students fail to review or consider previously taught materials. Similarly, in the monitoring category, they do not seek alternative approaches to solve a problem and instead rely on their peers' work. Lastly, in the evaluation category, they struggle to explain what they have learned during the study.

Contributions can be made by researchers in the form of suggestions or recommendations that can be taken into consideration to improve metacognitive skills. From the results of the analysis of metacognitive skills in terms of interest in learning mathematics of vocational students, the researchers presented several suggestions such as for students, it is hoped that they will be more active and diligent in learning, especially in practicing math problems and also maximizing the use of existing references to achieve better metacognitive skills. For teachers, it is hoped that they can conduct learning in a more varied and not monotonous way so that students feel like they want to be involved in learning and create much better metacognitive skills and interest in learning mathematics. For further research, it is hoped that it can add other variables that are far more varied to obtain more diverse results to analyze students' metacognitive skills and interest in learning mathematics.

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