JURNAL PENDIDIKAN MATEMATIKA DAN IPA

Vol. 14, No. 1 (2023) h. 118-133

http://jurnal.untan.ac.id/index.php/PMP

ANALYSIS OF STUDENT ERRORS IN WORKING ON HOTS QUESTIONS FOR ALGEBRA MATERIALS ON WATSON'S CRITERIA BASED ON GENDER

Ayu Wulandari[1], Windia Hadi[1]
[1]Universitas Muhammadiyah Prof. Dr. Hamka
Email: windia.hadi@uhamka.ac.id

DOI: http://dx.doi.org/10.26418/jpmipa.v14i1.55745

Abstract

This study aims to determine what errors students made in working on algebraic Higher Order Thinking Skill (HOTS) questions based on gender. This type of research method uses qualitative research methods. Data collection techniques in the form of essay test instruments, student interviews, and triangulation were used to test the validity of the data. This research was conducted on tenth-grade high school students in Jakarta by taking research subjects, namely those with high and low abilities. The results showed that the indicators of errors made by high-ability male students occurred in indicators of inaropriate procedures, errors other than the 7 criteria (not solving the problem), missing conclusions, and indirect manipulation. Meanwhile, women made mistakes on error indicators other than the 7 criteria (not solving the problem), incorrect procedures, and missing conclusions. As for the error indicator, the male student with low ability made an error on the error indicator other than the 7 criteria (not solving the problem), but the procedure indicator did not. Meanwhile, female students made mistakes on indicators other than the 7 criteria (not solving the problem), incorrect data, incorrect procedures, missing conclusions, indirect manipulation, and hierarchical problems.

Keywords: *Algebra, Error analysis, Watson, Higher Order Thinking Skill, Gender*

INTRODUCTION

Mathematics is a multilevel reasoning science from concrete to abstract, focusing on connecting material entities, using the right formulas and symbols, and using the right concepts (Anugrah & Pujiastuti, 2020). By the 2013 SKL (Graduate Ability Standards) in mathematics, all students are equied to develop logical, analytical, systematic, critical, and creative thinking skills and the ability to work together (Sa'adah & Misri, 2019). Higher request thinking abilities or HOTS is the capacity to associate, control, and change the information

Received **: 24/06/2022**
Revised **: 14/09/2022**
Accepted **: 16/09/2022**

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

and experience previously had that is basic and imaginative in going with critical thinking choices in new circumstances (Dinni, 2018). According to Bloom's taxonomy, the cognitive level consists of 6 levels, starting from C1 (memory), C2 (understanding), C3 (alication), C4 (analysis), C5 (assessment), and C6 (creation) (Rohim, 2019). The first three (bottom) levels, C1, C2, and C3 are Low-Order Thinking Skills (LOTS), while the next three levels, C4, C5, and C6, are Higher-Order Thinking Skills (HOTS) (Yusuf & Widyaningsih, 2018).

The results of research conducted by (Hartatiana, 2020) that students can only answer 2 math questions on the PISA level 5 model, so it can be concluded that higher-order thinking skills in evaluating student indicators are still lacking. Research conducted by (Irawati, 2018) also states that higher-order thinking skills are very low from the interviews, this is because students are not used to solving math problems in every classroom learning. A study conducted by Amalia & Hadi (2021), found that students with visual learning styles with mathematical problem-solving abilities with HOTS were able to fulfill all indicators of questions C4, C5, and C6 well. Students with auditory learning styles can fulfill well in all indicators of questions C5 and C6 but in indicator C4, students have difficulty planning problem-solving. Students with kinesthetic learning styles can fulfill all indicators C4 and C5 well.

There are gender differences in research (Mulyani & Muhtadi, 2019) there is a gender effect in overcoming the HOTS-type problem in the triangle material, namely the female gender representation at the Transformation stage has fewer errors than males, while the female gender representation at the understanding, processing skills, and coding has more errors than men. And in research (Saputri et al., 2018) states that the level of the male student's error in data loss was 13.33%, the percentage of respondent-level conflict was 13.33%, and the percentage other than Watson's 7 errors (not answering the question) was 16.67%. Female students are prone to conclusions, namely, students cannot draw conclusions based on questions, 24.14%. It can be concluded that men make more mistakes than women. Gender differences do make physiological differences and affect psychological differences in learning (Siswandi, Sujadi, & Riyadi, 2016). There are differences between men and women in learning mathematics, namely men are better at reasoning, and women are better at accuracy, thoroughness, accuracy, and thoroughness in thinking (Afandi, 2016).

These gender differences raise the question of whether thinking, learning, and conceptualization processes also differ by gender. Based on the research that I have quoted above, this gender difference is one of the important factors in learning mathematics. Therefore, gender differences are the result of social construction and are the differences in roles, functions, and responsibilities between men and women that can change over time (Simanjuntak, Hia, & Manurung, 2019).

The results of research conducted by (Setiawan, Hapizah, & Hiltrimartin, 2018) concluded that the

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

errors of SMP Negeri 1 Palembang students in solving math olympiad questions on algebraic material were at the stage of misunderstanding, and students had errors in understanding the overall meaning. in research Mauliandri & Kartini (2020), it is stated that two factors influence student errors, the first is student internal factors and student external factors. One factor that comes from within the student is that the student is less thorough in dealing with the questions given, and one of the factors that come from outside the student is the learning model used by the teacher in the learning process. It can be concluded that students often make mistakes in working on Algebra material, where students do not understand what the questions mean and students are less thorough in working on Algebra questions.

Algebra is a branch of mathematics that teaches students how to think analytically, systematically, and critically when developing problem-solving strategies (Istikomah & Jana, 2018). Algebra is a mathematical material that has many concepts in it so the form of algebra has a special place in the high school mathematics curriculum (Sari & Afriansyah, 2020). Errors made by students in solving algebra problems can occur in understanding questions, preparing solution plans, implementing completion plans, and re-examining (Muda, Alhaddad, & Saidi, 2021).

Errors made by students when solving HOTS questions and Algebra questions that have been studied by previous researchers have standard errors. Several criteria that can be used to determine the cause of errors in solving math problems include Newman, Polya, Watson, and others (Viani, Setyowati, & Zuhri, 2020). Watson's criteria is one of the criteria used to analyze students' errors in doing math problems. Watson's standard errors include 8 errors namely, incorrect data, incorrect procedures, skill level problems, missing data, indirect operations, response level conflicts, missing conclusions, and in addition to 7 types of errors such as not doing the questions or not doing the questions (Hariyani, Aisyah, & Dinullah, 2019).

Several studies are relevant to this research, the first research was conducted by Mafruhah & Muchyidin, (2020) regarding student errors in solving story problems based on Watson's criteria which stated that the research results showed students still experienced all types of errors according to Watson's criteria when working on math story problems. The second study on HOTS math problem-solving errors is based on Watson's criteria for class VIII students Basri, (2018) states that errors made by high and low-capable students make the same mistakes in all types of indicators. The third study regarding the errors of junior high school students in solving HOTS questions on algebraic material is based on Newman's Theory, which states that there are differences in the types of errors made by students, students who have high abilities understand little about algebraic forms but make many mistakes, students who have moderate abilities do not pay attention to the rules or conditions of work, and students who have low abilities often make carelessness and make many mistakes (Bete, 2019). The fourth

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

study on student errors in solving HOTS-type math problems based on Newman's theory states that in general what causes errors is the ability of students to reason and be creative in solving problems in real contexts and alying them in algebraic form (Mahmudah, 2018). Based on the students' mistakes in the 4 studies, in doing math problems students often made mistakes. Students who have high and low abilities, both have a lot of errors. But the fault lies differently.

Therefore the researchers conducted research related to "Analysis of Student Errors in Solving HOTS Questions on Watson Criteria Algebraic Materials Based on Gender". So that researchers know whether there are differences in errors made by students based on gender. The Watson standard will make it easier for researchers to identify any mistakes made in each step of students' answers.

METHODS

This research will use the descriptive qualitative method. In qualitative research, conceptualization, classification, and description are made based on "events" obtained during field activities, so that data collection and data analysis cannot be separated from each other (Rijali, 2019). Research procedures that will be used in this study are a) Giving test questions to students, and questions given to students in the form of descriptions of HOTS-type algebra material. Data collection techniques in the form of essay test instruments totaling 5 questions to analyze student errors in solving HOTS-type math problems, as well as interviews. The instruments that will be tested on students have been validated by experts, namely 2 lecturers and teachers of related subjects. b) Interviews, interviews were conducted with students to find out the truth that occurred when working on the test questions that had been given. This interview method was carried out to collect data which was an oral expression of students' errors in understanding math problems. In addition, to find out more about the factors that cause students to make mistakes. c) Analyzing, the test answer sheets will be analyzed after being given test questions and interviewed. The stages of analyzing data go through three stages, namely data reduction, data presentation, data verification, and conclusion (Savitri & Yuliani, 2020).

To test the validity of the data obtained, in this study triangulation of data sources was carried out. The triangulation method is one method that is tried to test whether the information is said to be valid or not against information obtained from research (Alfansyur & Mariyani, 2020). Where after going through the observation of the research subject where the data subject is obtained from the results of the mid-semester test scores of students with low and high abilities. The instrument that will be given to students is in the form of test questions and research subjects will be interviewed. Instruments that have passed the validity test will underlie the data and data sources in this study can be seen in table 1.

Guidelines for identifying student errors are based on the following Watson Criteria indicators (Mafruhah & Muchyidin, 2020):

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

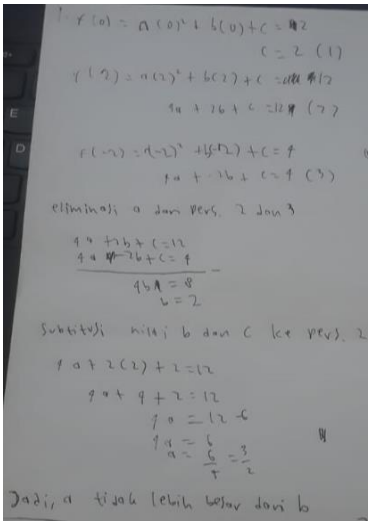
Table 1. Watson error indicator

Watson Criteria	Indicator
(*inaropriate data/id*)	- Does not use data that should be used - Error when entering data into variables
(inaropriate procedure/IP)	- Using the wrong formula - Do not write down the steps in solving the problem
(omitted data/od)	- The data entered is incomplete
(omtited conclusion/oc)	- Do not make conclusions using data from the answers obtained
(response level conflict/rlc,)	- Not ready to solve problems
(undirect manipulation/um)	- Do not understand the meaning of the question - Illogical reasoning used when solving problems
(skills hierarchy problem/shp)	- Made a mistake in the calculation - When using algebraic ideas students make mistakes
(above other/ao)	- Not answering the answer - Rewrite questions

RESULTS AND DISCUSSION

Based on the results of a test carried out on April 19, 2022, for students of class X MIPA-2 SMA in Jakarta, with test questions in the form of Al-Jabar material questions of the High Order Thinking Skills (HOTS) type. The questions are tested on students who have low and high abilities taken from the mid-semester test scores that have been tested. 2 people with low ability are selected, female and male, as well as with high ability, and 2 people are female and male.

The following are the results of the work of students who have high ability male gender.



English version

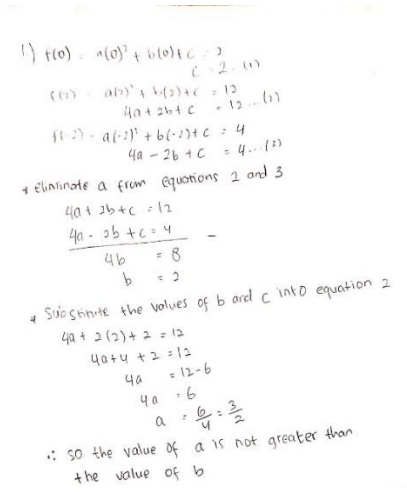


Figure 1. Student test results

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

Based on the results of the work above and accompanied by the results of interviews, no errors were found in the process. Students can do it by following the steps that should be. In the interview process, students can also explain the process well.

Figure 2. Student test results

From Figure 2 above, students only write the final answer and do not write down the steps in the process. So that the error indicator is in the inaropriate procedure (IP), students do not write down the steps in solving the problem. In the interview, the students stated that in changing the problem into its mathematical form, the students did not understand so the students worked on the problem by adding and subtracting so that the answer they got was even.

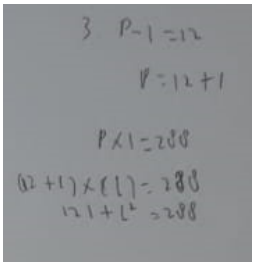


Figure 3. Student test results

Figure 3 above shows that students have not completed the problem, students only do part of it. The indicator of the error he made was an error other than the seven criteria (above other/ao), where the student had not completed the problem or could be called not working on the problem. The student mentioned in the interview session that he did not understand the factoring, so he could not continue with the solution.

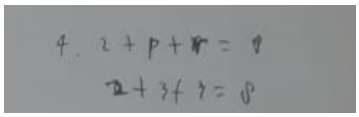


Figure 4. Student test results

Students make mistakes in several indicators in Figure 4. The error indicators are 1) Inaropriate procedure (IP), students use incorrect formulas and do not write down the steps for solving them; 2) Committed Conclusion (OC) students do not make conclusions using data from the answers obtained; 3) Undirect Manipulation (UM) students do not understand the questions. During the interview process, students said that they only used logical methods or trial and error methods in the process.

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

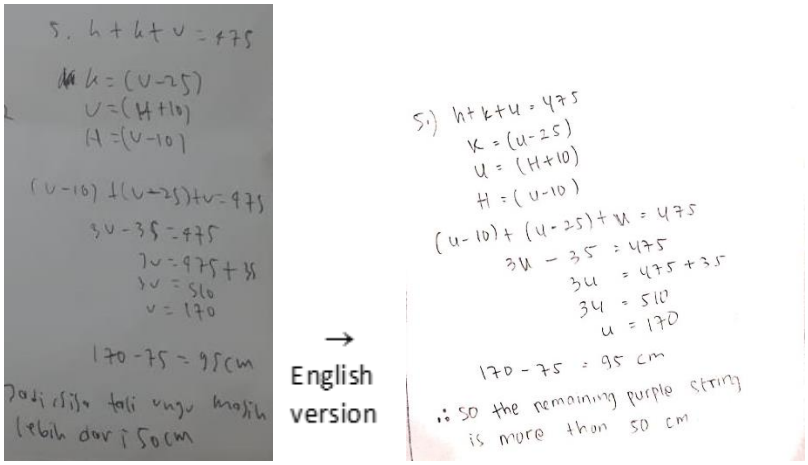


Figure 5. Student test results

Based on the results of student work in Figure 5, no errors were found in the process. Students can do it by following the steps that should be. In the interview process, students can also explain the process well and students feel confident in their answers.

The following are the results of the work of students who have high abilities and are female.

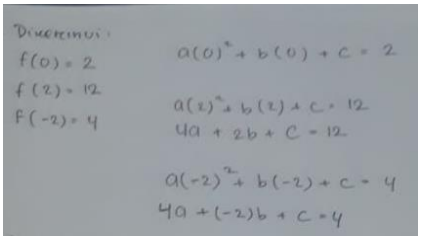


Figure 6. Student test results

In the picture of the student's work above the students only did it partially so that the error indicator was an error other than the seven criteria (above other/ao), the student had not finished the problem. From the interview process, students stated that they understood the meaning of the question but did not understand the steps involved. Students stated that they had forgotten how to do it, so it was rather difficult to continue working on the problem.

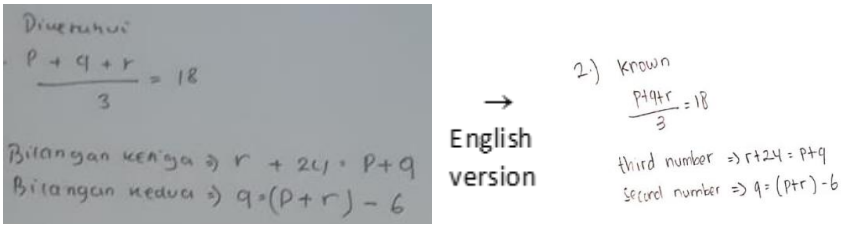


Figure 7. Student test results

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

In Figure 7 students only write what they know in the questions so that students' answers are included in the error indicators other than the seven criteria (above other/ao), where students do not work on the questions and only rewrite the questions on the answer sheet. During the interview, it was stated that if students did not understand question number 2, students only knew to change the problem into its mathematical form without knowing what the question meant.

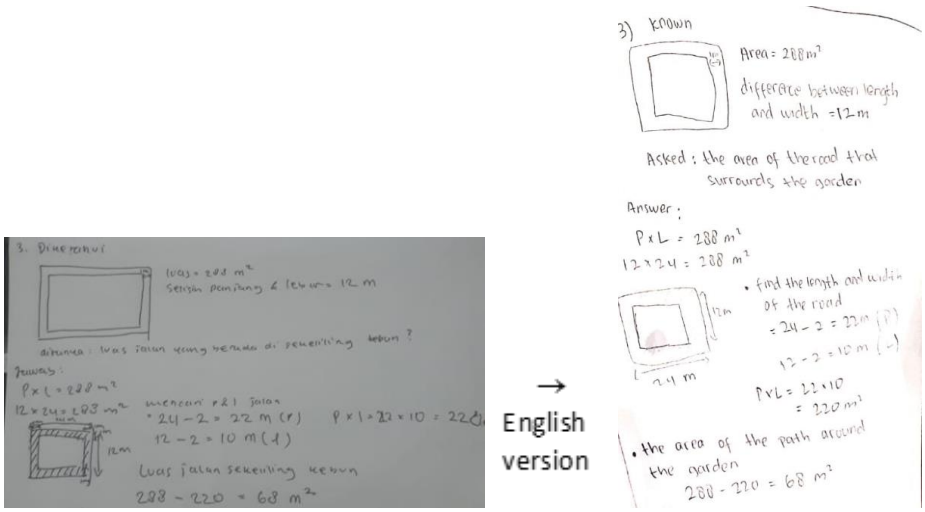


Figure 8. Student test results

In Figure 8 students make several mistakes in solving the problem. The error indicators in question are 1) Inaropriate procedure (IP), students use incorrect formulas; 2) conclusions are lost, and students do not make conclusions using data from the answers obtained. Students solve problems using steps that are not by the procedure.

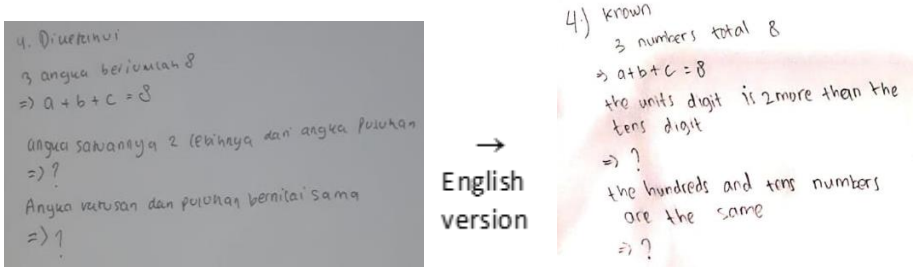


Figure 9. Student test results

In Figure 9, students only write what they know and do not work on the questions, so the error indicator is an error other than the seven criteria (above other/ao), and students rewrite the question again. In the interview, the student said that he did not understand what the question meant.

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

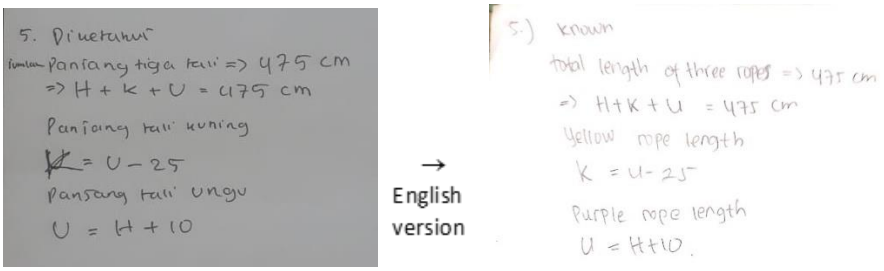


Figure 10. Student test results

In student worksheets on question number 5 in Figure 10 students only write what they know and do not work on the questions, so the error indicator is an error other than the seven criteria (above other/ao), and students rewrite the question again. In the interview, the student said that he did not understand what the problem meant and the student did not understand how to solve it.

Here are the results of the work of students who have low ability male sex.

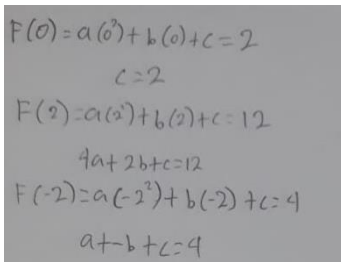


Figure 11. Student test results

In Figure 11 above, the students did not solve the problem, the students only worked on the question of substituting the known part into the equation of the problem. So that the error indicator is an error other than the seven criteria (above other/ao), where the student has not completed the problem or can be called not working on the problem. In the interview, the student said that he understood the problem and was sure of the answer. In this case, it can be concluded that students do not understand the meaning of the problem so they do not solve the problem perfectly.

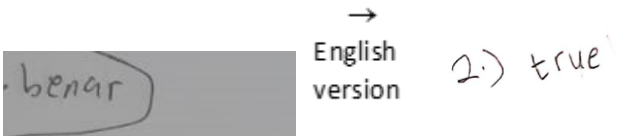


Figure 12. Student test results

In Figure 12, it is the same as in Figure 5, students only write down the final answer. So that the error indicator is in the inaropriate procedure (IP), students do not write down the steps in solving the problem. In the interview, the student stated that in the process he did not use a method, according to him, because all the data in the problem were even numbers, and the result was also an even number.

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

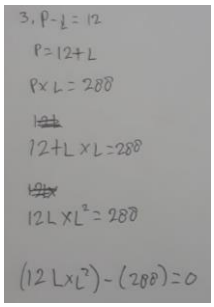


Figure 13. Student test results

It can be seen that the students have not completed the questions until the end in Figure 13. The indicator of the error they made was an error other than the seven criteria (above other/ao), where the student had not completed the question. During the interview session, the student said that he understood question number 3 and was sure of the answer. But in reality, students have not solved the problem correctly.

Students with Low Male ability, do not work on questions number 4 and 5. Students empty the answer paper numbers 4 and 5 so that the error indicator is an error other than the seven criteria (above other/ao), students do not write down answers or students leave the answer sheet blank. The student said that he did not understand the meaning of the problem and did not know how to work on questions number 4 and 5.

The following are the results of the work of students who have low abilities and are female.

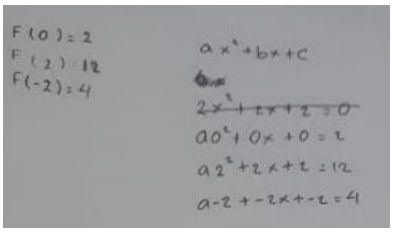


Figure 14. Student test results

The 14th picture above is the work of students with low abilities. Students do not work on the questions completely so that the answers are included in the error indicators other than the seven criteria (above other/ao), where students have not completed the questions or can be called not working on the questions. From the results of the interviews conducted, students only know the initial step and do not know the next step. Students do not understand how to solve it, so students cannot solve it.

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

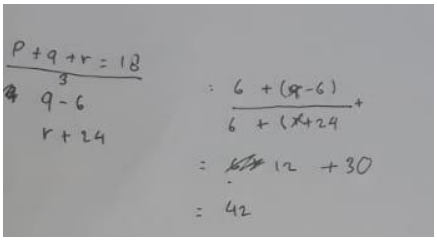


Figure 15. Student test results

In Figure 15 students make several mistakes, namely: 1) Incorrect data, students make mistakes when entering data into variables. 2) the procedure is not right, students use the wrong formula. 3) conclusions are lost, students do not make conclusions using data from the answers obtained. 4) Indirect manipulation, students do not understand the problem so they use illogical reasons when solving problems. During the interview, the student said that he did not understand the meaning of question number 2, the student did not know what was known from the question and did not know what was asked in the question.

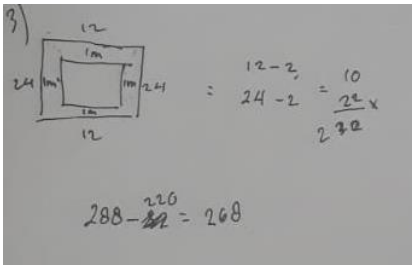


Figure 16. Student test results

Students make errors in several indicators: 1. Inaropriate data (inaropriate data/id) students make mistakes when entering data into variables; 2. Inaropriate procedure (IP), students use the wrong formula; 3. Missing data (omitted data / OD) the data entered by students is incomplete, and the data contained in the questions still have not been listed; 4. Committed conclusion (OC) students do not make conclusions using data from the answers obtained; 5. Indirect manipulation (um) students do not understand the questions and use illogical ways to solve problems. In the interview, the student said that he understood question number 3, but Figure 11 shows that the student did not understand the meaning of the question.

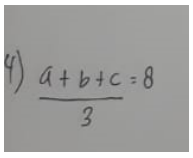


Figure 17. Student test results

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

In Figure 17 students only write questions again or write known. So that the indicators of errors made by students are errors other than the seven criteria (above other/ao), students do not solve the problem and only write the question again. The student said that he did not understand how it was done, the student only understood what he knew.

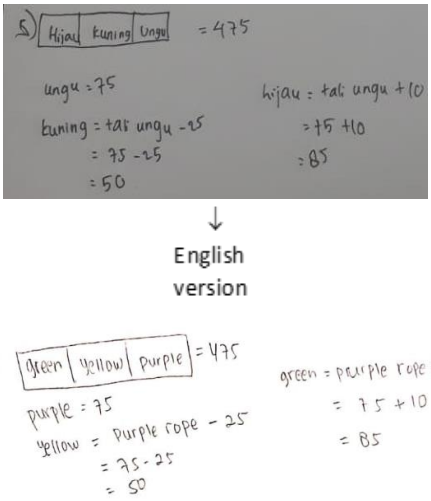


Figure 18. Student test results

In figure 18, students make mistakes in several indicators, namely 1) Inaropriate data (inaropriate data/id) students do not use data that should be used, it is written purple has a length of 75 cm which should be 75 cm is a purple rope used instead of a purple rope entirely; 2) Inaropriate procedure (IP), students use the wrong formula; 3) Missing data (omitted data/od) there are still steps that were missed during processing; 4) Committed conclusion (OC) students do not make conclusions using data from the answers obtained; 5) Indirect manipulation (um) students do not understand the questions and use illogical ways to solve problems; 6) Skills hierarchy problem (sh) when using algebraic ideas students make mistakes. In the interview session, students felt unsure about the final result because it did not match the number in the question, but students were confident in how it was done.

Indicators of errors made by high-ability male students occur in numbers 2, 3, and 4. Students can solve questions number 1 & 5 according to existing indicators, but at number 2 students only write answers without going through the process so the errors that students do is inaropriate procedures because the completion steps do not exist. Also found the same error in the research Maryani & Chotimah, (2021) Where errors that often aear on research subjects are inaccurate data (id) and missing data (od). So the error indicator is when placing data or variables, or not using the data that should be used. In number 3 the student did not complete the answer he wrote, the student only wrote what he knew and wrote one equation to solve the problem. So that the error made by students in number 3 is not solving the problem until the end. In number 4 students wrote down 2 equations as answers that were not by the completion steps where the equation was also not by what was known in the question. So, by Islam et

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

al., (2021) research, students' errors in the response level conflict criteria are direct answers without calculation steps and only performing simple operations based on existing data with inaropriate steps.

While women make mistakes in all solutions, the error indicator that occurs is an error other than 7 criteria (not solving the problem) in numbers 1, 2, 4, and 5 where the error that students have made is not solving the problem and only rewriting what is known by the students. question. The error indicator in question number 3 is the wrong procedure and missing conclusions, students write down what is known in the problem and solve the problem to the end. But students do not use the right procedure and students also use the wrong formula, so the questions that students solve are not right. The omitted conclusion error criteria were also found in the Maf'ula & Mardhiyana, (2021) research where the errors that occurred were that students completed the questions but had not yet reached the final stage, or students were able to work on the questions but did not reach the requested conclusions.

And for the indicator of error for low-ability students, the male gender occurs in all numbers. At numbers 1, 3, 4, and 5, they made mistakes on the error indicators other than the 7 criteria where the student's error was not solving the problem until the end and only rewriting the question and not completing the question until the end. Similar errors were also found in Hasibuan & Harahap, (2022) research where errors other than the 7 criteria were errors made because students did not know how to answer the questions so they were not answered. And in question number 2 students only write down the answers without going through the process so the mistakes made by students are improper procedures because the steps for solving them do not exist.

Meanwhile, female students with low abilities also made mistakes on all indicators. In numbers 1 and 4, they made mistakes on indicators other than 7 criteria (not solving the problem) where students' errors occurred because they rewrote the equations in question. In numbers 2, 3, and 5 students make mistakes when working on questions that do not use the data provided so the completion procedure is also incorrect, and the final result is also wrong. According to research conducted by Islami et al. (2021), students make skill errors. Skill is the ability to use procedures or steps to solve a problem. Where students skip the work step so that they get answers without being based on logical reasons.

CONCLUSION

Based on the results of research and discussions that have been carried out, male students who have high abilities tend to make fewer mistakes than female students who have high abilities. Female students made a lot of mistakes apart from the 7 criteria (not solving the problem). Female students often do not solve the questions and only rewrite the questions on the answer sheet.

Male students with low ability, often make mistakes other than 7 criteria (does not solve the problem). Because students did not solve the problems and some were not done at all. Meanwhile, female students made mistakes on almost all indicators but

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

students did not complete the answer sheet like low-ability male students.

The cause of the errors made is mostly because students do not understand the meaning of the problem so they cannot solve the problem because they do not know the formula that will be used to find the solution to the problem. To minimize errors made by students, teachers should often provide HOTS practice questions to train students so that in solving HOTS they are not confused when converting into algebraic form.

REFERENCES

Afandi, A. (2016). Profil Penalaran Deduktif Siswa SMP dalam Menyelesaikan Masalah Geometri Berdasarkan Perbedaan Gender', *APOTEMA: Jurnal Program Studi Pendidikan Matematika*, 2(1), . 8–21.

Alfansyur, A. & Mariyani, M. (2020). Seni Mengelola Data: Penerapan Triangulasi Teknik, Sumber dan Waktu pada Penelitian Pendidikan Sosial. *Historis: Jurnal Kajian, Penelitian dan Pengembangan Pendidikan Sejarah*, 5(2), . 146–150.

Amalia, R. Z. & Hadi, W. (2021). Analisis Kemampuan Pemecahan Masalah Matematis Bermuatan *Higher Order Thinking Skills* Ditinjau dari Gaya Belajar. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 10(3), . 1564–1578.

Anugrah, A. & Pujiastuti, H. (2020). Analisis Kesalahan Siswa dalam Menyelesaikan Soal HOTS Bangun Ruang Sisi Lengkung. *Jurnal Pendidikan Matematika*, 11(2), . 213–225.

Basri, S. N. (2018). Deskripsi Kesalahan Penyelesaian Soal Matematika Higher Order Thinking Skills Berdasarkan Kriteria Watson Siswa Kelas VIII SMPN 9 Binamu Kabupaten Jeneponto. *skripsi*. Universitas Negeri Makassar.

Bete, H. (2019). Analisis Kesalahan Siswa SMP dalam Menyelesaikan Soal Berbentuk Higher Order Thinking (HOT) pada Materi Aljabar. *RANGE: Jurnal Pendidikan Matematika*, 1(1), . 33–42.

Dinni, H. N. (2018). HOTS (High Order Thinking Skills) dan Kaitannya Dengan Kemampuan Literasi Matematika. in *PRISMA, Prosiding Seminar Nasional Matematika*, . 170–176.

Hariyani, S., Aisyah, F. N. K. & Dinullah, R. N. I. (2019). Analisis Kesalahan Penyelesaian Soal Cerita Berdasarkan Kriteria Watson. *JRPM (Jurnal Review Pembelajaran Matematika)*, 4(1), . 11–22.

Hartatiana, H. (2020). Kemampuan Berpikir Tingkat Tinggi Siswa SMP dalam Menyelesaikan Soal Matematika Model PISA. *Jurnal Pendidikan Matematika*, 14(1), . 15–24.

Hasibuan, W. A. & Harahap, I. H. (2022). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Himpunan Berdasarkan Kriteria Watson. *Jurnal MathEducation Nusantara*, 5(1), . 96–101.

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

Irawati, T. N. (2018). Analisis Kemampuan Berpikir Tingkat Tinggi Siswa SMP dalam Menyelesaikan Soal Pemecahan Masalah Matematika pada Materi Bilangan Bulat. *Gammath: Jurnal Ilmiah Program Studi Pendidikan Matematika*, 3(2), . 67–73.

Islam, S. N., Susilawati, W. & Sugilar, H. (2021). Analisis kesalahan Siswa dalam Menyelesaikan Soal Berpikir Abstraksi Matematis Berdasarkan Kriteria Watson. *Jurnal Perspektif*, 5(1), . 112–129.

Istikomah, D. A. & Jana, P. (2018). Kemampuan Pemahaman Konsep Matematis Mahasiswa melalui Pendekatan Pembelajaran Saintifik dalam Perkuliahan Aljabar Matrik. in *Prosiding Seminar Nasional Pendidikan Matematika Etnomatnesia*.

Maf'ula, D. A. & Mardhiyana, D. (2021). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Transformasi Geometri Berdasarkan Kriteria Watson. *Konferensi Ilmiah Pendidikan*, 1(1), . 159–164.

Mafruhah, L. & Muchyidin, A. (2020). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Matematika berdasarkan Kriteria Watson. *PYTHAGORAS*, 15(1).

Mahmudah, W. (2018). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Matematika Bertipe HOTS berdasar Teori Newman. *Jurnal UJMC*, 4(1), . 49–56.

Mauliandri, R. & Kartini, K. (2020). Analisis Kesalahan Siswa Menurut Kastolan dalam Menyelesaikan Soal Operasi Bentuk Aljabar pada Siswa SMP. *AXIOM: Jurnal Pendidikan dan Matematika*, 9(2), . 107–123.

Muda, H. H., Alhaddad, I,. & Saidi, S. (2021). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Operasi Hitung Bentuk Aljabar. *Jurnal Pendidikan Guru Matematika*, 1(2).

Mulyani, M. & Muhtadi, D. (2019). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Trigonometri Tipe Higher Order Thinking Skill ditinjau dari Gender. *JM (Jurnal Penelitian dan Pembelajaran Matematika)*, 12(1), . 1–16.

Rijali, A. (2019). Analisis Data Kualitatif. *Alhadharah: Jurnal Ilmu Dakwah*, 17(33), . 81–95.

Rohim, D. C. (2019) . Strategi Penyusunan Soal Berbasis HOTS pada Pembelajaran Matematika S., *BRILIANT: Jurnal Riset dan Konseptual*, 4(4), . 436–446.

Sa'adah, A. & Misri, M. A. (2019). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Matematika HOTS Bertipe PISA. *Holistik*, 3(1), . 53–64.

Saputri, R. R., Sugiarti, T., Murtikusuma, R. P., Trapsilasiwi, D., & Yudianto, E. (2018). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Materi Fungsi Berdasarkan Kriteria Watson ditinjau dari Perbedaan Gender Siswa SMP kelas VIII. Kadikma, 9(2), 59-

Jurnal Pendidikan Matematika dan IPA
Vol. 14, No. 1 (2023) h. 118-133

68. *Kadikma*, 9(2), . 59–68.

Sari, H. M. & Afriansyah, E. A. (2020). Analisis Miskonsepsi Siswa SMP pada Materi Operasi Hitung bentuk Aljabar. *Mosharafa: Jurnal Pendidikan Matematika*, 9(3), . 439–450.

Savitri, D. A. & Yuliani, A. (2020). Analisis Kesalahan Siswa dalam Menyelesaikan Permasalahan Trigonometri ditinjau dari Gender Berdasarkan Newman. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 3(5), . 463–474.

Setiawan, Y. B., Hapizah, H. & Hiltrimartin, C. (2018). Kesalahan Siswa dalam Menyelesaikan Soal Olimpiade SMP Konten Aljabar. *Jurnal Riset Pendidikan Matematika*, 5(2), . 233–243.

Simanjuntak, E., Hia, Y. & Manurung, N. (2019). Analisis Kemampuan Berpikir Kreatif dalam Pemecahan Masalah Ditinjau dari Perbedaan Gender. *School Education Journal PGSD FIP Unimed*, 9(3), . 213–220.

Siswandi, E., Sujadi, I. & Riyadi, R. (2016). Analisis Kesalahan Siswa dalam Menyelesaikan Masalah Matematika Kontekstual pada Materi Segiempat berdasarkan Analisis Newman ditinjau dari Perbedaan Gender (Studi Kasus pada Siswa Kelas VII SMPN 20 Surakarta). *Jurnal Pembelajaran Matematika*, 4(7).

Viani, C. F., Setyowati, R. D. & Zuhri, M. S. (2020). Analisis Kesalahan Siswa SMP berdasarkan Kriteria Watson dalam Menyelesaikan Soal Metematika Bertipe High Order Thinking Skills (HOTS) Ditinjau dari Gaya Belajar. *Imajiner: Jurnal Matematika dan Pendidikan Matematika*, 2(5), . 372–381.

Yusuf, I. & Widyaningsih, S. W. (2018). Profil Kemampuan Mahasiswa dalam Menyelesaikan Soal HOTS di Jurusan Pendidikan Fisika Universitas Papua', *Jurnal Komunikasi Pendidikan*, 2(1), . 42–49.