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Analysis of student errors based on newman's error analysis in terms of gender

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Abstract: This research was conducted so that educators can find out the location of student errors. In addition to these factors, there are many other factors that influence student errors in answering math story questions, one of which is the gender factor. The analysis used to find out what types of mistakes students made, here the researcher uses Newman's procedure. The type of research used in this research is descriptive qualitative research. The research subjects were 31 students of class XI Madrasah Aliyah for the test. Then in the interview 6 subjects (3 women and 3 men) were taken representing each category of high, medium, low for interviews. Subjects were selected through a short test given by the researcher, the results of the previous test scores and discussion with the Mathematics Teacher of the class. The results of the study showed that female students made more mistakes in the completion process error indicator. Then in the male category, they made more mistakes in the final answer writing indicator. When viewed from the many types of errors of male and female students, a conclusion can be drawn that male subjects are slightly superior in solving math problems than female subjects. This is because men have better mechanical and mathematical abilities but women are also more effective in terms of accuracy and accuracy in solving mathematical problems.

Keywords: Error analysis, story problems, arithmetic sequences and series, gender.

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Introduction

Mathematics is one of the fundamental fields of science that underlies current technological advancements. Therefore, mathematics should be taught to all students. It is hoped that this learning method will enable students to develop the ability to think logically, analytically, systematically, critically, creatively, and collaboratively (Jamal, 2018). This aims to equip students with the skills to apply mathematics in their everyday lives. Students' understanding of mathematics itself will be well formed if they gain a more direct understanding of mathematics learning (Ariawan, 2021). In a mathematics learning process, student understanding can be measured by asking questions to assess the learning process. One type of question that can be used to assess students' mathematical abilities is the story problem (Suratih & Pujiastuti, 2020).

Story questions are widely used to assess students' skills in solving problems related to the real world (Darmawan, 2018). From this problem, students can transform it into a mathematical concept in the form of text or mathematical symbols. When solving mathematical story problems, it is crucial that students can understand the problem given in a lesson to identify what the object of mathematics is and relate it to mathematical concepts, so that students can draw conclusions based on what has been analyzed previously (Suratih & Pujiastuti, 2020). There are many mathematical materials that can be used and are important for training students' skills in solving problems. One of the important materials for measuring students' skills in solving a problem is the material on number series and sequences, also known as arithmetic sequences and series.

One aspect of mathematical literature that is considered challenging is the material on arithmetic sequences and series. Hariyomurti et al. (2020) and Silaban et al. (2022) stated that most students still have difficulty understanding this material. In research by Annisa & Kartini (2021), it was found that students made many errors in the transformation process (Transformation Error) as much as 35% and in the process skills (Process Skill Error) as much as 45%. Based on research by Sastri (2019), it was also stated that student learning outcomes in arithmetic sequence and series material were quite low. This also occurred in one of the high schools that will be studied, where students still had difficulty solving arithmetic sequence and series problems.

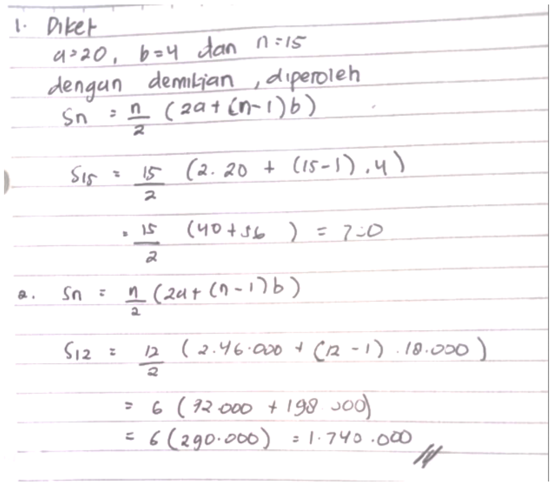
1. Diket
a=20, b=4 dan n=15
dengan demikian, diperoleh
$S_n = \frac{n}{2}(2a+(n-1)b)$
$S_{15} = \frac{15}{2}(2.20 + (15-1).4)$
$= \frac{15}{2}(40+56) = 720$
2. $S_n = \frac{n}{2}(2a+(n-1)b)$
$S_{12} = \frac{12}{2}(2.46.000 + (12-1).18.000)$
$= 6(92.000 + 198.000)$
$= 6(290.000) = 1.740.000$

Figure 1. Short test answers

Students' difficulties in solving arithmetic sequence and series word problems were demonstrated by a short test conducted by the author. This test revealed that a significant number of students still made mistakes. In the process of working on word problems, the success rate was 45%, and the difficulty in converting word problems into mathematical form was 40%. An interview with a teacher at a state high school in Kediri indicated that 40% of students scored below the passing grade on daily exams. According to the teacher, many students made mistakes when converting word problems into mathematical form and during the calculation process. This shows that there are still many errors in solving word problems related to arithmetic sequences and series.

Therefore, it is necessary to find solutions to this problem, one of which is by analyzing students' difficulties in solving word problems on arithmetic sequences and series. According to Diniati (2021), students make mistakes because their competence in problem-solving is lacking, leading to low problem-solving abilities. This can be improved by analyzing these errors to identify where the most common mistakes occur in the mathematical solving process. Teachers can assist students by pointing out common mistakes, thereby minimizing errors when solving arithmetic sequence and series problems (Jamal, 2018). This research was conducted to help educators identify where students' mistakes are occurring. Besides these factors, there are many other influences on students' errors in answering math word problems, one of which is gender.

Gender is used to analyze differences between men and women from a non-biological perspective. Some researchers believe that there is a gender effect in mathematical analysis due to biological differences in the brains of boys and girls, as evidenced by research (Arbain et al., 2017). Gender differences in problem-solving skills have been studied as affective and cognitive predictors of mathematics achievement (Risma Rintias, 2018). These differences show that men and women face distinct challenges in problem-solving (Siswandi, Sujadi, & Riyadi, 2016). Considering the different difficulties faced by male and female students, it is likely that this will affect their ability to solve problems when they work on questions. Therefore, the errors made by both male and female students require further research to determine the location of these errors. This solution involves analyzing student errors in arithmetic sequence and series material in terms of gender.

One way to analyze errors is to use Newman's theory. Newman's Error Analysis (NEA) is designed as a simple diagnostic procedure for solving mathematical word problems (Octaviana, 2018). According to Anne Newman, as cited in Diniati (2021), the steps used in analyzing errors include five categories: reading errors, comprehension errors, transformation errors, processing errors, and errors in writing the final answer.

Several studies have been conducted on the analysis of students' errors in solving word problems based on Newman's Error Analysis (Suratih & Pujiastuti, 2020; Darmawan, 2018; Oktaviana, 2018; Jamal, 2018), which discuss error analysis in specific materials. However, no research has focused on error analysis in sequence and series material in terms of gender using NEA. For this reason, the author conducted a study entitled "Analysis of Students' Errors in Solving Arithmetic Sequence and Series Word Problems Based on Newman's Error Analysis in Terms of Gender." Thus, this research aims to identify the types of errors male and female students make in solving word problems on arithmetic sequences and series based on Newman's Error Analysis.

Method

This research employs a descriptive methodology with a qualitative approach, utilizing qualitative data explained descriptively. Data collection techniques included tests and interviews. To identify students' mistakes in solving story problems, a test consisting of three essay questions on Arithmetic Sequences and Series was used. These questions were validated by two mathematics teachers and a Master of Mathematics Education lecturer. Additionally, a semi-structured interview technique was employed to ascertain the nature and causes of the errors made by students in answering the questions. The interview questions were tailored to the circumstances and results of each subject's test sheet.

Anne Newman suggests five stages to help identify where students make mistakes in solving mathematical problems. These stages are Reading Error, Comprehension Error, Transformation Error, Process Skill Error, and Encoding Error (Clements, 1980). To systematically identify the types of student errors, indicators corresponding to this classification were adapted from Mansur & Subanji (2021) as follows.

Table 1. Research error indicators

Types of errors	Error indicator
Reading error (Reading Error)	Students do not understand the symbols, words and terms contained in the questions
Misunderstanding (Comprehension Error)	1) Students cannot write down everything they know and are asked about in the questions 2) Students write incorrectly what they know and are asked about in the question 3) Students do not write down what they know and are asked about the questions.
Transformation Error (Transformation Error)	1) Students cannot change the information in the problem into a mathematical model 2) Students cannot determine which operations to use for solve the problem 3) Students are wrong in determining the operations used for problem solving
Resolution Process Error (Process Skill Error)	1) Students cannot continue the completion process 2) Students can continue the completion process but it is not appropriate 3) Students can continue the solution process but make mistakes in the calculations

Types of errors	Error indicator
Final Answer Writing Mistakes (Encoding Error)	1) Students cannot determine the final answer from solving the problem 2) Students can determine the final answer from solving the problem but it is not correct 3) Students can determine the final answer but are less able to write the final answer to solve the problem

This research was conducted at Madrasah Aliyah Negeri in Kediri on Arithmetic Sequences and Series material during the 2022/2023 even semester academic year. Data sources were drawn from two aspects: students' answers to story test questions and interviews regarding the causes of errors encountered by students in solving these questions. Data collection techniques included tests and interviews. During the interviews, six selected students were asked various questions about their reasons for answering the test questions as indicated on their answer sheets. These six students consisted of 2 high-ability students (one male and one female), 2 medium-ability students (one male and one female), and 2 low-ability students (one male and one female). This distribution of abilities was determined through discussions between the researcher and the class mathematics teacher, students' scores on previous exams, and the results of short tests administered by the researcher. The categorization and related information are provided below.

Table 2. Participant category coding information

Category	Information
SPKT	Higher Category Female Students
SLKT	High Category Male Students
SPKS	Medium Category Female Students
SLKS	Medium Category Male Students
SPKR	Low Category Female Students
SLKR	Low Category Male Students

Checking the validity of the data in this study used triangulation. Data analysis techniques use data reduction, data presentation and drawing conclusions (Chevallard & Bosch, 2020).

The percentage of conceptual errors in each indicator can be calculated using the following formula:

$$P_j = \frac{\sum N_{ij}}{K_j \, x \, N} \, x \, 100\% \quad \text{(Sugiyono, 2017)}$$

Information:
P_j = Percentage of jth concept errors
K_j = A lotitem for the jth concept
N_{ij} = Number of students who answered the ith item incorrectly in the jth concept
N = Number of respondents

The test sheet used is a description test on sequence and arithmetic series material which will be consulted with the validation team (expert lecturer). After the researcher carries out validation, it can be concluded that the test has met the validity of the items because it is in accordance with the basic competencies and characteristics of the questions.

Results and Discussion

Analysis of each type of student error

Based on the results of the tests administered to students, several errors were identified in their answers to each question. To determine the percentage of student achievement for each indicator, refer to the following table.

Table 3. Student test results for each indicator

No	Indicators of Competence Achievement	Students who answered correctly	Percentage
1	Explains the concept of arithmetic series and the number of arithmetic nth terms	28	96.55 %
2	Develop the concept of arithmetic series and the number of nth arithmetic terms	13	44.82 %
3	Forming the concept of arithmetic sequence and series to present and solve contextual problems related to other material	0	0 %

Based on Table 1, it's evident that none of the students achieved a 100% correct response rate for any indicator of competency achievement and cognitive level in the material on sequences and arithmetic series. In question 3, the percentage of students who answered correctly was 0%, indicating that none of the students answered question 3 correctly. For questions 1 and 2, the percentages were 96.55% and 44.82% respectively. It can be inferred from the percentage of question 1 that students still made errors in answering arithmetic sequences and series questions. Similarly, the relatively low percentage for question 2 suggests that many mistakes were made by students in answering arithmetic sequences and series questions. The overall percentage of each error for the three questions made by 29 students is presented in the table below.

Table 4. Percentage of each error for all questions

No	Error Type	Percentage	Category
1	Reading Error (Reading Error)	24.13%	Low
2	Misunderstanding the Problem (Comprehension Error)	33.34%	Low
3	Transformation Error	43.67%	Enough
4	Completion Process Error (Process Skill Error)	44.82%	Enough
5	Final Answer Writing Error (Encoding Error)	54.02%	Enough

From Table 2, calculations using the formula by Sugiyono reveal that errors in writing final answers are the most frequently occurring errors among students, accounting for 54.02%, followed by completion process errors at 44.82% and transformation errors at 43.67%. On the other hand, errors in understanding the problem represent 33.34% of errors, while reading errors are the least common, at 24.13%.

Regarding the error presentation category, it was observed that reading errors and errors in understanding the problem fall into the low category. This implies that students are proficient in comprehending the problem statement and interpreting symbols and instructions. However, types of transformation errors, completion process errors, and errors in writing final answers are categorized as quite high. This suggests that students frequently make mistakes when applying mathematical models, utilizing formulas, executing operations, and drawing conclusions based on their results.

Category analysis of each type of male student error

The errors made by male students encompass all classifications of errors based on the Newman procedure. The research will discuss five classifications of errors, namely reading errors, comprehension errors, transformation errors, completion process errors, and errors in writing the final answer, which are outlined in the table below.

Table 5. Percentage of male students' errors for all questions

No	Error Type	Percentage	Category
1	Reading Error (Reading Error)	23.80 %	Low
2	Misunderstanding the Problem (Comprehension Error)	33.34%	Low
3	Transformation Error	42.85%	Enough
4	Completion Process Error (Process Skill Error)	47.61%	Enough
5	Final Answer Writing Error (Encoding Error)	47.61%	Enough

Based on Table, it was found that the most errors made by male students were errors in the completion process and errors in writing the final answer with the same percentage, namely 47.61%, included in the fairly high error category. The next most common error is transformation error with a percentage of 42.85%, which is in the quite high category. Errors in understanding the problem with a percentage of 33.34% are included in the low category, and errors with the lowest percentage are reading errors which have a percentage of 23.80% which is included in the low category. Male students made quite a lot of errors in transformation errors, completion process errors, and errors in writing final answers.

Category analysis of each type of error by female students

The errors made by male students encompass all classifications of errors based on the Newman procedure. The research will discuss five classifications of errors, namely reading errors, comprehension errors, transformation errors, completion process errors, and errors in writing the final answer, which are outlined in the table below.

Table 6. Percentage of female students' errors for all questions

No	Error Type	Percentage	Category
1	Reading Error (Reading Error)	24.24%	Low
2	Misunderstanding the Problem (Comprehension Error)	33.34%	Low
3	Transformation Error	43.93%	Enough
4	Completion Process Error (Process Skill Error)	43.93%	Enough
5	Final Answer Writing Error (Encoding Error)	56.06%	Enough

Based on Table 4, it was observed that the most common errors made by female students were errors in writing final answers, accounting for 56.06% and falling into the fairly high error category. Following this, transformation errors and completion process errors were equally prevalent, both at 43.93%, categorizing them as quite high errors. Errors in understanding the problem constituted 33.34% of errors and were categorized as low, while reading errors had the lowest percentage at 24.24%, also classified as low. This indicates that female students still make a considerable number of mistakes in the areas of transformation errors, completion process errors, and errors in writing final answers.

This discussion is based on research data detailed in sub-chapter IV concerning errors made by subjects in solving story problems on arithmetic sequences and series, analyzed according to gender using Newman's Error Analysis procedure. It will be further discussed in alignment with the research focus, which centers on the types of errors made by male and female students in solving arithmetic sequences and series story problems based on Newman's Error Analysis.

Categories of each type of mistake by female students error

Reading error

Based on the described research data, it was observed that students encountered errors while working on arithmetic sequences and series story problems. The first type identified was reading errors, with a percentage of 24.24% among female students, categorized as low. This indicates that a few students misunderstood the symbols, words, and terms in the problem. During the researchers' interview process, most students demonstrated understanding of the words, terms, and objectives of the given questions. Based on this data, reading errors appear to be the least prevalent type of error compared to others. These findings align with Annisa's research, which similarly concluded that reading errors constituted the smallest percentage (Annisa & et al., 2023). In interviews with subjects, researchers found that one reason for students' errors falling into the low category in this study was their encounter with a similar type of question. Consequently, subjects became more familiar with the words, terms, and objectives contained in the learning material.

Comprehension error

In the case of comprehension errors, the percentage of errors among all female students is 33.34%, categorized as low. This finding aligns with Savitri's conclusion, which identifies Comprehension Error as a type of error with a low percentage (Savitri & Yuliani, 2020). An indicator of this error type is when students are unable to articulate what they know in response to the questions posed. This is also consistent with research by Suratih & Pujiastuti (2020), which suggests that errors in understanding can stem from students' inability to grasp keywords in the questions and failure to identify crucial information contained within them. In the interview findings, most subjects demonstrated the ability to articulate and elucidate their understanding of the questions. One reason for this proficiency among subjects was their exposure to similar types of questions prior to the study. However, subjects had only encountered these questions in reading exercises and had not yet progressed to solving them.

Transformation error

In the case of transformation errors, the overall percentage of errors among female students was 43.93%, classified as fairly high. These errors arise when students struggle to translate information from the problem into mathematical expressions and fail to identify which formula to apply in solving the problem. During the interviews, one subject mentioned that the inability to convert information from the problem into its mathematical form stemmed from a lack of understanding of the problem's mathematical representation. This observation is supported by Suciati & Wahyuni (2018), who assert that transformation errors occur when students struggle to process information from the problem into mathematical expressions. Similarly, Ferdiyanto & et al. (2021) suggest that transformation errors arise from students' inability to convert question data into a mathematical model. Consequently, students are unable to initiate the solution process because they lack comprehension of the mathematical form of the given problem.

Completion process error (process skill error)

In the process skills error category, the percentage of errors among all female students was 43.93%, categorized as quite high. The second most common mistake made by students occurs during the calculation process leading to the final result. If a student makes an error during this process, it is classified as a Process Skill Error. During the interviews, a subject mentioned that errors in the calculation process stemmed from inaccuracies rather than an inability to perform calculations. Annisa & Kartini (2021) also note that students' inaccuracies lead to errors in calculation operations. This aligns with the perspective of Annisa et al. (2023), who suggest that process skill errors occur when students fail to accurately execute procedures for numerical operations. Throughout the interviews, researchers found that errors in arithmetic operations were often due to students' lack of carefulness during the calculation process. Subjects felt that the allotted time was insufficient, and ultimately, they did not review their work. This observation resonates with research by Fatahillah et al. (2017), which attributes process skill errors to students' lack of attentiveness and proficiency in calculation.

Final answer writing error (encoding error)

An error in writing the final answer or what can be called an Encoding Error is an error caused by the subject incorrectly identifying/writing the correct conclusion as required in the question. In line with researchFatahillah et al, (2017), who stated that errors in writing final answers include errors in writing units, errors in not writing conclusions, and writing conclusions but not correctly. In the error analysis of all female students, the percentage of errors in writing the final answer was 56.06% in a fairly high category. This is in line with Siswandi, Sujadi, & Riyadi, (2016) who stated that the most common mistakes made were errors in determining the final answer. The cause of the subject making mistakes is that students forget to write conclusions based on what is asked in the question.

Categories of each type of male student error

Reading error

Based on the described research data, male students exhibited an error percentage of 23.80%, categorized as low. This indicates that only a few students misunderstood the symbols, words, and terms in the problems. During the interviews conducted by researchers with the subjects, many of them demonstrated understanding of the words, terms, and meanings of the questions. This observation is consistent with the findings of Salamah & Amelia (2020), who stated that reading errors occur when the subject fails to comprehend a word or sentence in the problem. Based on this data, reading errors among male subjects also represent the least prevalent type of error among other types. As noted in the research by Qodr & Ishartono (2022), the research subjects did not encounter significant obstacles related to reading errors. One reason for the infrequency of mistakes on this indicator could be that subjects already possess an understanding of the key words and sentences commonly found in arithmetic sequences and series problems.

Comprehension error

In the category of errors in understanding, the percentage of errors among all male students was 33.34%, falling into the low category. This suggests that while rare, some male students who were subjects of the research still made errors in understanding. One of the reasons for students' mistakes in the understanding process is their tendency to rush through the questions, resulting in incomplete comprehension of what is asked and what is known in the question. As noted in the research by Qodr & Ishartono (2022), students may make errors in understanding when they hurry to answer all the questions, leading to incomplete comprehension. Another cause of errors in the understanding indicator is incomplete writing, where students forget to jot down the information known and asked in the question. This finding aligns with the research by Jeharut & et al. (2019), which suggests that incomplete recording of known and asked information can lead to errors in understanding the question.

Transformation error

In the category of transformation errors, the overall percentage of errors among female students was 42.85%, falling into the fairly high category. These errors occur when students struggle to convert the information from the problem into its mathematical form and fail to understand which formula to use in solving the problem. During the interviews, one of the subjects explained that the reason they couldn't convert the information from the problem into its mathematical form was because they couldn't determine the appropriate formula for solving the problem. This statement is supported by Wahyuni (2018), who stated that transformation errors occur when students struggle to process the information in the problem into mathematical form. Similarly, Jeharut & et al. (2019) also stated that transformation errors occur when students cannot identify a formula that fits the problem.

Completion process error (process skill error)

In the category of process skills errors, the percentage of errors among all male students was 47.61%, falling into the quite high category. The most common mistakes occur during the calculation process when reaching the final result. Errors in this process, if made by a student, are classified as Process Skill Errors. This aligns with the findings of Jeharut & et al. (2019), who assert that errors in calculation operations lead to errors in the settlement process. During the interviews, subjects mentioned that errors in the calculation process were often due to inaccuracies and a perceived lack of time to check calculations thoroughly. Fahlevi & Zanthy (2021) also noted that men are more prone to being less thorough, rushing, and solving problems hastily.

Final answer writing error (encoding error)

An error in writing the final answer or what can be called an Encoding Error is an error caused by the subject being wrong/inaccurate in determining/writing the conclusion according to the problem in the question. In line withRahmawati et al, (2021) stated that errors in writing final answers were caused by students being less careful or inaccurate in writing the final results. In the error analysis of all male students, the percentage of errors in writing the final answer was 47.61% in the quite high category, which is the same number as the error indicator in the completion process with the highest percentage. This is in line with Siswandi et al., (2016), the error with the highest percentage is errors in writing the final answer. The cause of the subject making mistakes is that students forget or are incomplete in writing conclusions based on the problems in the question.

Causes of differences in mistakes made

The discussion regarding types of errors among women and men can be narrowed down to facilitate educators' focus. Among female students, more mistakes were observed in the completion process error indicator. Conversely, among male students, more mistakes were noted in writing the final answer. Considering the numerous types of errors made by both male and female students, it can be inferred that male students are slightly better at solving mathematical problems compared to female students. This inference is supported by the higher percentage of errors among female students compared to male students and qualitative data obtained during interviews with subjects.

These findings are consistent with research by Siswandi et al. (2016), which suggested that male subjects outperform female subjects in solving contextual mathematics problems. Similarly, Khasanah et al. (2020) found that men excel in reasoning and possess better mathematical and mechanical abilities compared to women. This supports the notion that boys exhibit stronger mathematical capabilities, while girls excel in other areas such as diligence, persistence, and thoroughness. Savitri & Yuliani (2020) also noted that male students make fewer mistakes compared to female students.

However, these findings contradict some expert opinions suggesting that male students make more mistakes than female students. This discrepancy may arise from difficulties encountered by male students during the learning process, such as understanding the questions and aligning conclusions with final results (Ferdiyanto et al., 2021). Additionally, research by Davita & Pujiastuti (2020) indicates that female students' problem-solving abilities in mathematics may surpass those of male students, attributed to their accuracy and attention to detail. Anggraeni & Herdiman (2018) also suggested that female subjects exhibit superior mathematical problem-solving abilities compared to male subjects, often due to better time management skills.

Therefore, while male students may excel in certain aspects of mathematical problem-solving, the performance of female students should not be underestimated, as they may exhibit strengths in accuracy, attention to detail, and time management.

Conclusion

The discussion regarding types of errors in women and men can be narrowed down to assist educators in focusing their attention more effectively. In the male category, they made more errors in the final answer writing indicator (Encoding Error). By examining the number of error types made by male and female students, it can be inferred that male subjects are slightly superior in solving mathematical problems compared to female subjects. This is attributed to men's better mechanics and mathematical skills. However, in the female category, they made more mistakes in the process skill error indicator (Process Skill Error). Despite men's superiority in mechanics and mathematics compared to women, women also exhibit effectiveness in precision and accuracy when solving mathematical problems. Based on the results of this research, the author provides several suggestions, which are summarized as follows: 1) For researchers, it is necessary to replicate the study in other schools with similar characteristics to the research location. Additionally, further research can be conducted on students from different schools, focusing on gender perspectives. This aims to validate whether the findings obtained by the researcher align with those of other studies. 2) For teachers, it is recommended to emphasize understanding the stages of problem-solving processes for male students, while for female students, the emphasis should be on determining the final answer and mastering the problem-solving process.

References

Achmad Gilang Fahrudhin, EZ (2018). Increasing Understanding of Mathematical Concepts Through Realistic Mathematic Education with the Help of Bongpas Teaching Aids. ANARGYA: Scientific Journal of Mathematics Education, 15-20.https://doi.org/10.24176/anargya.v1i1.2280

Anggraeni, R., & Herdiman, I. (2018). Middle School Students' Mathematical Problem Solving Ability on Circle Material in the Form of Contextual Questions Judging from Gender. Journal of Numeracy, Vol (5), 19-28.https://doi.org/10.46244/numeracy.v5i1.293

Annisa, R., & Kartini, K. (2021). Analysis of Student Errors in Solving Arithmetic Sequence and Series Problems Using Newman's Error Stages. Scholar's Journal: Journal of Mathematics Education, 5(1), 522–532. https://doi.org/10.31004/cendekia.v5i1.506

Annisa, Prayitno, S., Kurniati, N., & Amrullah. (2023). Analysis of Errors in Solving Mathematics Story Problems on Relationships and Functions Based on the Newman Procedure in View of Gender Differences in Class VIII Students of SMP Negeri 22 Mataram for the 2021/2022 Academic Year. Scientific Journal of the Education Profession, 323-334.10.29303/jipp.v8i1.1141

Arbain, J., Azizah, N., & Sari, IN (2017). Gender Thought According to Experts: Study of the Thoughts of Amina Wadud Muhsin, Asghar Ali Engineer, and Mansour Fakih. Sawwa: Journal of Gender Studies, 11(1), 75. https://doi.org/10.21580/sa.v11i1.1447

Ariawan, R. &. (2021). Mathematical Critical Thinking Ability in View from Cognitive Style (Case Study in Differential Equations Course. Scholar's Journal: Journal of Mathematics Education, 1410-1426.https://doi.org/10.31004/cendekia.v5i2.652

Arif Fatahillah, Yuli Fajar Wati NT, S. (2017). Analysis of Student Errors in Solving Mathematics Story Problems Based on Newman's Stages and the Scaffolding Forms Given. Kadikma, 8(1), 40–51.https://doi.org/10.19184/kdma.v8i1.5229

Arifin, Z. (2017). Development of an Instrument for Measuring Higher Order Thinking Skills in Mathematics for Class X High School Students. PTTHAGORAS: Journal of Mathematics Education, 98-108.10.21831/pg.v12i1.14058

Arsyad, R.b. (2019). Improving Mathematics Learning Outcomes Using the Cooperative Learning Model and Napier Technique for Class IV B Students at Muhammadiyah 2 Elementary School, Sorong City. Qalam: Journal of Educational Sciences, 465-466.10.33506/jq.v5i2.256.

Chevallard, Y., & Bosch, M. (2020). Didactic transposition in mathematics education. Encyclopedia of mathematics education, 214-218.

Clements, K. (1980). Analyzing Children's Errors on Written Mathematical Tasks. Educational Studies Mathematics, 1-21.

Connell, R. (2009). Short Introduction Gender. United Kingdom: Polity Press.

Darmawan, I., Kharismawati, A., Hendriana, H., & Purwasih, R. (2018). Analysis of Junior High School Students' Mistakes Based on Newman in Solving Mathematical Critical Thinking Ability Questions on Flat Side Shaped Material. JURING (Journal for Research in Mathematics Learning), 1(1), 71. https://doi.org/10.24014/juring.v1i1.4912

Davita, & Pujiastuti, H. (2020). Analysis of Mathematical Problem Solving Ability in View of Gender. Kreano: Journal of Creative-Innovative Mathematics, 111-117.https://doi.org/10.15294/kreano.v11i1.23601

Diniati, AW (2021). Analysis of Student Errors in Solving Story Problems on Systems of Linear Equations in Two Variables Based on Newman's Stages. https://eprints.umm.ac.id/77294/

Fahlevi, MS, & Zanthy, LS (2021). Analysis of Student Mistakes in Solving Space Building Material Questions Based on Watson's Criteria in View of Gender Differences in Class VIII Middle School Students. JPMI: Journal of Innovative Mathematics Learning, Vol (4), 709-718.https://doi.org/10.22460/jpmi.v4i3.p%25p

Fatahillah, A., & Wati, YF (2017). Analysis of Student Errors in Solving Mathematics Story Problems Based on Newman's Stages and the SCAFFOLDING Forms Given. Kadikma, Vol(8), 40-51.https://doi.org/10.19184/kdma.v8i1.5229

Ferdiyanto, A., Kusmaryono, I., & Maharani, HR (2021). Analysis of Student Errors in Solving Trigonometry Problems Based on the Newman Procedure Viewed from a Gender Perspective. Sultan Agung Education Journal, 198-205.http://dx.doi.org/10.30659/jp-sa.v1i3.17661.

Hariyomurti, B., Prabawanto, S., & Jupri, A. (2020). Students' learning obstacles in learning arithmetic sequences and series. Juring (Journal for Research in Mathematics Learning), 3(3), 283-292. http://dx.doi.org/10.24014/juring.v3i3.10118.

Jamal, F. (2018). Analysis of Errors in Solving Quadratic Inequality Story Problems Based on the Newman Procedure. Forward, 5(2), 41–51. https://www.neliti.com/id/publications/269923/analysis-kelaluan-dalam-selesaikan-soal-cerita-pertidaksamaan-kuadrat-berdas

Jeharut, EH, & et al. (2019). Analysis of Errors in Completing Story Problems Based on Newman's Stages in View of Gender. FST National Seminar, Vol (2), 575-582. https://conference.unikama.ac.id/article/index.php/senastek/article/view/160

Karnasih. (2015). Analysis of Newman's Errors in Mathematical Story Problems. Journal of Mathematics Education, 37-51.https://doi.org/10.24114/paradikma.v8i1.3352.

Khasanah, M., Utami, RE, & Rasiman, R. (2020). Analysis of high school students' ability to understand mathematical concepts based on gender. Imaginary: Journal of Mathematics and Mathematics Education, 2(5), 347-354. https://doi.org/10.26877/imaginer.v2i5.6517.

Lestari, KE (2015). Mathematics Education Research. Refika Aditama.

Lusi Rahmawati, SN (2022). Learning Patterns, Sequences and Arithmetic Series Based on Problem Based Learning Through Hijriyah Calendar Media. Indonesia: Lakeisha Publishers.

Neal, K., Gustafson, D., & Hughes, J. (2012). Precalculus. Cengage Learning.

Oktaviana, D. (2018). Analysis of Error Types Based on Newman's Theory in Solving Story Problems in Discrete Mathematics Courses. Science Edu: Journal of Science & Mathematics Education, 5(2), 22. https://doi.org/10.23971/eds.v5i2.719

Pertiwi, RD, & Siswono, TY (2021). Mathematical Communication Skills in Solving Geometry Transformation Problems Viewed from Gender. JPPMS: Journal of Mathematics and Science Education Research, 27-36.https://doi.org/10.26740/jppms.v5n1.p26-36

Pujiastuti, MF (2020). Analysis of High School Students' Errors in Answering Three Dimension Questions Based on Newman's Theory. FORWARD: Scientific Journal of Mathematics Education, 182-190. https://www.neliti.com/id/publications/502440/analysis-kelaluan-siswa-smadalam-menrespond-soal-dimensi-tiga-based-theoretica-n

Qodr, N., & Ishartono, N. (2022). Mistakes in Working on Trigonometry Material Based on Newman Error Analysis (NEA) Viewed from Gender Differences. Journal of Educational Science Research, 15(2), 113-127.10.21831/jpipfip.v15i2.45017

Rahmawati, D., & Permata, LD (2018). Analysis of Student Errors in Solving Linear Program Story Problems Using the Newman Procedure. Electronic Journal of Mathematics Learning, 5(2), 173–185. https://jurnal.uns.ac.id/jpm/article/view/26050

Retnawati, H. (2016). Quantitative Analysis of Research Instruments (Research Guide, Student, Psychometrician). Parama Publishing.

Salamah, DP, & Amelia, R. (2020). Error Analysis Based on Newman's Stages on Compound Event Probability Material Viewed from Gender and Self Confidence in Class XII Vocational School Students in West Bandung. JPMI: Journal of Innovative Mathematics Learning, Vol (3), 273-284. https://journal.ikipsiliwangi.ac.id/index.php/jpmi/article/view/3795/1834

Salmina, M., & Nisa, SK (2018). Students' Mathematical Reasoning Ability Based on Gender in Geometry Material. Journal of Numeracy, 41-48.http://dx.doi.org/10.33603/jnpm.v5i2.3641

Saputri, RR (2018). Analysis of Student Errors in Solving Function Material Questions Based on Watson's Criteria in View of Gender Differences in Class VIII Middle School Students. 9, 59–68.https://doi.org/10.19184/kdma.v9i2.9710

Sastri, DN, Sujatmiko, P., & Fitriana, L. (2019). Analysis of Student Mistakes in Solving Mathematical Problems on the Main Application of Sequences and Series Based on Polya Steps in View of Students' Initial Abilities. JPMM: Journal of Mathematics and Mathematics Education, 3(6), 601–610.https://doi.org/10.20961/jpmm%20 Solusi.v3i6.39276

Satiti, WS, & Amaliah, IN (2021). School Arithmetic and Geometry Sequences. Jombang: Institute for Research and Community Service, KH University. A. Wahab Hasbullah.

Savitri, DA, & Yuliani, A. (2020). Analysis of Student Errors in Solving Trigonometry Problems in View of Gender Based on Newman. JPMI: Journal of Innovative Mathematics Learning, 463-474.https://doi.org/10.22460/jpmi.v3i5.p%25p

Sepriyanti, N. & Julisra, W. (2019). Students' mathematical literacy abilities from a gender perspective in class X MIA 7 SMAN 10 Padang. MATS EDUCA JOURNAL, 3(2). https://doi.org/10.15548/mej.v3i2.673.

Silaban, AM, Simbolon, K., & Lumbantoruan, JH (2022). Students' Difficulty in Solving Arithmetic Sequence and Series Problems. Brillo Journal, 1(2), 95-101. https://doi.org/10.56773/bj.v1i2.14.

Siswandi, E., Sujadi, I., & Riyadi. (2016). Analysis of Student Errors in Solving Contextual Mathematics Problems on Quadrilateral Material Based on Newman's Analysis in View of Gender Differences. Electronic Journal of Mathematics Learning, 633-643. https://jurnal.fkip.uns.ac.id/index.php/s2math/article/view/9169.

Suciati, I., & Wahyuni, DS (2018). Analysis of student errors in solving mathematics problems in fraction calculation operations for fifth grade students at Pengawu Elementary School. JPPM (Journal of Mathematics Research and Learning), 11(2).http://dx.doi.org/10.30870/jppm.v11i2.3760.

Sugiyono. (2017). Quantitative, Qualitative and R&D Research Methods. Alphabet.

Suratih, S., & Pujiastuti, H. (2020). Analysis of student errors in solving linear programming story problems based on Newman's error analysis. Pythagoras: Journal of Mathematics Education, 15(2), 111–123. https://doi.org/10.21831/pg.v15i2.30990.

Zaura, B. and S. (2012). STAD Type Cooperative Learning Model as an Effort to Improve Student Learning Outcomes in Number Sequences and Series Material in Class IX of SMP Negeri 1 Labuhanji, South Aceh. Unsyiah Journal, 21-29. https://jurnal.usk.ac.id/peluang/article/view/1293.