p-ISSN: 2086-4280
e-ISSN: 2527-8827

Analyzing Students' Errors in Solving Trigonometric Problems Using Newman's Procedure Based on Students' Cognitive Style

Rostina Sundayana[1*], Cindy Elsa Parani[2]

Mathematics Education, Institut Pendidikan Indonesia
Jalan Pahlawan No 32, Sukagalih, Garut, Jawa Barat, Indonesia
[1*]*sundayanaros@gmail.com;* [2]*cindyelsap@gmail.com*

Article accepted: 25-09-2022, revised: 18-01-2023, published: 31-01-2023

Abstrak

Tujuan penelitian ini untuk mengetahui kesalahan yang dilakukan siswa yang memiliki gaya kognitif *field dependent* dan *field Independent* dalam menyelesaikan soal trigonometri berdasarkan prosedur Newman. Pendekatan yang digunakan adalah pendekatan kualitatif dengan jenis penelitian deskriptif. Pengumpulan data menggunakan tes GEFT (*group embedded figure test*), tes trigonometri, dan wawancara. Subjek penelitian ditentukan dengan *purposive sampling* dan dipertimbangkan berdasarkan beberapa kriteria, yaitu; (1) siswa berada pada kategori gaya kognitif *field dependent* atau *field Independent* , (2) siswa memiliki kemampuan komunikasi yang baik (berdasarkan informasi dari guru dan pengamatan dilapangan). Teknik analisis data dilakukan dengan tiga tahapan yaitu reduksi data, penyajian data, dan pembuktian serta penarikan kesimpulan. Hasil penelitian menunjukkan bahwa kesalahan siswa tertinggi pada kesalahan penarikan kesimpulan untuk siswa dengan jenis gaya kognitif yang berbeda. Berbeda dengan siswa dengan gaya kognitif *field dependent* , siswa dengan gaya kognitif *field Independent* tidak ada yang melakukan kesalahan membaca, sedangkan salah satu siswa dengan gaya kognitif *field dependent* masih ada yang melakukan kesalahan membaca. Penyebab kesalahan-kesalahan tersebut pada umumnya yaitu kebiasaan tidak menuliskan penyelesaian soal sesuai konteks yang diminta soal, kurang teliti, kurang memahami situasi masalah, dan kurang berlatih soal-soal terutama soal bentuk cerita.
Kata Kunci: Kesalahan; Prosedur Newman; Gaya Kognitif; Trigonometri.

Abstract

The purpose of this study was to find out the errors made by students with field dependent and field independent cognitive styles in solving trigonometry problems based on Newman procedure. This descriptive study used a qualitative approach. The data collection techniques involved the GEFT test (group embedded figure test), trigonometry tests, and interviews. The participants were determined by purposive sampling and considered based on several criteria, namely; (1) students were categorized into field defender or field independent cognitive style, (2) students demonstrated good communication skills (based on the information from the teacher and field observations). The data analysis technique was carried out in three stages, namely data reduction, data presentation, and verification and drawing conclusions. The results showed that the students' errors were the highest in drawing conclusions for students with different types of cognitive styles. In contrast to the students with the field defender cognitive style, the students with the field independent cognitive style did not make any reading errors, while one of the students with the field dependent cognitive style still made reading errors. The reasons of these errors in general were the student's habit, in which they did not write the solution to the problem being asked, conduct the process thoroughly, understand the problem situation, and do exercises, especially about the form of the story.
Keywords: Cognitive Style; Error; Newman Procedure; Trigonometry.

I. INTRODUCTION

Maths is essential in everyday life. Almost every activity of human life requires mathematics skills. For that reason, it becomes one of the compulsory subjects given at every level of education. But in reality, most students consider mathematics a difficult subject to understand. This occurs because mathematics contains abstract basic objects, namely facts, concepts, operations, and principles. Soejadi (2000) argued that in mathematics, the basic objects studied were abstract, often also called mental objects, so that learning mathematics was not observable objects that could be immediately identified by human senses. This is why mathematics is not easy to learn, and in the end many students conclude that mathematics is a difficult subject to learn.

Based on the interviews with several high school students, the most difficult mathematics topic was trigonometry. It was supported by Blackett & Tall, 1991 in Keith Weber (2005: 91), the initial stages of learning about trigonometric functions are fraught with difficulty (Fauziah & Puspitasari, 2022). Furthermore, Gur (2009) stated that Trigonometry is an area of mathematics that students believe to be particularly difficult and abstract compared with the other subjects of mathematics.

Sirait and Purba (2017) suggested that the low ability to solve problems in trigonometry lesson was a problem in learning mathematics. A study by Wulandari and Gusteti (2020) revealed that concept errors (86.96% of students), principle errors (43.48% of students) and algorithm errors (30.43% of students). The main reason of the students' errors was insufficient of the students' comprehension of trigonometry. Furthermore, Cahyani and Aini (2021) explained that the cause of students making incorrect procedure errors was a lack of understanding of the concepts to solve problems and an inadequate understanding on how to compose the process of solving steps. The main factor of missing data errors was due to lack of accuracy in presenting the data that should be used. Missing conclusion errors were influenced by inability to associate previously known/obtained data to draw a conclusion. Last, skill hierarchy problem errors were affected by the students' inaccuracy of the calculating process (Rohmawati & Afriansyah, 2022).

Trigonometry is closely related to everyday life such as measuring an angle, measuring the height of an object, calculating the distance between two objects, calculating the depth of the sea, and so on. Insani and Kadarisma (2020) revealed that trigonometry was useful for students in higher education because trigonometry was not only taught in mathematics department but also taught in other branches of science such as engineering, chemistry, geography, physics and others.

Considering the high frequency of errors made by students in solving trigonometric problems, it is necessary to resolve problems by analysing various errors that students often make in solving the problems given. The analysis will present the material which has not been mastered by students and feedbacks for teachers to conduct revision to minimize student errors, with the intent that the learning

p-ISSN: 2086-4280
e-ISSN: 2527-8827

process becomes more meaningful. Regarding the issue, Newman procedure could be employed to analyse the error. Karnasih (2015) argued that Newman's Error Analysis provided a framework to determine the underlying reasons of the students' difficulties experienced in solving mathematical story problems and it was a process that helped teachers determine the misconceptions. In addition, it also provided clues for teachers to direct effective teaching strategies to overcome student difficulties.

Jha (2012) explained that there were five stages of analysis according to Newman, namely: reading errors, comprehension errors, transformation errors, processing skill errors, and endcoding errors. By using these five stages, the errors made by students in solving trigonometry problems will be revealed.

Concerning the unique characteristics of each student, in conducting the analysis, it is necessary to pay attention to the situation and conditions of the students. Diverse student background can be classified based on different student abilities. By understanding students' characteristics, teachers may be able to apply appropriate and effective learning strategies, models and methods in achieving the desired learning objectives. Besides. the cognitive style of students is also a determining factor. Cognitive style is a term used in cognitive psychology to describe how people think, understand, and recall information. Fadiana (2016) suggested that cognitive style was an important variable that affected the choice of teachers and students in the academic setting, the progress of the academic development, the conduct of the learning process, and the interaction in the classroom. Both teachers and students showed different approaches in acquiring or providing the lesson, according to their cognitive styles. Lusiana (2017) explains that cognitive style was distinguished based on psychological differences namely field independence (FI) and field dependence (FD). Field independence is a cognitive style of an individual with a high level of independence to observe an information independently without relying on the teacher. Meanwhile, field dependence (FD) is a cognitive style of an individual who is generally very dependent on the source of information from the teacher. The difference between the two cognitive styles is the dependence level of the students on the teacher's explanation which causes different errors, especially in solving maths problems.

Based on the description above, trigonometry was considered a difficult subject to understand, resulting in various errors in the process of problem solving. By using Newman's error analysis, it was expected that the error would be clearly visible. There were different characteristics of cognitive styles and new learning habits of students. Teachers might prepare some solutions to minimize the errors made by students in solving problems, especially in the trigonometry lesson. Therefore, this study was necessary to analyse students' errors in solving trigonometry problems using Newman's procedure based on cognitive styles.

II. METHOD

This study utilized descriptive qualitative to describe the students' errors in solving trigonometry problems based on the students' cognitive style. In addition, the study was also supported by some quantitative calculations to state the data of the test results of the participants. This study aimed to understand a phenomenon experienced by the participants by describing or narrating the findings in the setting. The numerical description aimed to describe the types of errors of the students with two different categories in solving trigonometric problems in story form.

The participants of the study were selected through a cognitive style test using the GEFT test which was tested to all students of class XI MIPA 4. From the test results, the students were grouped based on the cognitive style of field dependent (FD) and Independent (FI). There were 3 students for each cognitive style (Table 1).

Table 1.
The participants of the study

Ss code	Total score	Cognitive style
S-1	2	FD
S-4	5	FD
S-8	8	FD
S-10	10	FI
S-12	14	FI
S-13	16	FI

The rationale underlying the selection of the participants were, namely: (1) students were in the category of field dependent or field Independent, this study chose a total score of different students based on their cognitive style, both cognitive styles selected based on low, medium, and high levels of each different cognitive style, (2) students could communicate well based on the teacher's opinion and observations during the GEFT test took place.

III. RESULT AND DISCUSSION

The data of the study were presented in Table 2.

Table 2.
The students' errors based on Newman procedure

Jenis Kesalahan	Nomor Soal				Jumlah	Persen	Tingkat Kesalahan
	1	2	3	4			
Membaca	0	1	0	0	1	1,538	Sangat Rendah
Memahami	6	5	3	4	18	27,692	Rendah
Transformasi	1	3	0	0	4	6,154	Sangat Rendah
Kemampuan Memproses	5	6	5	3	19	29,231	Rendah
Penulisan Jawaban Akhir	5	6	6	6	23	35,385	Rendah
Jumlah	17	21	14	13	65	100	

Based on Table 2, the highest number of errors dealt with final answer writing covering 35,385%, followed by processing errors yaitu 29,692%, understanding errors 27.692%, transformation errors 6.154%, and the lowest percentage of errors in reading 1.538% with a classification at a low and very low level. In previous studies, students still learned face to face, directly with the teacher. Accordingly, due to different learning method, the students became more apathetic in learning. In the online learning, teachers occasionally conduct explanations through video conference applications such as Zoom meet and Google meet. The rest of the lesson was the delivery of the material in the form of documents, learning recommendation videos, and even just daily assignments. As a result of this new learning habit, the students were not motivated to explore the lesson by themselves. In general, they would probably accept what was explained by the teacher, which was insufficient. In addition, this also occurred because the students

p-ISSN: 2086-4280
e-ISSN: 2527-8827

did not comprehend the previous material very well, which was the barrier to learn the next lesson.

The result of the students' problem resolution based on their cognitive style.

Table 3.
The students' errors based on Newman procedure based on cognitive style

Jenis Kesalahan	Jenis Gaya Kognitif				Jumlah	Persen	Tingkat Kesalahan
	FD	%	FI	%			
Membaca	1	2,857	0	0	1	1,538	Sangat Rendah
Memahami	8	22,857	10	33,333	18	27,692	Rendah
Transformasi	3	8,571	1	3,333	4	6,154	Sangat Rendah
Kemampuan Memproses	11	31,429	8	27,667	19	29,231	Rendah
Penulisan Jawaban Akhir	12	34,286	11	36,667	23	35,385	Rendah
Jumlah	35	100	30	100	65	100	

According to Table 3. The study pointed out that the large percentage for each type of students' error in solving trigonometry problems in terms of cognitive style as a whole in each type of error based on Newman's procedure was at a level between low and very low. The finding showed that the highest frequency error made by FD and FI participants was the same, namely the error of writing the final answer. Despite a large percentage difference of 2.381%, both groups were not accustomed to writing the final answer in accordance with the context of the problem. Accordingly, even though the results were correct, students could not write the final answer in accurate sentences that were appropriate with the question.

The samples of trigonometry test questions and answers from each cognitive style of students and the types of errors were presented in the picture as follows:

A security guard with a height of 180 cm is observing a multi-purpose building with an elevation angle of 30°. If the distance between the officer and the building is 30 m, determine:
a. The problem illustration and write down the given and asked elements!
b. Calculate the height of the building!
c. Draw the correct conclusion from the answer!

Figure 1. The trigonometry problem

From the problems given, students with field dependent cognitive style (FD) gave the following answers:

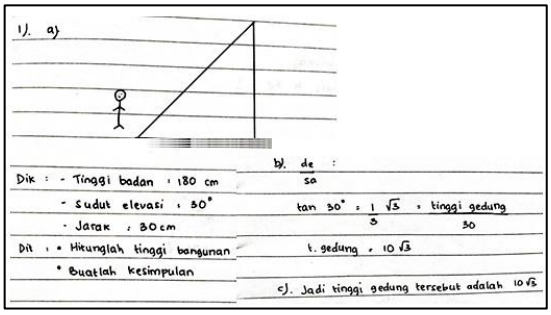

Figure 2. The sample answer of FD participant

Based on the student answers in Figure 2, FD student could not illustrate the problem well. This indicated that the student did not understand the situation in the problem. In addition, in the illustration made, there was no needed information that should have been written. Even though students wrote the given and asked information in problems 1a-1c. Besides, the participants wrote the possible concept by tangent comparison. The participant wrote $\frac{de}{sa}$ usually used to recall tangent. It meant that the students had conducted the transformation process correctly, followed by processing, namely calculating. However, the student assumed that the process was complete, but the participant should have added some information regarding the height of the security guard.

Therefore, the conclusion was incorrect because of unfinished process of the previous stage.

The students with independent field cognitive style (FI) gave the following answers:

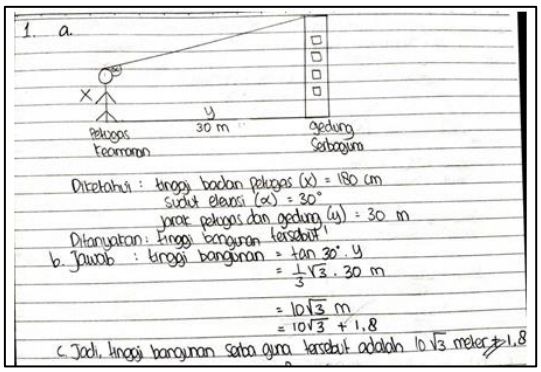

Figure 3. The sample answer of FI participant

FI student were able to write an image representation of the problem correctly. This indicated that the student understood the situation in the problem. However, the student focused on 1b very much that he somehow missed the information of numbers 1a-1c. S-13 forgot writting what was asked in questions 1a and 1c. Furthermore, the participant performed the transformation stage correctly using tangent comparison, followed by processing in the form of calculations and the final result was added to the security guard's height. Thus, F1 Students were able to write the final answer conclusion correctly.

From the results of the analysis of errors in solving trigonometry problems using Newman's procedure based on the cognitive style of students, the study discovered errors as follows:

A. Reading Errors

Reading errors were made by students with FD cognitive style. This error was discovered through the results of the analysis of student answers and the interview process, students incorrectly mentioned the symbol of an angle. After further investigation, the student did not know more about the angle symbols, only knew the symbols that were used frequently by the teacher. This was in line with the results of the study by Farida, Qohar, and Rahardjo (2021), stating that reading errors were provoked by the lack of students' mathematical literacy habits and caused errors in the pronunciation of mathematical symbols. Likewise, according to Lusiana (2017), the students with field dependent cognitive styles tended to have low learning awareness. However, other participants, especially subjects with FD cognitive style, did not demonstrate a lot of reading errors. This might occur due to the new learning atmosphere during the pandemic when learning, which was in line with the research of Dewi and Kartini (2021) arguing that reading errors were the lowest in frequency compared to other errors because they were influenced by the students' learning styles at that time. Errors made by one of the FD cognitive style participants were in line with the study by Oktaviana (2017) implying that reading errors occured when the students did not recognize the important information in the problem. However, the participants with FI cognitive style did not make reading errors because in general the FI participants usually explored or even asked some information that they did not understand yet. In addition, Mulyani and Muhtadi (2019) also found there were no reading errors on the students' problem-solving process.

p-ISSN: 2086-4280
e-ISSN: 2527-8827

The strategy to minimize reading errors were: Teachers should frequently provide examples of how to mention mathematical symbols, instruct students to find out the meaning and pronunciation of terms and of symbols related to teaching materials, and students were encouraged to independently find out the pronunciation and meaning of terms regarding symbols that were not yet known.

B. Comprehension errors

Comprehension errors made by both FD cognitive style and FI cognitive style were demonstrated by the incomplete writing of the information asked. Students only wrote the information to resolve, whereas it was obvious that the question asked more information. This occurred due to the participants' habit that rarely or even never wrote the given and asked information of the problem. However, after further investigation through interviews, the four participants understood what the question meant, but they did not write the information asked completely. From the description of the discussion regarding comprehension errors made by the participants, it was in line with Novianti and Riajanto (2021) that students did not write down the information that has been obtained from the problem or better known as what was given and what was asked in the problem, which emerged new errors in the next stage of solving, especially in determining how to solve the problem. This was also in line with the study by Rahmawati and Zhanty (2019) which stated that students' errors in answering questions occurred due to the inaccurate process of interpreting the information provided into sentences or mathematical symbols. Even though the information was known, asked, and illustrated was the main point of the problem.

The solutions to minimize understanding errors were: Teachers provided examples and exercises of various type of problems, one of which was story problems, encourage the habit of writing given and asked information in the story problems, and guide students to illustrate problems that required more real situations.

C. Transformation errors

During the interview, it was found that the cause of the error was that they considered the problem involving travelling time difficult. In addition, one of the participants thought there was missing information so that he could not find concepts that could be used to solve the problem as the form of the problem was not common. So, even though the participants understood the situation of the problem, it did not necessarily mean that the participants were able to find the concept.

Even though the participants understood the problem, they were not able to determine the method. This was also in line with Magfirah et al (2019) which found that the transformation error occured because the participants could not determine or choose the appropriate formula to the problem. Even though the formula or concept written before was correct, they were not sure which caused the error.

The solutions to minimize transformation errors were: Teachers

provided examples and practice of non-routine story problems, gave more emphasis on the main concept, and Teachers and students collaborated to find other ways of problem-solving with the correct implementation of the main concept.

D. Process Skill Errors

The participants were too focused on the tangent concept and did not pay attention to the situation in the context of the problem However, there were other participants who made mistakes because they miscalculated the results containing roots. This happened because students did not carefully check the entire answer.

The solutions to minimize process skill errors were: The teacher reminded the steps of problem-solving starting from identifying to checking the answer again, provided direct learning from various examples, and practiced problems to be more trained, and students must diligently practice problems related to the teaching material.

E. Encoding errors

Regarding the various reasons by the participants in encoding the final answer, the study found the following causes: the habit they rarely wrote the final answer or conclusion in accordance with the information in the problem, not being able to make conclusions from the results of processing the answers, and errors in the previous stages. Therefore, it was necessary to encourage the students to write the final answer, especially in making conclusions that fit the context in the story problem.

The solutions to minimize encoding errors were that teachers encouraged students to write the final answer in the form of a conclusion sentence, especially in story problems, and students must write the final answer according to the context of the problem.

IV. CONCLUSION

Based on the results of analysis and discussion of the students' errors in solving trigonometry problems based on Newman's procedure in terms of cognitive style, the study concluded that: Types of errors made by students in solving trigonometry problems consist of: (1) reading errors, students did not find out the pronunciation of symbols that were not yet known, (2) comprehension errors, students were familiar to the writing steps of the given and asked information even though it was clearly requested in the problem, (3) transformation errors, students were not able to determine the concepts to solve problems because they rarely practiced to solve problems, (4) process skill answers, students were not able to further process the problem, complete the calculation operation, or perform the calculation process incorrectly, (5) encoding errors, students were not familiar to writing the conclusions in accordance with the context of the problem; they stopped at the calculation results. However, of the five errors made by both categories of cognitive styles, only one student made a reading error. This was affected by the way each student learned, some were assisted by private lessons, high curiosity, different learning awareness and some happen to excel in their class.

The students with FD cognitive style generally made mistakes at all stages of

p-ISSN: 2086-4280
e-ISSN: 2527-8827

Newman's procedure, whereas students with FI cognitive style did not make mistakes in the first stage, namely reading errors, but in other stages. The main reasons of the errors were: (1) the students considered trigonometry difficult as it involved angles, (2) the students were not familiar with non-routine trigonometry story problems, (3) the students lacked practice in trigonometry problems, (4) new learning habits (the learning took place online-offline where time was limited).

Overall, to address the causes of the students' errors in solving problems, especially in the trigonometry lesson, it was necessary for the teacher to guide and encourage the student to minimize the students' errors by choosing appropriate learning strategies in teaching the material. In addition, the role of student awareness itself was also very necessary. Beside the teacher, the students and teacher also might collaborate to develop their skills, and avoid making errors in the future.

BIBLIOGRAPHY

Cahyani, A., & Aini, I., N. (2021). Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Trigonometri Berdasarkan Kriteria Watson. *Jurnal Pembelajaran Matematika Inovatif, 4*(2).

Dewi, S., & Kartini, K. (2021). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Sistem Persamaan Linear Tiga Variabel Berdasarkan Prosedur Kesalahan Newman. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 5*(1), 632-642.

Fadiana, M. (2016). Perbedaan kemampuan menyelesaikan soal cerita antara siswa bergaya kognitif reflektif dan impulsif. *JRAMathEdu (Journal of Research and Advances in Mathematics Education), 1*(1), 79–89.

Farida, R. N., Qohar, A., & Rahardjo, S. (2021). Analisis Kemampuan Literasi Matematis Siswa SMA Kelas X dalam Menyelesaikan Soal Tipe Pisa Konten Change and Relationship. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 5*(3), 2802-2815.

Fauziah, R., & Puspitasari, N. (2022). Kesulitan Belajar Matematika Siswa SMA pada Pokok Bahasan Persamaan Trigonometri di Kampung Pasanggrahan. *Plusminus: Jurnal Pendidikan Matematika*, *2*(2), 325-334. https://doi.org/10.31980/plusminus.v2i2.1876

Gur, H. (2009.) Trigonometry Learning. *New Horizons in Education*, *57*(1), 67-80.

Insani, M. I., & Kadarisma, G. (2020). Analisis Epistemological Obstacle Siswa SMA Pada Materi Trigonometri. *Jurnal Pembelajaran Matematika Inovatif, 3*(5).

Jha, S. K. (2012). Mathematics Performance of Primary School Students in Assam (India): an Analysis Using Newman Procedure. *International Journal of Computer Applications in Engineering Sciences 2, 2*(1), 17–21.

Karnasih, I. (2015). Analisis Kesalahan Newman Pada Soal Cerita Matematis (Newman's Error Analysis In Mathematical Word Problems). *Paradikma: Jurnal Pendidikan Matematika*, *8*(1), 37-51.

Keith, W. (2005). Student· Understanding of Trigonometric Functions. *Mathematics Education Research Journal, 17*(3), 91-112.

Lusiana, R. (2017). Analisis kesalahan Mahasiswa dalam memecahkan masalah pada materi himpunan ditinjau dari gaya kognitif. *JPPM (Jurnal Penelitian dan Pembelajaran Matematika), 10*(1).

Magfirah, M., E., & Suryawati. (2019). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Matematika Berdasarkan Prosedur Newman. *Lentera Sriwijaya: Jurnal Ilmiah Pendidikan Matematika, 1*(2), 1–12.

Mulyani, M., & Muhtadi, D. (2019). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Trigonometri Tipe Higher Order Thinking Skill Ditinjau dari Gender. *Jurnal Penelitian dan Pembelajaran Matematika, 12*(1).

Novianti, V. & Riajanto, M. L. E. J. (2021), Analisis Kesulitan Siswa SMK dalam Menyelesaikan Soal Materi Trigonometri. *Jurnal Pembelajaran Matematika Inovatif*, *4*(1).

Oktaviana, D. (2017). Analisis Tipe Kesalahan Berdasarkan Teori Newman dalam Menyelesaikan Soal Cerita pada Mata Kuliah Matematika Diskrit. *EduSains: Jurnal Pendidikan Sains & Matematika, 5*(2), 22–32.

Rahmawati, C., & Zhanty, L. S. (2019). Analisis Kemamampuan Komunikasi Siswa Menengah Terhadap Resiliensi Matematis. *JPMI (Jurnal Pembelajaran Matematika Inovatif), 2*(3), 147 - 154.

Rohmawati, E., & Afriansyah, E. A. (2022). Kemampuan Abstraksi Matematis Siswa Ditinjau Dari Perbedaan Gender. *Jurnal Kongruen*, *1*(4), 379-405.

Sirait, S. & Purba, O. (2017). Peningkatan Kemampuan Pemecahan Masalah pada Materi Trigonometri dengan Model LAPS-Heuristic pada kelas X SMA Shafiyyatul Amaliyah. *Prosiding Seminar Nasional Multidisiplin Ilmu UNA 2017*. ISBN 978-6025039-1-4.

Soedjadi, R. (2000). *Kiat Pendidikan Matematika di Indonesia*. Jakarta: Dirjen Dikti Depdiknas.

Wulandari, S., & Gusteti, M. U. (2020). Analisis Kesalahan Menyelesaikan Soal Trigonometri Siswa Kelas X SMA. Math Educa Journal. *Jurnal Matematika dan Pendidikan Matematika, 4*(1), 64-80.

RIWAYAT HIDUP PENULIS

Dr. Rostina Sundayana, M.Pd.

Born in Garut, on December 28, 1966. Lecturer in PNS DPK at the Garut Indonesian Institute of Education. Study S1 Mathematics Education IKIP Bandung, graduated in 1992; Master's Degree in PKLH, Siliwangi University, Tasikmalaya, graduated in 2009; Masters in Mathematics Education UPI, Bandung, graduated in 2012; and UPI Mathematics Education Doctoral Program, Bandung, graduated in 2018.

Cindy Elsa Parani, S.Pd.

Born in Garut, May 16, 2000. Studying S1 Mathematics Education Garut Indonesian Institute of Education, graduating in 2022.