Exploring metacognitive strategies in feminine female high school students: a qualitative study in statistical problem-solving

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ABSTRACT

The problem and the aim of the study. Metacognition is one of the most influential factors in students' success in solving problems, although it is complex and inconsistent. Students who are directly involved in learning activities know better how they use metacognitive abilities as a strategy in solving mathematical problems because the subjective nature of metacognition allows for differences in strategies based on their gender, for example, in female students with their feminine character. Unfortunately, a complete picture of the metacognitive activities of female students is still limited and has yet to be discussed in detail at each stage of problem-solving, especially statistical problems. *This study aims* to describe and map the metacognitive activities of feminine female students in solving statistics problems.

Research methods. This research design uses descriptive explorative with a qualitative approach. The interview technique based on the results of solving statistical problems is used to explore information about students' natural metacognitive processes according to what they think when working on problems. A total of 16 12th-grade students were involved in this study, and one student was taken based on the level of mathematics ability at the (medium) level with female gender characteristics for further interviews. Participants were taken based on the results of the mathematics ability test and gender questionnaire. The interview results were validated using the time triangulation technique using cluster analysis. Data analysis was carried out using coding in the data classification stage, and data reduction was carried out in two phases, namely first cycle code and second cycle code.

Results. The interview results on the statistics problem-solving task showed that feminine female students used all metacognitive components in solving statistics problems, namely declarative, procedural, and conditional knowledge, as well as metacognitive regulation, which includes planning, monitoring, and evaluating. At understanding the problem stage, they showed self-awareness regarding strengths and weaknesses and were able to recall relevant material, assess the complexity of the task, and understand important information. When devising a plan, they planned strategies based on their understanding of previous material, recognized important parts of the problem, and knew when to use various formulas. In carrying out the plan, they realized the constraints, related the questions, and applied the strategies they had thought of while monitoring and double-checking their performance. In looking back, they could evaluate their thought processes and methods used and identify shortcomings and potential improvements, with a tendency to be influenced by feminine expressions.

Conclusion. This study showed that female students used metacognitive activities at each stage of problem-solving. They used declarative, procedural, conditional, planning, and monitoring knowledge to understand the problem. They used conditional, planning, and monitoring knowledge when developing the plan. They used procedural, conditional, planning, monitoring, and evaluation knowledge to execute the plan. They used declarative knowledge, monitoring, and evaluation to look back. This shows that female students can use metacognitive abilities, especially declarative knowledge, to solve statistics problems.

Keywords: metacognition, female students, feminine, statistical problem-solving

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INTRODUCTION

Daily life activities must be distinct from the important role of the field of mathematics. It is proven that every activity, such as economics, politics, culture, and technology, is inseparable from mathematics. The field of study of mathematics is even present at all levels of formal education. Even at the preschool level, the basic mathematics concepts have been taught from an early age. The field of study of mathematics is one of the pillars of the development of science and technology from human resources that will be prepared for the industrial world in the future. UNESCO emphasizes mathematical competencies such as investigative thinking, logical reasoning, problem-solving, and cognitive development through mathematics education to improve professional skills in students [1].

Learning can provide changes due to intellectual, motor, and behavioral acquisitions when viewed as a cognitive and metacognitive mechanism. However, education can also reveal various issues regarding learning, the mechanism of generating learning, and its causes and effects [2]. Several empirical studies have explained how individual student characteristics such as gender, academic motivation, self-efficacy in school, family environment, and school climate such as emotional support provided by teachers and peers, autonomy given to students, and the quality of instructive practices have a real impact on how students engage in learning activities and how they obtain academic achievement [3]. Thus, factors related to performance in learning are found at the level of personal context, such as motivation and expectations, being able to know prior abilities and beliefs about the material, and being able to make decisions and control the process, social context, and at the physical level such as experience [4].

To understand statistics, students need more than just study skills; they must know when and how to apply statistical thinking, use their skills, and realize when they need additional knowledge. Confidence in understanding and using statistics and a belief that statistics are useful in professional and personal life is essential. Students must be willing to try to learn statistical thinking and skills and realize that although challenging, statistics can be learned. This concept is known as metacognition, which involves students' awareness of their abilities, confidence in the task, and use of appropriate strategies in solving statistical problems [5; 6]. According to Herawaty et al. [7], metacognition plays an important role in learning and is the focus of the 2013 curriculum. Learning should trigger students' metacognition. Despite its importance, many aspects of metacognition still require further research [8]. Metacognition helps students realize their thought processes in learning mathematics so that they not only answer the questions but also understand and realize the answers given [9].

Problem-solving is the application of students' understanding of concepts and skills [10]. However, the fact is that there are still many students who are constrained in solving problems in mathematics, especially statistical material. One of the main causes is the need for more student awareness of the material they have learned and the benefits of the material about the problem at hand. This form of awareness is referred to as metacognition [11]. In solving statistical problems, students have difficulty transforming problems into the right form of mathematical models, making it difficult to understand the meaning of the problem and unable to determine the purpose of the problem because statistical problems that have been learned are not able to be re-organized to serve as the basis of information in solving problems [12].

Metacognition is now one of the most important predictors of mathematics performance [13]. Metacognition is a 'predisposition' factor that enables children, for example, in terms of intelligence and motivation to learn and focus on learning content [14]. How students acquire mathematical knowledge is influenced by gender issues, and students' mathematical abilities differ based on gender factors. As revealed by [15], it shows that gender conditions strongly influence students' process in conceptualising knowledge. For example, Gartmann and Freiberg [16], explained some related to students' metacognition in solving mathematics. Some studies also examined students' abilities, for example, in mathematical reasoning based on gender, explaining differences between male and female students in the process of reasoning and thinking mathematically [17].

Some authors reported that males are more positive towards statistics than females. For example, in Tempelaar and Nijhuis' study [18], hey found that males performed better than females in understanding statistics. In their study, Ashaari et al. [19] found no gender differences in statistical understanding. However, on the other hand, some studies have reported more positive attitudes toward women in statistics; for example, in the study of [20], it was found that female students performed better than male students in statistics exams.

Based on the results of previous studies, the researcher sees inconsistencies and a tendency to view female students as not so good in the use of metacognition in problem-solving, so it needs to be studied more deeply by clearly mapping the metacognitive activities of female students, especially on feminine gender characteristics. Problems in metacognition research still need to be specifically and in-depth discussed in dealing with statistics problems. Students always consider statistics material one of the most difficult fields of study. It is frightening and challenging to learn because it has complex concepts [21]. This research aims to report the mapping of feminine female high school students' metacognition profiles in solving statistics problems.

RESEARCH METHODS

Design research

This study aims to describe the metacognitive activities of feminine female high school students in solving statistical problems. These activities are explored through examining students' actions and expressions before, during, and after solving statistics problems. Data were collected through task-based interviews on solving statistics problems and analyzed qualitatively to produce a metacognitive profile of feminine high school students. This research seeks to explore, reveal, and provide an in-depth look at the metacognitive activities of female students, so that a complete and natural picture of metacognition is obtained.

Participant and Data collection

A total of 16 12th-grade students were involved in this study and one student was taken based on the level of mathematics ability at the (medium) level with female gender characteristics for further interviews. Participants were selected based on the results of the maths ability test and gender questionnaire (BSRI). Moderate mathematics ability was selected because the majority (11 out of 16) of the feminine female students had moderate mathematics ability.

Table 1

Distribution of mathematical ability by gender

Mathematical Ability	Sex with gender characters				Total
	Female				
	Masculine	Feminine	Androgynous	Undifferentiated	
High	0	1	1	0	2
Moderate	0	9	2	0	11
Low	0	2	1	0	3

Data collection was conducted using the main instrument, namely the researcher, and supporting instruments such as gender questionnaires, mathematics ability tests, interview guidelines, statistical problem solving tasks (TPMS) [22], and audio-video recording devices. The data collection process began by asking feminine female students to read and understand the problem without working on it first. The researcher then interviewed the students about their understanding and problem-solving plan. Furthermore, students worked on TPMS problems and after completion, the researcher conducted interviews related to the subject's answers. The interview was semi-structured, with the researcher developing questions based on the subject's previous answers. The data obtained were analyzed and validated using time triangulation, with 'very similar' or 'equivalent' TPMS problems to avoid duplication of answers.

Table 2

Statistics problem solving task instrument (TPMS)

Problem
A coin arrangement competition was held during the Nusantara Indah High School anniversary celebration. The competition was attended by six class XII students: Radit, Gita, Adi, Nuning, Linda, and Sambo. The first group was followed by male participants, namely Radit, Adi, and Sambo. Radit managed to arrange the coins as high as 70 cm, Adi as high as 60 cm, and Sambo as high as 20 cm. The second group was followed by female participants: Gita, Nuning, and Linda. Gita managed to arrange the coins as high as x cm, Nuning as high as 30 cm, and Linda as high as 40 cm. If the results of the height of the coin arrangement of the first and second group participants are combined into one data so that the mean and median values are the same, then; a. Find the value of x if the height of Gita's coin is greater than that of Sambo's! b. Find the variance of the coin arrangement height data if Gita's coin arrangement height is greater than Radit's coin arrangement height! c. Find the standard deviation of the coin arrangement height data if Gita's height is greater than Radit's height!

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a. Find the value of x if the height of Gita's coin is greater than that of Sambo's!

b. Find the variance of the coin arrangement height data if Gita's coin arrangement height is greater than Radit's coin arrangement height!

c. Find the standard deviation of the coin arrangement height data if Gita's height is greater than Radit's height!

Validation and Data Analyzing

Validation is done by comparing interview data using cluster analysis. Data analysis was carried out through 5 stages of data analysis, namely data classification or grouping, data reduction, data presentation, data interpretation and conclusion drawing. Coding in the data classification and data reduction stages was carried out in two phases, namely First Cycle coding, and Second Cycle coding [23]. In the first cycle coding stage, grammatical method (attribute coding), elemental method (descriptive coding, in vivo coding, process coding), and affective method (emotion coding, value coding) were used. In the second cycle coding stage, the categories/theme method (pattern coding, focused coding) was used [23].

Two dimensions become the framework for observing students in their problem-solving process: metacognitive knowledge and metacognitive regulation. These metacognition indicators were developed from the Metacognitive Awareness Inventory (MAI) questions introduced by Schraw using the ask-think-and-tell-why method [24].

The results of interviews based on statistical problem-solving tasks (TPMS) related to female students' metacognitive activities at the stages of understanding the problem, developing a plan, implementing the plan, and looking back were validated using time triangulation techniques to obtain credible data. Validation was carried out by comparing TPMS-1 and TPMS-2 based interview data using a comparison table and cluster analysis using dendrograms to see consistency and similarity in each statement. The results of cluster analysis using dendrograms obtained Pearson correlation coefficient values close to 1 at each stage of statistical problem solving (see Table 2). These results conclude that the TPMS-1 interview data are consistent and credible for further analysis.

Table 3

Results of cluster analysis of TPMS-1 and TPMS-2 interview data

Problem-Solving stage	r	Conclusion
Under standing the problem	0.888157	Consistent
Devising a plan	0.888381	Consistent
Carrying out the plan	0.888270	Consistent
Looking back	0.888471	Consistent

RESULTS

Declarative knowledge activity

When understanding the problem, feminine female students' declarative knowledge activities include awareness of their abilities, including memory abilities, weaknesses, and strengths. In this process, students realize the 'material,' 'difficulty level of the problem,' and 'strengths' and 'weaknesses' when understanding the TPMS problem. The following is an example of a student interview excerpt;

Researcher: Explain how you know the material in this problem?

Student: Because this material has been learnt before about mean, median, variance, and standard deviation.

Researcher: How difficult do you think this problem is to solve?

Student: ...a bit difficult sir, because we have to calculate the mean and median values to be the same...

When carryin out the plan, students realized the 'obstacle' in finding the variance value by only guessing to find the value of x and trying the numbers one by one to find the mean and median values, which they realized was 'not an effective way.' Students also realize 'that there is no other way' to find the value of x so that the mean and median values are the same. The following is an example of a student interview excerpt;

Researcher: Why did you take so long to do part B questions?

Student: ...I was a bit constrained because I forgot the formula sir.

When looking back, female students realised that the method used must be 'not the right formula' and felt that 'there is a better way'. The following is an example of a student interview excerpt;

Researcher: why did you focus on rechecking the variance and standard deviation sections?

Student: Because I feel that my formula is not right sir, there seems to be something missing, and there is a better way.

Procedural knowledge activity

When understanding the problem, feminine female students' procedural knowledge activity is consciously knowing how to apply steps in doing something. It can be seen in the process of procedural knowledge activities that students realize that they cannot 'find the variance' if there is unknown data in the problem, realize the 'amount of data' in the problem, and realize the 'symbol' of the formula that will be used to solve the problem in the problem. The following is an example of a student interview excerpt;

Researcher: Why would you say that the height of the coin is important information?

Student: Because the variance value cannot be calculated if the data is incomplete...

When carrying out the plan, students realize that in the 'known information,' there are data requirements that must be met in order for the x value to be sought correctly, realize that the coin height requirement is looking for a reference to 'find one by one' the appropriate number to calculate the mean and median, realize the correct formula for 'determining the mean' is to add up all the data then divide by the amount of data, realize the formula for 'determining the median' is to sort the lowest to highest data then the middle value is added up and divided by two, and realize the variance formula used is written as 'S2'. The following is an example of a student interview excerpt;

Researcher: How did you determine the value of x?

Student: ...I guessed one by one the numbers that are greater than 20...

Conditional knowledge activity

When understanding the problem, feminine female students' conditional knowledge activities know why and when to use the right information and procedures. It can be seen in the process of students' conditional knowledge activities that they realize when to have a 'discussion' regarding the use of formulas in problems, realize when to 'ask for opinions' regarding the formulas in problems, and realize why to use the mean, median, variance and standard deviation 'formulas' in problems. The following is an example of a student interview excerpt;

Researcher: Why did you have to use those formulas?

Student: ...because to equate the mean and median, and in questions B and C it requires the variance and standard deviation formulas...

When devising a plan, it can be seen in the activities of students who realize the 'important part' of the problem so that they know the reason why the mean and median formulas are important to use to work on problems and 'know the formula' to be used by realizing when the mean, median, standard deviation and variance formulas are used when working on problems.

Researcher: Why do you want to use the mean formula?

Student: Because there is data that we want to calculate the average of the whole amount of data...

When implementing the plan, it can be seen in the activities of students who realize when the standard deviation value can be answered; according to him, to get the standard deviation value, the 'variance value must be known' before the standard deviation. The following is an example of a student interview excerpt;

Researcher: Why do you want to use variance here? Is that correct?

Student: Yes sir, it is correct because you have to know the variance value first and then the standard deviation...

Planning activity

When understanding the problem, feminine female students' activities realize their understanding in developing plans to do something when understanding the problem. In the planning activity process, students realized their understanding of the 'important information' to be known in the problem in order to solve the problem of the 'height of the first group of coins', and the second group realized the 'known' and 'asked' information in the problem, realized that there was a 'picture' related to the previously learned statistical material in the problem, realized that there was 'incomplete data' in the information presented in the problem, and realized the 'strategy to understand' the problem by understanding the problem, focusing, and remembering the formula well. The following is an example of a student interview excerpt;

Researcher: Why do you say the height of the coin is important information?

Student: Because the questions in the problem cannot all be answered if the coin height data for each group is provided sir.

Researcher: Explain which information is known and asked?

Student: Known is the data of the coin height arrangement of the first group and the second group, and the question is part A is the coin height data of the second group, one of which is unknown. Part B is the variance value, and C is the standard deviation.

When devising a plan, students' activities were seen when they realized that they had 'worked' on problems whose material was similar to the material in the TPMS problem and the material had 'been taught' before by the teacher. Students realize the 'ultimate goal' to be achieved in the TPMS problem is to solve the problem according to the question in the TPMS problem. Students also realize the 'strategy' that will be used to solve the problem: directly write the mean and median 'formulas' based on the 'important information' obtained from the TPMS problem. The following is an example of a student interview excerpt;

Researcher: How can you say that you have a 'picture' of this problem?

Student: Because the material in this problem has been learnt and taught before by the teacher.

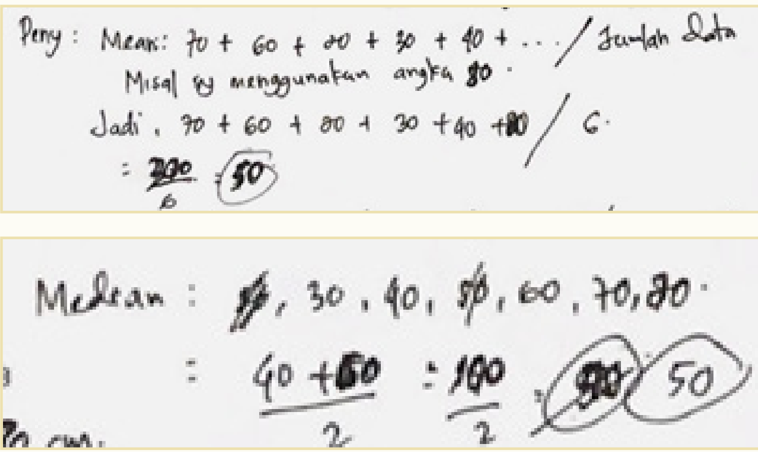
Researcher: What is your first step to solve this problem?

Student: I plan to find and collect unknown data first...

When carrying out the plan, students' planning activities are seen when students realise their understanding of the 'known' and 'asked' information is important to be written in the answer so that it becomes a guide to working on the problem, realise their understanding in obtaining the 'mean' formula where the value of x = 80 is entered into the previously planned mean formula so that the value x =50 is obtained (see Figure 1), realised his understanding in obtaining the formula 'median' where the value of $\overline{x}$ = 80 was entered into the previously planned median formula so as to obtain the value Me=50, realised his understanding in obtaining the value of x which is by 'guessing numbers' starting from x > 20 (see figure 1), realised his understanding in obtaining the formula 'variance' where the value of x-$\overline{x}$ that has been obtained is divided by n-1, realised his understanding in obtaining the purpose of calculating the value of variance is to be used to find the value of standard deviation or 'root of variance' (see figure 2).

Researcher: How did you get the value x = 80?

Student: Based on the known data information, there is a requirement that the value of x must be greater than the height of Sambo's coin, so I tried to guess and enter a value greater than 20 until I got a value that could produce the same mean and median. Here I get x = 80 because the mean and median values produced are 50.



Completion: Mean: 70+60+20+30+40+…/ total data
For example, I use the number 80,
So, 70+60+20+30+40+80/ 6 = 300/6 =50

Median: 30, 40, 60, 70, 80 = 40+50/2 = 100/2 = 50

Figure 1 Solving the x-value problem for the mean and median

Monitoring activity

When devising a plan, feminine female student activities are aware of their understanding and cognitive performance in solving problems. It can be seen in the monitoring activities that students realize how to determine the objectives to be achieved in the TPMS problem based on 'three question questions,' namely asking for the value of x, the variance value, and the standard deviation.

Researcher: How can you say that is your goal?

Student: Because I think this problem must have an answer, based on the three problem questions, so my goal is to answer the three questions.

When carrying out the plan, student activity is seen when 'believing the value of x = 80 correct' ecause it has been checked again according to the data requirements in the problem, 'believing the mean value is correct' because it has rechecked with the mean formula for each x value guessed, 'believing the median value is correct' because it has rechecked with the median formula for single data that is even for each x value guessed, 'believing the variance formula is correct' because according to him the S2 formula is always used, realising that the 'standard deviation' formula written as S=√(S^2) is correct (see Figure 2), directly realised that the way to determine the value of x by guessing must still refer to the student's 'coin height clue' which is a requirement in the problem, so that every x value guessed in the 'trial' matches the coin height requirement in the problem, directly realised that the value of x = 80 is correct because it meets the 'problem requirement' which requires the value of $\overline{x}$=Me (see figure 1), realised that the number operations in the formula used to calculate the 'variance' value were strange and would affect the 'standard deviation' value, realised that the method used to determine the x value was appropriate from the original plan, but felt that 'there was an effective formula' that could be used from guessing (see figure 2).

Researcher: Do you think the value x = 80 is correct?

Student: Yes sir, I think it is correct.

Researcher: How do you make sure it is correct?

Student: I just adjust it to the requirements of the question and the instructions in each question...

Researcher: What about the variance and standard deviation values?

Student: I think my event is correct, I just doubt the summing or multiplying part because the results don't help me find the standard deviation value...

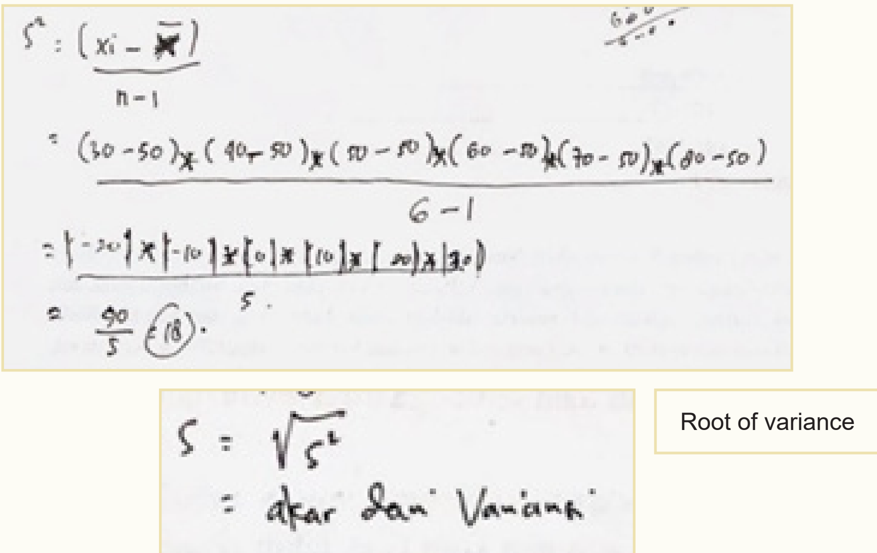


Figure 2 Solving the problem of variance value and standard deviation

Evaluating activity

When carrying out the plan, feminine female students realise the results of their thinking process by evaluating and assessing the control process and the results of their thinking in solving the problem. Seen in the process of monitoring activities, students realised that the value of 'standard deviation' was not found because the variance value was still incorrect, so the purpose of question part C was not achieved.

Researcher: Why did you miss the standard deviation?

Student: I tried sir, with a variance value of 18, but I couldn't get the root value.

When looking back, student activity is seen when realising and assessing that 'performance is not good' because it cannot solve all questions properly, and the method used is only a way of guessing. Students realise that the value of x should be the same 'mean and median'. Students realise and assess that 'it is according to procedure'. Students also realise and assess the achievement of 'the goal was not achieved' as planned at the beginning.

Researcher: How do you think you did in solving this problem?

Student: I think less than 50% sir, my performance was not good, because I still doubt the value of the variance that I found, and the standard deviation I could not solve. But I think I have done it according to the procedure required by the problem. Like the mean and median values must be the same.

Metacognitive activity map of feminine female students

Based on the analysis above, students' metacognitive activities are mapped based on the stages of problem-solving so that the following results are obtained.

When understanding the problem, feminine female students use declarative knowledge, procedural knowledge, conditional knowledge, planning, and monitoring. Feminine female students use conditional knowledge, planning, and monitoring when developing a statistical problem-solving plan. When implementing a statistical problem-solving plan, feminine female students use declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and monitoring. Looking back at problem solving results, feminine female students use declarative knowledge, monitoring, and evaluation (see Figure 3). This illustrates that metacognitive activities become the input layer, and the problem-solving stages become the output layer.

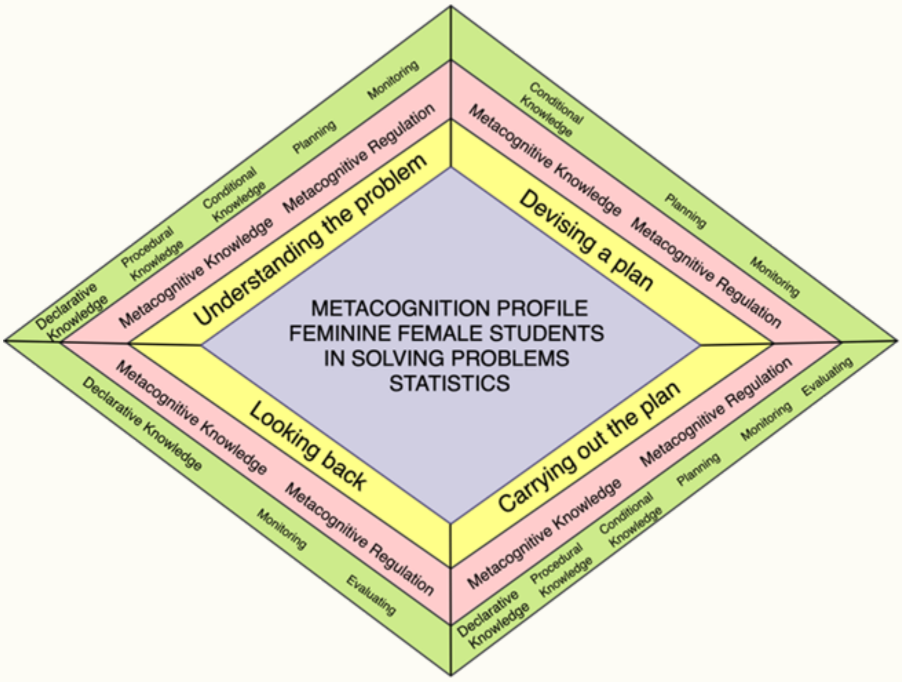


Figure 3 Metacognitive activity map of feminine female students

DISCUSSION

The research results align with the findings of Misu & Salam [25] which revealed that feminine female students demonstrate good metacognitive knowledge when solving mathematical problems. These students show awareness of their abilities, recognizing their strengths and weaknesses in understanding statistical concepts like mean, median, variance, and standard deviation. This awareness is consistent with Shen's research [26] which suggests that students are capable of critically evaluating their performance and recognizing their limitations and strengths, such as enthusiasm combined with haste in problem-solving.

Similarly, Bakker et al [27] emphasized the importance of self-awareness in understanding mathematical problems, particularly for female students. This self-awareness is closely linked to procedural knowledge, which involves identifying facts and algorithms that aid in solving non-routine problems [28]. Procedural knowledge, including understanding symbols and formulae, is crucial for solving mathematical problems [29; 30]. In this study, female students demonstrated procedural awareness by identifying necessary formula symbols and recognizing the importance of complete data for calculating variance.

However, despite their procedural understanding, students often struggle with selecting and applying appropriate problem-solving concepts [31]. This difficulty highlights the need for a connection between procedural and conditional knowledge. Conditional knowledge involves understanding when and why certain procedures, like using mean, median, variance, and standard deviation, are appropriate. This ability to adapt and apply knowledge in various contexts is critical, as supported by Hickendorff et al. [32], that solving mathematical problems is a multifaceted process that requires a strong understanding of mathematical concepts and procedures and the ability to adapt and apply them in various contexts.

Students also engage in planning and monitoring activities, ensuring their focus on relevant aspects of the task, which facilitates accurate problem understanding. Safitri et al. [33] emphasized that metacognition is a fundamental component of mathematical problem-solving. Students in this study demonstrated critical abilities by identifying information gaps, verifying missing data, and structuring necessary steps, which is consistent with the findings by Bakar & Ismail [34] on the importance of monitoring and regulating cognitive processes.

Lastly, the ability to evaluate their thinking process is evident in students as they recognize flaws in methods and understand the need for improvement. However, this evaluation does not consistently occur at all stages of problem-solving, contradicting Misu & Salam [25] who asserted that planning, monitoring, and evaluation should be present at every stage. Research has shown that female students tend to be more emotionally involved in their learning experiences, which can affect their self-assessment and self-evaluation processes [35]. For example, Pelch's research [36] showed that female students are more likely to be motivated by positive emotions and less likely to be motivated by negative emotions compared to male students. In addition, the research also found that female students tend to be more influenced by their emotional experiences during learning, which may affect their self-perception and self-confidence.

Planning, monitoring, and evaluating were simultaneously used by students only at the stage of implementing the problem-solving plan. When looking back at the problem-solving results, monitoring and evaluation activities appeared at the stage of looking back at the results. This proves that metacognitive activities, such as planning, monitoring, and evaluating one's thinking, have been shown to have a strong relationship with students' mastery of mathematical concepts and their overall mathematical competence [34]. These findings suggest that feminine female students use metacognitive knowledge and metacognitive regulation to solve statistics problems.

CONCLUSION

This study revealed that feminine female students used all metacognitive components in solving statistics problems, namely metacognitive knowledge (declarative, procedural, and conditional knowledge) and metacognitive regulation (planning, monitoring, and evaluating). Although all components were used, metacognitive subcomponents varied at each problem-solving stage.

Understanding the problem: Feminine female students demonstrated self-awareness regarding their strengths and weaknesses. She could recall relevant material and assess the task's complexity. She could identify important information, understand what to do first and the symbols needed in the formula, and collaborate thinking under certain conditions to support her understanding of the problem. At this stage, feminine female students use declarative knowledge, procedural knowledge, conditional knowledge, planning, and monitoring.

Devising a plan: Feminine female students can plan appropriate strategies based on understanding previous material that has been learned. The student realized the important part of the problem, which enabled her to understand why the mean and median formulas were important to use when solving the problem. In addition, the student knows when to use the mean, median, standard deviation, and variance formulas. The student has a clear understanding of the end goal to be achieved. At this stage, feminine female students use conditional knowledge, planning, and monitoring.

Carrying out the plan: Feminine female students realize the obstacles they experience in solving problems. Students realize that each question is related to each other. However, from the existing constraints, students can demonstrate the ability to apply procedures according to the strategies they have thought of. The strategy of guessing based on data patterns is used by students in solving problems. Students actively monitor their understanding and cognitive performance, double-check their answers, and assess the shortcomings of the answers based on the objectives to be achieved. At this stage, feminine female students use declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and evaluation.

Looking back at the results of problem solving: Feminine female students can evaluate the thinking process and methods used and identify shortcomings and potential improvements that can be made in the future. Students are more likely to get carried away when assessing their performance. This is probably inseparable from the feminine expression factor. At this stage, feminine female students use declarative knowledge, monitoring, and evaluation.

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