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How students with masculine and feminine genders solve circle problem: A commognitive perspective

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Abstract

Cognitive is the way students communicate their thinking processes in problem-solving. In solving problems, it is not only influenced by their thinking process, but other factors can affect it, such as gender differences. One of the subjects that can demonstrate students' cognitive abilities is the topic of circles. This study aims to determine students' cognitive abilities in solving circle problems from the perspective of masculine and feminine gender. The type of this research is exploratory research with a qualitative approach. This research was conducted in the 11th grade at SMA Negeri 1 Torue. The subjects in this study consist of one male student and one female student. After determining the research subjects, they were given a circular task. In addition, interviews were conducted while the subjects completed the task. The data analysis techniques used in this study are data condensation, data presentation, and conclusion drawing. The results of this study indicate that female students can solve circle problems by expressing all cognitive aspects in detail, neatly, clearly, and correctly. Meanwhile, when solving circle problems, male students express all cognitive aspects briefly and correctly.

Keywords: commognitive; problem solving; gender

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I. Introduction

In mathematics learning, the communication process can be in the form of interpersonal and intrapersonal communication (Febriyanti & Setianingsih, 2018). Activities carried out together and transformed into an idea through the process of individualization are called interpersonal communication. Sfard (2008) argues that communication is an activity of a person with themselves, followed by an activity with other individuals in the form of reactions to the thinking process. Whereas according to Lefrida, Yuli, Siswono & Lukito, (2023), communication is an important element in learning. Through how we communicate, we can see how someone is understanding in solving problems. Additionally, their way of thinking and providing ideas for solving problems will also be evident when communicating. In other words, a person's cognitive process will be visible when communicating. Thus, the investigation of students' cognitive processes can be conducted by

analyzing their analogical reasoning abilities, which must be good, and their mathematical communication skills, which must be reasonable and consistent (Mujiasih, Waluya, Kartono & Mariani, 2020).

Communicating and thinking are two processes that can occur within a single activity based on the commognitive perspective (Kim & Lim, 2017; Lefrida et al., 2021; Supardi, Zayyadi, Lanya, Hasanah & Hidayati, 2021). Commognitive is a combination of two words, namely communication and thinking. Furthermore, commognitive consists of ideas and focuses on a learning approach based on the assumption that thinking can be conceptualized as a person's communication with themselves and expressed in written or spoken form (Lefrida et al., 2021; Zayyadi, Nusantara, Hidayanto, Sulandra, & Sa'Dijah, 2020). Lefrida et al. (2023) also assume cognition as communication with oneself whose activities are grouped.

The communication skills an individual possesses will also emerge when engaging in discourse in mathematics, as stated by Sfard (2008), where the type of communication involving several people and simultaneously excluding others is called discourse. Three types of discourse observed in mathematics learning are everyday conversation, informal, and formal. Everyday discourse is visually mediated by concrete material objects, which exist independently of the discourse Sfard (2008). Formal discourse is a form of oral or written communication used in official situations, using standard language and systematic structures. At the same time, informal discourse is a form of communication used in informal or relaxed situations with a freer and more familiar language style. This discourse often appears in everyday conversations. Furthermore, Sfard (2008) and Nardi, Ryve, Stadler & Viirman, (2014) state that mathematical discourse is characterized by keywords using specific terms "word meaning" in mathematical terms to solve problems, visual mediators using mediators such as graphs, diagrams, and symbols, and also using physical objects as props in solving problems, endorsed narratives using definitions, formulas, theorems, and proofs in solving problems, and routines, the processes carried out by students. This is in line with the opinion of (Lefrida et al., 2021; Sfard, 2008; Zayyadi et al., 2020) that commognitive provides an alternative aspect to communicate the solution to mathematical problems, which consists of the use of words, visual mediators, narratives, and routines. Here are the commognitive aspects of solving circle problems in Table 1.

Table 1. Commognitive aspects

No	Commognitive Aspects	Description
1	*Keywords*	Using the specific term "word meaning" in mathematical terminology, such as writing the word circle and noting what is known and what is being asked in a circle problem.
2	*Visual mediator*	Solving circle problems using mediators such as graphs, diagrams, symbols, and images and using physical objects as teaching aids.
3	*Endorsed narratives*	Using definitions, theorems, and proofs like the formula for a circle.
4	*Routines*	Orderliness in using words and visual mediators in narration, such as explaining steps or stages in solving circular problems.

The researcher conducted an interview with a mathematics teacher, and the teacher stated that students lack detail in solving circle problems. They often experience confusion in using the formulas to solve the problems, and there are mistakes when they make assumptions about the questions. Additionally, students still cheat when completing assignments, which results in them not truly understanding the material in the questions they work on. This

cheating ultimately makes them focus only on the final result without going through the proper process. Therefore, if given individual assignments, they struggle to complete them. Therefore, it is necessary to investigate students' commognitive processes in solving problems because commognitive refers to how students communicate their thinking processes in solving circular problems.

Students' problem-solving processes are influenced by other factors, including gender differences. Gender differences can be a differentiating factor in how a person thinks and solves problems.

In addition, the level of problem-solving ability of each student, both male and female, varies depending on the student's skills and level of intelligence. According to Krutetskii in Wicaksono (2020), the precision, accuracy, thoroughness, and precision of thinking of male students indicate that they have better mathematical abilities than female students. In line with this, Kartono (Davita & Pujiastuti, 2020) stated that there are differences between male and female students; female students generally focus on concrete, practical, emotional, and personal things, while male students focus on intellectual, abstract, and objective things.

This gender difference also raises the question of whether learning styles, thinking processes, or conceptualization processes differ by gender. Thus, it can be said that gender can affect students' cognitive processes in communicating their thoughts when solving mathematical problems, especially on circle material. Based on the results of an interview with a teacher, students often experience confusion in using formulas to solve circle problems.

Therefore, the problem discussed in this study is students' cognitive in solving circle problems seen from the perspective of masculine and feminine gender.

II. Research Method

The research conducted is exploratory research with a qualitative approach. Qualitative research has four characteristics, namely: (1) focusing on processes, understanding, and meaning-making, (2) the researcher being the main instrument in data collection and analysis, (3) the research process being inductive, and (4) data presentation in descriptive form, namely in the form of words and images (Merriam & Tisdell, 2016). This research will naturally delve deeper into the commognitive aspects of problem-solving in circle problems, examined based on masculine and feminine gender perspectives. This research was conducted at SMA Negeri 1 Torue in the odd semester of the 2024/2025 academic year. The subjects of this research are two eleventh-grade students from SMA Negeri 1 Torue. The two students in question are students with masculine gender and feminine gender. The subjects were selected based on the results of the gender questionnaire.

The instruments used are a gender questionnaire to categorize students' gender types. In the questionnaire, students are asked to fill in several statements that describe their personality. Each statement has different points. Such as never/rarely (-1), usually not true (-2), sometimes true but not often true (-3), sometimes true (-4), often true (-5), usually true (-6), always/almost always true (-7). Then use Microsoft Excel to see the results of the questionnaire. A validated circle task sheet, the assignment sheet is given to measure how students think in solving circle problems.

Moreover, an interview guideline sheet to delve deeper into students' commognitive processes in solving circle problems. Interviews are conducted to measure students' communication methods and thinking processes according to commognitive indicators. Because with interviews, we can see how students can answer questions according to the interview guidelines used in solving the problems. The data collection technique involved administering a gender questionnaire and a circle problem sheet accompanied by interviews conducted while the students took the test. The quality of the research results using data credibility is conducted through

prolonged engagement, increased persistence, peer debriefing, member checking, and dependability. The data analysis technique used in this research is qualitative data analysis, which includes three stages as proposed by Miles, Huberman & Saldana (2014): data condensation, data display, and drawing conclusions and verification. (conclusion drawing and verification). Here is the circle problem given to the students in Task 1.

Determine the equation of the circle whose center lies on the coordinate line 2x+3y-5=0 and is tangent to the negative x-axis and the positive y-axis.

III. Results and Discussion

After obtaining two students who were made subjects, the researcher gave them the initials of a masculine-gender student (DR) and a feminine-gender student (IP). They were assigned a circle task and interviewed to delve deeply into the information from each answer written by the students. The researcher has determined the subjects in Table 2.

Table 2. Gender survey data result

No.	Gender	Result
1.	Masculine	3
2.	Feminime	7
3.	Androgynous	7
4.	Undeferrianted	13

Based on the results of the gender questionnaire in Table 2, the data shows that there are 3 students with a masculine gender, 7 students with a feminine gender, 7 students with an androgynous gender, and 13 students with an undifferentiated gender. Here is the commognitive of students in solving circle problems.

Commognitive of Masculine Gender Students (DR)

When the subject DR was given the circle task, DR immediately worked on it and an interview at the same time accompanied it. It is evident that when completing the circle material task, the subject displayed commognitive aspects such as keywords, visual mediators, narratives, and routines. The results of the subject DR's work can be seen in Figure 2.

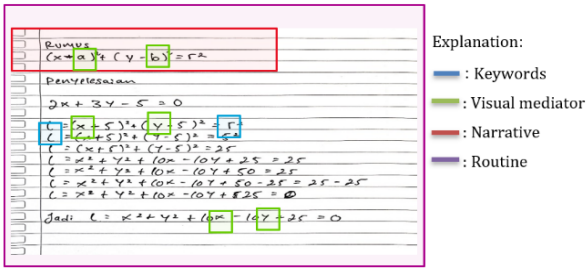

Figure 1.Students DR work result

Figure 2 shows that the DR subject wrote down the information obtained from the questions by bringing up cognitive indicators in the form of keywords. DR wrote down the keyword information "circle," "radius of circle," "circle equation," "x-axis," "y-axis," and "coordinate line." Furthermore, the DR subject also wrote down the keyword symbols he mentioned.

When writing down the information obtained from the questions and the instructions requested, the DR subject only wrote briefly, but it would be very different when the DR subject was interviewed in more detail.

Table 3. Interview results

	Dialog
PDIPM06	According to you, what does the question discuss?
DRM06	Circle the answer
PDIPM07	After writing the problem, what steps do you take to solve it?
DRM07	in my opinion, the immediate solution is to write the equation of the circle, which is $(x-a)^2+(y-b)^2=r^2$
PDIPM09	Try to explain the meaning of that formula!
DRM09	The formula's purpose is to determine the equation of the circle we want to find.
PDIPM10	Try to explain the meaning of the circle formula that you wrote!
DRM10	Well, the formula is $(x-a)^2 + (y-b)^2=r^2$ x is the x-axis on the circle's coordinate line, and a is the center point touched by the circle, just like b and y are the y-axis on the circle's coordinate line.

PDIPM11	Do you know how to draw a circle that touches the negative x-axis and the positive y-axis?
DRM11	I do not know, sis, because I am not used to using drawings and also find it difficult to visualize the picture.
PDIPM12	So, what step did you take next?
DRM12	he solution is the line 2x + 3y – 5=0, then substitute the circle equation formula, which is $L = (x-a)^2 + (y-b)^2 = r^2$ lalu $L = (x+5)^2 + (y-5)^2 = 5^2$, thus, the result is $L = x^2 + y^2 + 10x - 10y + 25 = 0$
PDIPM13	If you do not mind me asking, where did the 5 come from, sis?
DRM13	From the radius of the circle, sis.
PDIPM14	So, how does the younger sibling find out the radius?
DRM14	From the line 2x + 3y – 5 = 0, I replace the values of x and y with r, and I get the result of 5.
PDIPM15	According to you, L, what does it symbolize?
DRM15	The circle
PDIPM16	According to you, what does the circle symbolize?
DRM16	The radius of the circle
PDIPM17	What is the process for solving the circle problem?
DRM17	After I wrote the problem, I immediately solved it by writing the equation of the circle, which is $L = (x-a)^2 + (y-b)^2 = r^2$. Then, after I obtained the value of r, I substituted the value of r into the circle equation. So, we obtain the equation of a circle whose center lies on the line 2x + 3y – 5=0, which touches the negative x-axis and the positive y-axis, namely $L = x^2 + y^2 + 10x - 10y + 25 = 0$

Subject DR wrote down the information obtained from the problem by highlighting the commognitive aspect. DR wrote down the keywords "circle," "radius of the circle," "equation of the circle," "x-axis," "y-axis," and "coordinate line." Subsequently, the subject also symbolized the keywords he had mentioned. Subject DR, when writing down the information obtained from the problem and the requested instructions, only wrote it briefly, but it was very different when subject DR was interviewed, being more detailed. The DR subject also introduced visual mediators by writing mathematical symbols such as "x, y, a, b, and r." However, the DR subject did not include the circle diagram in the question. The interview results revealed that the DR subject is not accustomed to representing problems in images or creating drawings because the DR subject finds it difficult to visualize a problem in a visual form.

The commognitive aspect used by subject DR is the narrative in the form of using the circle equation formula "$(x-a)^2 + (y-b)^2 = r^2$ " It is clear that DR, in formulating the solution plan, presents circle formulas related to the problem, such as writing the circle equation formula.

Based on the interview results, the subject DR can clearly and accurately explain the formula's reasons. Therefore, the narrative used by the subject is correct in solving the given problem. The next commognitive aspect used by subject DR is a written steps or stages routine. There are two solutions; the first is finding the value of the circle's radius. Then, after obtaining the radius value, it is followed by substituting the radius value into the circle equation formula. Then, the subject DR wrote down the conclusion from the problem-solving results.

The interview results with the subject DR revealed that DR could correctly explain the steps of the task from start to finish but lacked detail. This is in line with the research conducted by Dewi, Suwari & Liesdiani, (2024), which states that male students can also correctly follow the steps in problem-solving but lack detailed explanations.

Subjects with masculine gender in completing the circle task bring up the four commognitive aspects, including keywords, visual mediator, narrative, and routine. Subjects with masculine gender bring up the keywords contained in the circle equation; the subject also brings up the visual mediator, which is only writing symbols in solving the given problem. The subject does not bring up the circle image

referred to in the question; the subject reveals that the subject is not used to making images to solve problems. The subject brings up the narrative as a circle equation formula correctly. Furthermore, the routine brought up by the subject is in the form of steps used in solving the problem that are done correctly. The subject writes down the steps to solve it briefly and without complications. This proves that masculine gender subjects can bring up the four commognitive aspects but in a short way. This is in line with research conducted by (Triani, 2020), which states that masculine students can meet the six indicators of mathematical reasoning ability, but in writing answers to questions, masculine students do not write complete answers even though in the interview results, students can explain the results of their work. In addition, masculine students do not recheck their answers.

Commognitive of Feminime Gender Student (IP)

After agreeing with the IP Subject to conduct data collection, the researcher immediately assigned the circle task, which the subject then completed. Next, based on the task results, it is evident that IP completed the circle task, which also revealed cognitive aspects such as keywords, visual mediators, narratives, and routines. The results of the subject IP work can be seen in Figure 3.

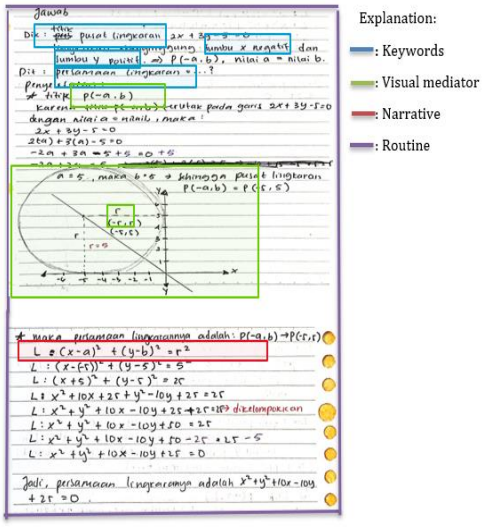

Figure 2. Student IP work result

Table 4. Interview results

	Dialog
PDIPM05	After you read the question, what comes to your mind?
IPM05	From this problem, you are asked to find the equation of a circle whose center lies on the line 2x + 3y – 5=0, which is tangent to the negative x-axis and the positive y-axis.
PDIPM06	What step will you take next?
IPM06	First, I created what is known, which is the line 2x + 3y – 5=0 that touches the negative x-axis and the positive y-axis, represented by P (-a,b) where -a = negative x-axis and b = positive y-axis. Then, I created what was asked in the question to determine the equation of the circle.
PDIPM07	Then what is the next step?
IPM07	After that, it is immediately worked on because point P (-a,b) lies on the line 2x + 3y – 5=0 with the value a = value b, so 2x + 3y – 5=0, the value of x is replaced with a and the value of y is replaced with b, then the value a = 5 is obtained, because the value a = value b, then the value b is also 5. Thus, the center of the circle becomes P (-5,5). Then, if the x-axis is drawn at point -5 and the y-axis at point 5, its radius, denoted by r, is obtained. (-5,5).
PDIPM08	Why did you write r in the circle diagram?
IPM08	I'm sorry, sis. I wrote it wrong. It should be (-a, b), but if r means radius, where r is used as a symbol to denote the radius of the circle, the radius is the distance from the center of the circle to any point on the circumference of the circle. So, r is 5.
PDIPM09	According to your younger sibling, what is the function of the circle diagram?
IPM09	So that we can determine the axis that is tangent to the line 2x + 3y – 5=0
PDIPM10	Well, after you draw the circle, what is your next step?
IPM10	Then, since the center of the circle has been obtained, I input it into the circle equation formula, which is $L = (x - a)^2 + (y - b)^2 = r^2$
PDIPM11	Where did you get the formula for the equation of the circle?
IPM11	Because I had already been taught, I tried to recall it. Then, I happened to

	search for the topic of circles and the equation of a circle on Google.
PDIPM12	Could you explain the meaning of that formula?
IPM12	x represents the center point that intersects with the circle line from the x-axis, then a represents the center point that intersects with the circle line, then b represents the y-coordinate line, and y represents the center point that intersects with the circle line from the y-axis.
PDIPM13	Then, how did you determine the equation of the circle?
IPM13	Entering P (-5,5) into the circle equation formula, which is $L = (x - a)^2 + (y - b)^2 = r^2$, with a replaced by -5 and b replaced by 5. Then $L = (x - (-5))^2 + (y - 5)^2 = 5^2$ resulting in $L = x^2 + 10x + 25 + y^2 - 10y + 25 =$ 25 After grouping like terms, we get $L = x^2 + y^2 + 10x - 10y + 25 = 0$. Therefore, the equation of the circle with its center on the line 2x + 3y – 5=0, which touches the negative x-axis and the positive y-axis, is $L = x^2 + y^2 + 10x - 10y + 25 = 0$

The commognitive aspects used by the IP subject include keywords such as "circle equation," "negative x-axis," "positive y-axis," "circle radius," "circle center," "circle circumference," and "radius." Based on this, it shows that the subject understands the given problem. The interview results also prove that the subject IP uses keywords in conveying the information obtained from the problem. The commognitive aspect in the form of visual mediators used by the subject IP in solving the circle task shows that the subject depicted a circle that touches the negative x-axis and the positive y-axis, with the circle's center being 2x+3y-5=0. The subject also wrote mathematical symbols such as "x, y, a, b, r, p." In the interview results, IP stated that the function of the drawing was to determine the axis that touches the line, which is 2x + 3y – 5=0. Therefore, it can be concluded that the subject IP used visual mediators in solving the problem.

The cognitive aspect, in the form of narration, used by the subject IP in solving the circle problem shows that the subject uses the circle equation formula, which is $L=(x-a)^2+(y-b)^2=r^2$. The interview results with the subject IP explain that the narration is accurate and correct.

The commognitive aspect in the form of routines, which are the steps in solving the problem, is written in order. In formulating a plan for the problem, the IP subject writes down what is known, then what is being asked, and finally the solution. Starting with finding the center point of the circle denoted as P(-a, b), which lies on the line 2x + 3y – 5=0 with the value a = value b after obtaining it, then the value –a = x, and the value b = y, resulting in the radius of the circle which is r(-5,5). After obtaining the radius of the circle, the subject then substitutes the radius into the circle equation formula. Thus, the desired equation of the circle is obtained. The IP subject wrote the conclusion obtained from the problem-solving accurately and correctly.

Subjects with feminine gender in completing circle tasks bring up several commognitive aspects, including keywords, visual mediators, narratives, and routines. Feminine subjects explain the information obtained from the problem by bringing up the commognitive aspects of keywords. The subject identifies the information contained in the problem clearly and logically. The commognitive aspect in the form of a visual mediator used by the subject in solving the circle problem shows that the subject can imagine the problem in the form of a picture. The subject also knows the function of the circle image he made. The commognitive aspect in the form of a narrative used by the subject in solving the circle problem shows that the subject uses the circle equation formula correctly. The commognitive aspect of a routine is the steps in solving the problem written neatly and clearly. This can be seen when the feminine subject writes down the steps to solving the problem, starting by writing down what is known, then what is asked, and then the solution. This proves that subjects with feminine gender can bring up the four commognitive aspects neatly and clearly. This is in line with research

conducted by Nugraha & Pujiastuti (2019), which states that feminine gender students can meet all indicators that are the reference for the study. This is also in line with research conducted by (Triani, 2020), which states that feminine students can meet the six indicators of mathematical reasoning ability; in addition, feminine students are more detailed and careful in answering a problem.

IV. Conclusion

Based on the description of the research results and discussion, it can be concluded that,

Subjects with masculine gender can solve circle problems by bringing up four commognitive indicators: keywords, visual mediators, endorsed narratives, and routines. However, masculine subjects do not write down what is known and asked from the given problem, but when the subject is being interviewed, the subject can explain more clearly. Masculine subjects also do not explain the information observed in the topic, but based on the research results, the subject can explain the information by referring to the commognitive indicators, namely keywords. The visual mediators written by the subject are only symbols. The subject uses narratives by writing circle formulas to solve problems accurately and concisely. The steps used by the subject in solving the problem are components of the commognitive routine indicator.

Subjects with feminine gender can also comprehensively and systematically solve circle problems by identifying important indicators, such as keywords, visual mediators, endorsed narratives, and routines. The feminine subject presents understood and asked information by bringing up a commognitive perspective, such as a clear and concise key. The feminine subject brings up a visual mediator to illustrate the nature of the problem that arises. The feminine subject brings up a narrative, namely the circle formulas, precisely so that the routines described as steps in solving the problem can be carried out correctly and adequately. Therefore, it is said that the masculine subject solves shortly, while the feminine gender subject solves in a more detailed way. This proves that the masculine gender and feminine gender subjects can bring up the four commognitive indicators but with different solutions.

References

Davita, P. W. C., & Pujiastuti, H. (2020). Analisis kemampuan pemecahan masalah matematika ditinjau dari gender. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *11*(1), 110–117. https://doi.org/10.15294/kreano.v11i1.23601

Febriyanti, R., & Setianingsih, R. (2018). Students' mathematical communication abilities in mathematical problem solving viewed from intrapersonal and interpersonal intelligences. *Jurnal Ilmiah Pendidikan Matematika*, *1*(7).

Dewi, H. R., Suwari, L. I., & Liesdiani, M. (2024). analisis kemampuan berpikir reflektif matematis siswa ditinjau dari perbedaan gender. *Primary Education Journal or Primary School Journal*, *4*(2), 223-228.

Kim, D., Choi, S., Lim, W. (2017). Sfard's commognitive framework as a method of discourse analysis in mathematics. world academy of science, engineering and technology. *International Journal of Cognitive and Language Sciences*. 11(11). .

Lefrida, R., Siswono, T. Y. E., & Lukito, A. (2021). Process-oriented routines of students in heterogeneous field dependent-independent groups: A commognitive perspective on solving derivative tasks. In *European Journal of Educational Research* (Vol. 10, Issue 4, pp. 2017–2032). Eurasian Society of Educational Research. https://doi.org/10.12973/EU-JER.10.4.2017

Lefrida, R., Siswono, TYE, & Lukito, A. (2023). Exploring the field-independent student's understanding derivative concepts: A case of commognitive perspective. *Acta Scientiae*, 25 (3), 180–207. https://doi.org/10.17648/acta.scientiae.7097

Lefrida, R., Yuli, T., Siswono, E., & Lukito, A.

(2023). Development of derivative understanding task instruments to explore student commognition. *Jurnal Pendidikan Matematika*, *17*(3), 343–360. https://doi.org/10.22342/jpm.17.3.20826.343-360

Matthew B, M., & A Michael, H. (1994). *Qualitative data analysis*.

Merriam, S. & Tisdell, E.J. (2016). Qualitative research: A Guide to Design and Implementation (4th ed). San Fransisco, CA: Jossey-Bass.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis*. Sage Publication

Mujiasih, M., Waluya, B., Kartono, K., & Mariani, S. (2022, September). Karakteristik proses komunikasi matematis pada penalaran analogi. In *Prosiding Seminar Nasional Pascasarjana* (Vol. 5, No. 1, pp. 701-709).

Nardi, E., Ryve , A., Stadler, E., & Viirman , O. (2014). Commognitive analysis of the learning and teaching of mathematics at university level: The case of discursive shifts in the study of Calculus. Research in Mathematics Education. https://doi.org/10.1080/14794802.2014.918338

Nugraha, T. H., & Pujiastuti, H. (2019). Analisis kemampuan komunikasi matematis siswa berdasarkan perbedaan gender. *Edumatica: Jurnal Pendidikan Matematika*, *9*(1), 1-7.

Sfard, A. (2008). *Thinking as communicating : Human development, the growth of discourses, and mathematizing*. Cambridge University Press.

Supardi, L., Zayyadi, M., Lanya, H., Hasanah, I., & Hidayati, S. N. (2021). Commognitive analysis of students' errors in solving high order thinking skills problems. In *Turkish Journal of Computer and Mathematics Education*, 12(6).

Triani, E. (2020). Analisis kemampuan penalaran matematika dalam menyelesaikan soal matemtaika ditinjau dari perbedaan gender.

Wicaksono, A. (2020). Profile solution problem mathematics student junior high school with interpersonal intelligence reviewed by gender. Coordinates Journal of Mathematics and Natural Sciences, 1(1), 39–51. https://doi.org/10.24239/kjpm.v1i1.6

Zayyadi, M., Nusantara, T., Hidayanto, E., Sulandra, I. M., & Sa'Dijah, C. (2020). Content and pedagogical knowledge of prospective teachers in mathematics learning: Commognitive. *Journal for the Education of Gifted Young Scientists*, *8*(1), 515–532. https://doi.org/10.17478/jegys.642131

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