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INCREASING STUDENTS' CONCEPT UNDERSTANDING CAPABILITY IN STATISTICS MATERIAL THROUGH THE DISCOVERY LEARNING MODEL

Meitia Putri Pratiwi[1)*], Harry Dwi Putra[2)]
[1,2]Department of Mathematic Education, IKIP Siliwangi
[1,2]JL.Terusan Jendral Sudirman, Cimahi, Indonesia
Email: meitiaputri12@gmail.com[1)*], harrydp@ikipsiliwangi.ac.id[2)]

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Abstract:
This research aims to determine the effect of the discovery learning model on high school students' mathematical abilities. This type of research is classroom action research, which aims to increase educators' professionalism in improving student learning outcomes. This research was carried out at senior high school Yumik Banjaran. The subjects in this research involved students in class XII IPA 1 for the 2023/2024 academic year with 36 students. The research instrument used was a description test during the pre-test and post-test. The learning material provided is data-centering statistical material. The tests carried out are divided into two parts, namely test cycles I and II (after giving the action). The procedures in this research consist of: (1) planning, (2) implementation of actions, (3) observation, and evaluation, and (4) reflection. The results of this research show that in cycle I the researcher was not optimal in providing understanding to students so there were still many students who did not understand the statistical material of data concentration, however in cycle II the researcher improved the learning method by paying more attention to the systematics in the discovery learning model so that after cycle II is completed, students' mathematical understanding abilities can increase. Based on the performance indicators, it is concluded that students' mastery of mathematical understanding in the data-centering statistics material for class XII IPA 1 students at senior high school Yumik Banjaran can be improved through the discovery learning model.

Keywords: Concept Understanding, Discovery Learning, Data Centralization Statistics

MENINGKATKAN KEMAMPUAN PEMAHAMAN KONSEP SISWA PADA MATERI STATISTIKA MELALUI MODEL DISCOVERY LEARNING

Abstrak:
Penelitian ini bertujuan untuk mengetahui pengaruh pembelajaran model discovery learning terhadap kemampuan matematis siswa SMA. Jenis penelitian ini adalah penelitian tindakan kelas yaitu penelitian yang bertujuan untuk meningkatkan keprofesionalan pendidik dalam meningkatkan hasil belajar siswa. Penelitian ini

dilaksanakan di SMA Yumik Banjaran. Subjek dalam penelitian ini melibatkan siswa kelas XII IPA 1 tahun ajaran 2023/2024 dengan jumlah siswa 36. Instrumen penelitian yang digunakan berupa tes uraian yang diberikan saat pre-test dan post-test. Materi pembelajaran yang diberikan adalah materi statistika pemusatan data. Tes yang dilaksanakan terbagi menjadi dua bagian yaitu tes siklus I dan II (setelah pemberian tindakan). Prosedur pada penelitian ini terdiri dari: (1) perencanaan, (2) pelaksanaan tindakan, (3) observasi dan evaluasi, dan (4) refleksi. Hasil pada penelitian ini menunjukan bahwa pada siklus I peneliti kurang optimal dalam memberikan pemahaman kepada siswa sehingga masih banyak siswa yang kurang dalam memahami materi statistika pemusatan data, namun pada siklus II peneliti memperbaiki model pembelajaran dengan lebih memperhatikan sistematika yang ada dalam model pembelajaran discovery learning sehingga setelah siklus II selesai kemampuan pemahaman matematis siswa dapat meningkat. Berdasarkan indikator kinerja, disimpulkan bahwa penguasaan pemahaman matematis siswa pada materi Statistika pemusatan data siswa kelas XII IPA 1 SMA Yumik Banjaran dapat ditingkatkan melalui model discovery learning.

Kata Kunci: Pemahaman Konsep, Discovery Learning, Statistika Pemusatan Data

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INTRODUCTION

Education is one of the most important things in this life. Success in education is a hope in the learning process, with the success shown by students, educators are preparing the young generation who are able to develop their potential with the abilities they have and are able to solve problems that exist in the environment. However, in reality, students tend to be unresponsive and tend to be silent during learning (Purwati, 2020). By studying mathematics, students can receive information and ideas that are often communicated or conveyed using mathematical language, as well as many problems that can be presented in mathematical models. In line with this, mathematics is a very important basic science to be studied and mastered as a regular activity in daily life (Manalu & Afrilianto, 2020).

The ability to understand mathematics is an initial ability that every student must have. Problem-solving abilities and understanding mathematical abilities are abilities that are needed by every student to solve problems in life and face global challenges (Aida & Hamdani, 2017). Mathematical

understanding is an important ability to develop other mathematical competencies in the learning process (Santoso & Sari, 2019). Rohaeti and Bernard (2018), mathematical understanding ability is the basis of education. According to Pebrianti and Puspitasari (2023), the ability to understand must be possessed so that students can think creatively, innovatively, critically, and logically. The ability to understand needs to be mastered because it means that mathematical concepts are not just memorized but are also thought out by students (Sugandi & Bernard, 2018). From this opinion, therefore, mathematical ability becomes very important and so that mathematical ability can be improved and mastered by students, teachers must be directly involved in learning.

For students' mathematical understanding abilities to increase, they must apply learning strategies that will be carried out on the results of observations in the field. One effort that is considered to be able to improve mathematical understanding abilities is discovery learning. Discovery learning is a learning model where students understand the concepts meanings, and relationships to reach conclusions for themselves (Efendi & Nugraha, 2024). Discovery learning involves teacher direction to organize student activities to be carried out such as searching, processing, tracing, and investigating (Rahayu, Muttaqien, & Solikha, 2023). However, in fact, in the field, mathematical understanding abilities are still relatively low, which is because students tend to be lazy and feel bored and even have difficulty understanding the material continuously. In addition (Cahtini, Soekisno, & Yumiati, 2023) according to discovery learning, it is more effective in improving mathematical understanding skills with an auditory learning style. Mariza (2015), discovery learning can help students discover knowledge themselves. Maharani and Hardini (2016), discovery learning facilitates students to learn directly. The indicators of the discovery learning model used are: 1) stimulation, 2) problem identification, 3) data collection, 4) data processing, 5) verification, and 6) concluding (Khansa, Pramudya, & Kuswardi, 2018).

This is in line with research Anastasha (2020) that students' mathematical understanding abilities are still low which is caused by monotonous learning. Meanwhile, according to Anisa, Ruswana, and Zamnah (2021) the ability to understand is still very low in algebra material. Yani, Maimunah, Roza, Murni, and Daim (2019), students' mathematical understanding ability is still low because students only memorize formulas (Kase, Nesti, Senid, Senia, & Djawa, 2021). Students still can't work on the

questions because they can't understand and classify the questions (Yulaistin & Roesdiana, 2022). Students are still confused in determining the steps for completing the material on probability (Luritawaty, 2018). Students have difficulty operating and implementing solutions because they do not understand the problem (Mahtuum, Nurhayati, Hidayat, & Rohaeti, 2020). Students' incorrect answers in solving questions are based on students' lack of understanding. The indicators of mathematical understanding according to Skemp are based on indicators of understanding according to Klickpat and Findell (in Ridia & Afriansyah, 2019) namely: 1) re-explaining a concept, 2) classifying an object, 3) implementing a concept algorithmically, and 4) presents examples studied. In addition to the understanding indicator, the indicator of achievement of mathematical understanding ability needs to be considered so that teachers can measure the achievement of students' mathematical abilities. The indicators of achievement of mathematical ability according to Wardhani (in Priyambodo, 2016) are: 1) re-proving a material, 2) grouping an object based on specific properties according to the material, 3) delivering material in mathematical representation, and 4) outlining the need and feasibility of the material.

Based on the results of observations at senior high school Yumik Banjaran and interviewing one of the class XII mathematics teachers, it was stated that several students in the class experienced difficulties in their mathematical comprehension skills in understanding concepts and solving mathematical problems. Therefore, researchers are interested in examining the mathematical understanding abilities of senior high school students because the level of understanding of mathematical concepts is still low. This research aims to analyze and improve the mathematical understanding abilities of class XII senior high school students through the application of the discovery learning model.

METHODS

The model used was classroom action research which was carried out at Yumik Banjaran senior high school using the spiral model developed by Kemmis and Mc Taggart (Aripin, Setiawan, & Hendriana, 2019); (Manalu & Afrilianto, 2020); (Aripin, Setiawan, & Hendriana, 2019). This research was carried out by teachers while learning was taking place through planning, implementation, and reflection. Then the results are analyzed to calculate the average score to determine students' understanding abilities before and after

learning. According to the Kemis and McTaggart model (Sunarto, Laa, Mahtuum, Siagian, & Afrilianto, 2021).

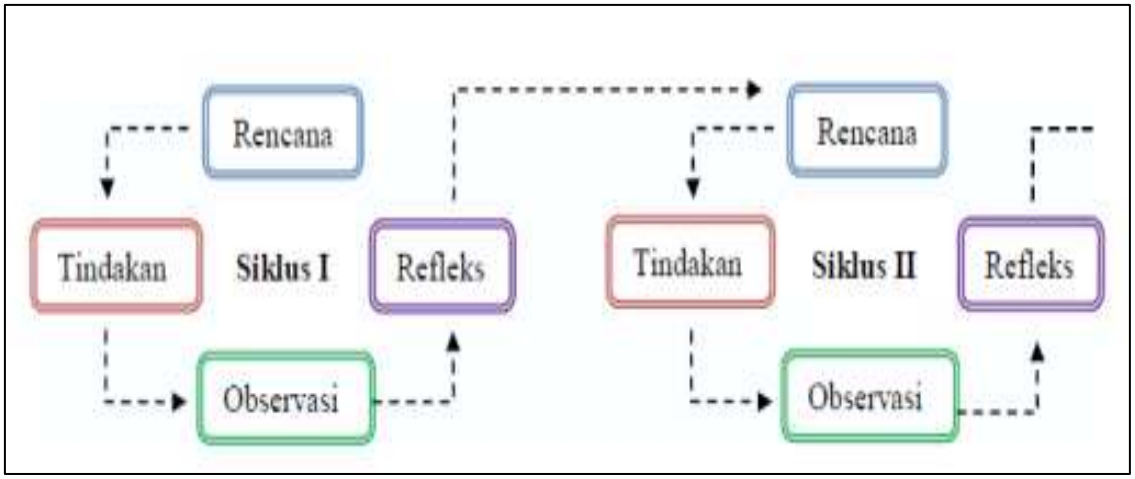

Figure 1. Kemmis and Mctaggart Research Model (Sunarto, Laa, Mahtuum, Siagian, & Afrilianto, 2021)

The flow in this classroom action research is divided into 2 cycles, namely cycles I and II. In the first cycle: 1) carrying out learning planning, 2) carrying out class actions following the learning planning, 3) making observations, and 4) reflecting. After taking action in the first cycle, if the level of mathematical understanding is still low, then the classroom action research is continued in the second cycle, namely: 1) carrying out learning planning, 2) carrying out class actions by the learning planning, 3) making observations, and 4) reflecting.

To determine whether N-Gain is increasing, decreasing, or remaining stable, the following criteria are used.

Table 1. N-Gain Value Criteria

Nilai N-Gain	Criteria
N-Gain ≥ 0,70	Tinggi
0,30 < N-Gain < 0,70	Sedang
N-Gain < 0,30	Rendah

The subjects in this research were 37 students in class The questions given include a test question instrument in the form of 5 pre-test and post-test description questions. The results of the test assessment were processed using the N-Gain Model to see mathematical understanding using the discovery

learning model for class With data processing techniques using the n-gain model according to Kahar, Layn, and Mandasari (2018) as follows.

$$N - Gain = \frac{Skor\ Postest - Skor\ Pretest}{SMI - Skor\ pretest} \quad (1)$$

RESULTS AND DISCUSSION

This research was conducted in class XII IPA 1, and the research subjects consisted of 36 students. The n-gain model is used to find out and see an increase in students' understanding abilities in solving questions. In this test, 5 questions are given in the form of descriptions. The following are the results of the pre-test assessment for each question.

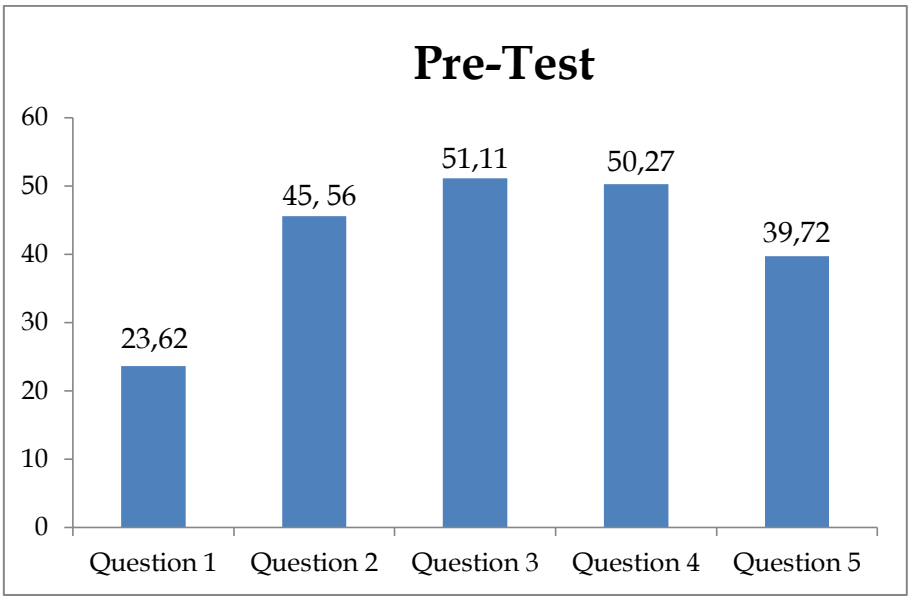

Figure 2. Pre-Test Average Value Results

If we look at figure 2, the average initial test score for students on each indicator is still low, in the first question the lowest average score was 23.62, then in the second question the average was 45.56, in question 3 got largest percentage, namely 51.11 and question 4 got an average percentage of 50.27 and finally question 5 got a percentage of 39.72. The results of the average post-test scores can be seen in the figure below.

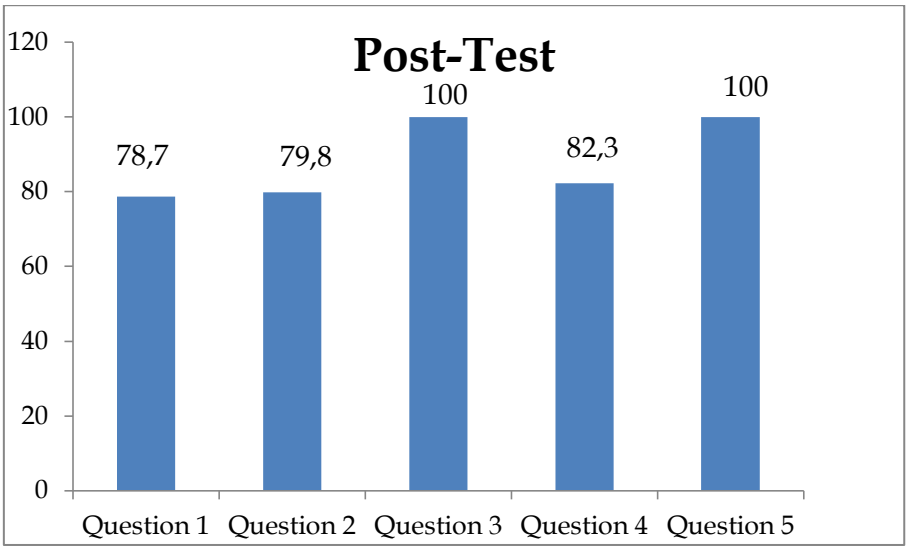

Figure 3. Post-Test Average Score Results

In figure 3, it can be seen that there has been an increase in the number of posttests that occurred after the completion of the learning action. The most significant increase was seen in the third question which increased from 70 to 100, followed by the fifth question which increased from 50 to 85. To learn more about the average increase in students before and after the learning action, you can see the diagram in Figure 5 below:

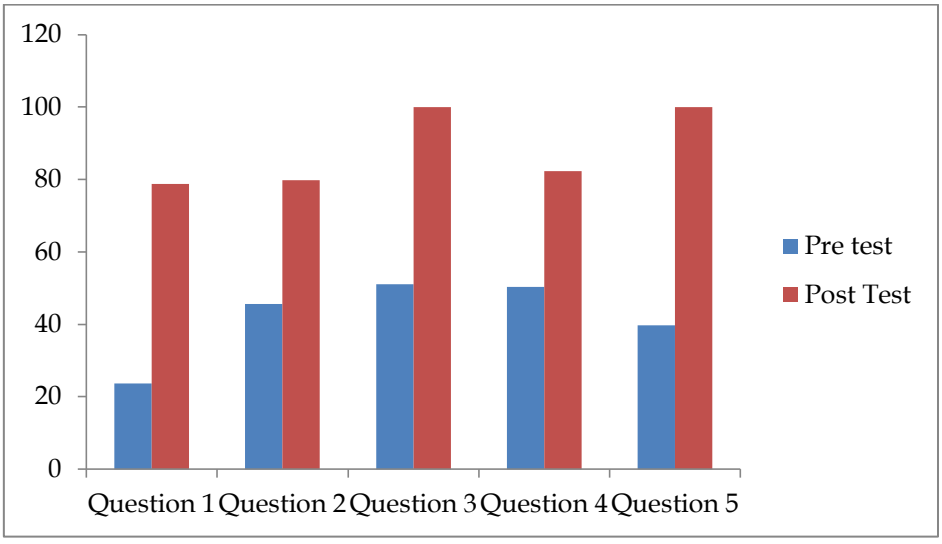

Figure 4. Results of pre-test and post-test scores

If you look at figure 4, you can see a comparison of the average results for the Pretest and post-test scores. The highest average results were found in questions number 3 and 5, while a significant increase was seen in question

number 3. As for finding out students' mathematical knowledge using the discovery learning model, further data processing uses the n-gain table as follows.

Table 2. Students' Mathematical Knowledge

Mean Score		Maximum Score	N-Gain
Pretest	**Post Test**		
5,84	12,24	20	0,43

The N-Gain value in the table above shows that the average pretest score is 5.84, and the average posttest score is 12.24 with a maximum score of 20. After calculating through N-Gain analysis, the average N-Gain score is 0. 43 with medium criteria.

The indicator in question number 1 is classifying an object in statistical material. From the picture of the student's answers, students are still wrong in determining whether the question is a group or single solution. The indicator in question number 2 is re-explaining, students are less able to explain relevant information.

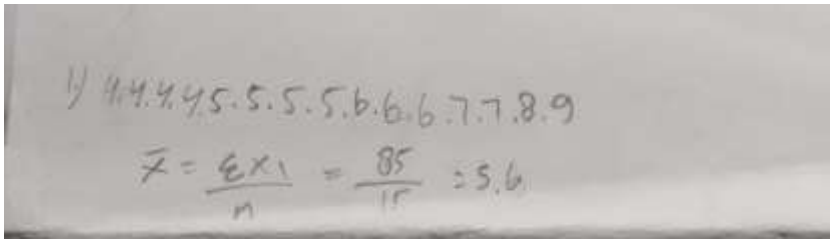

Figure 5. Student answer no. 1 Pre-test

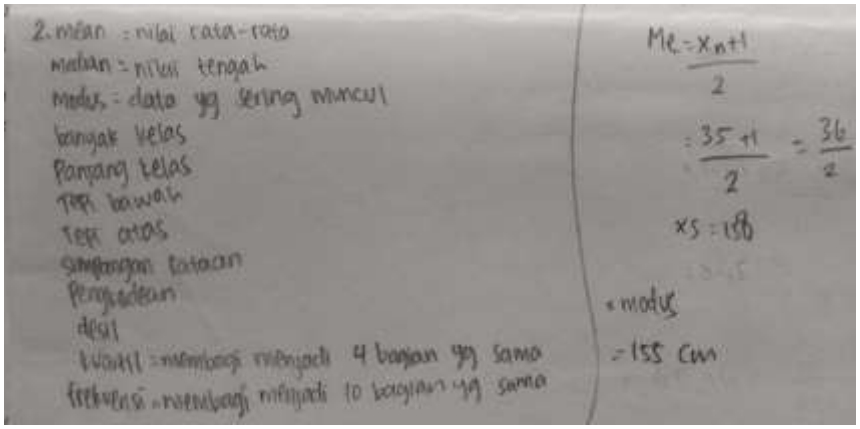

Figure 6. Student answer no. 2 Pre-test

Indicators for questions 3, 4, and 5 are implementing a concept that is already known. From the results of students' answers, students were still wrong in determining the results of the answers and did not provide further explanations regarding the answers.

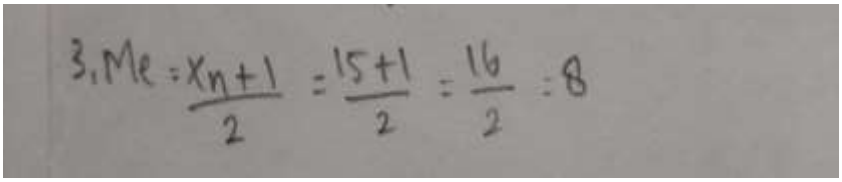

Figure 7. Student Answer Number 3 Pre-test

Figure 8. Shiva's Answer Number 4 Pre-test

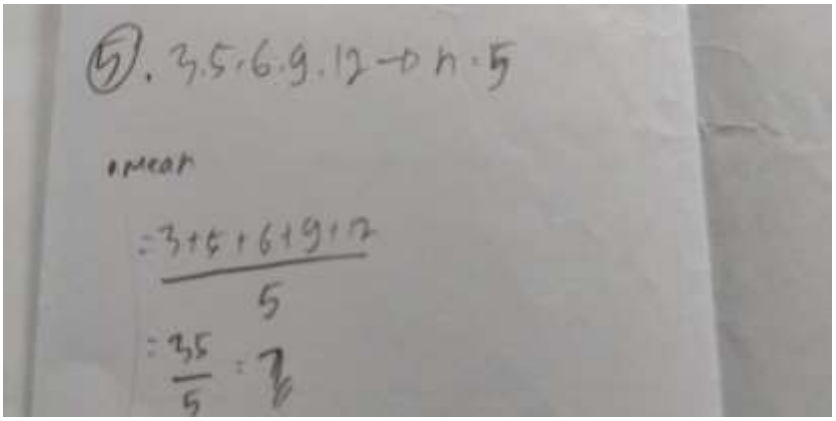

Figure 9. Student Answer Number 5 Pre-test

After carrying out the pre-test, students are given action by learning using the discovery learning model for 2 cycles/4 meetings. After that, students were given a post-test to see whether there was an influence of using the Discovery Learning model on senior high school students' mathematical understanding abilities. Below is a discussion of the results of the post-test answers.

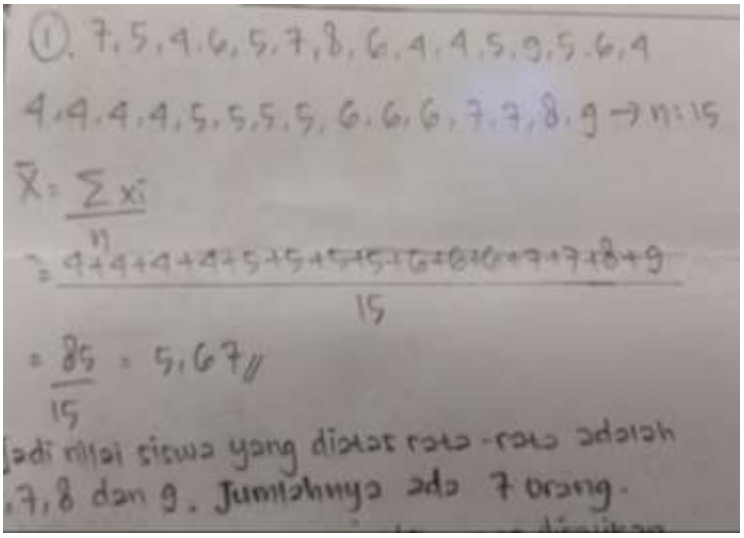

Figure 10. Student Answer Number 1 Post-test

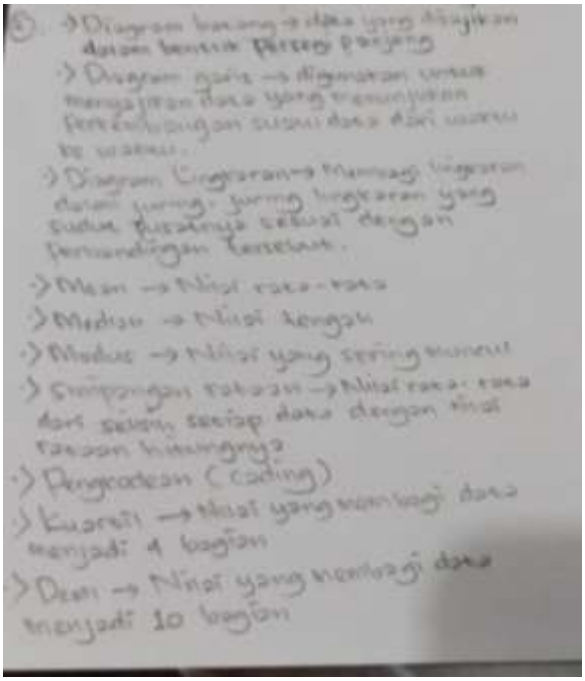

Figure 11. Student Answer Number 2 Post-test

After receiving action, students' answers to number 1 and number 2, students can classify the problem solutions into group data or single data and students can provide further explanations after getting the answer results.

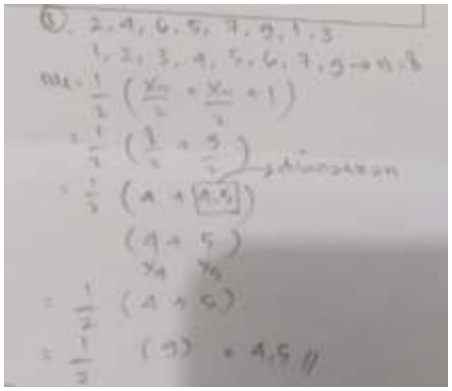

Figure 12. Student Answer Number 3 Post-test

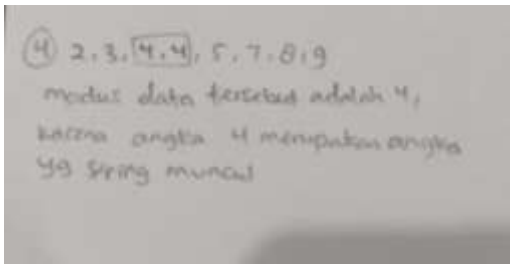

Figure 13. Student Answer Number 4 Post-test

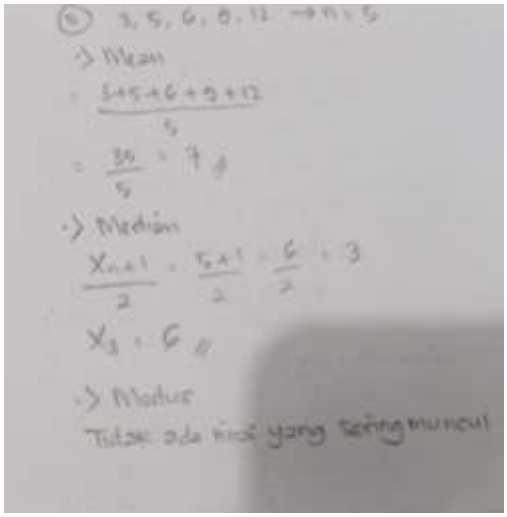

Figure 14. Student Answer Number 5 Post-test

Answers to questions number 3, 4, and 5 are indicators of implementing the concept, students can solve the questions get results, and provide further explanations.

CONCLUSION

Based on the classroom action research that has been carried out, it can be concluded that there is an influence of the Discovery Learning Model on the mathematical communication skills of class XII senior high school students. This can be seen from an increase in the results of the pre-test and post-test on the Statistics material, data concentration, and N-Gain results obtained in the Medium category.

REFERENCES

Aida, N., & Hamdani, A. S. (2017). Karakteristik instrumen penilaian hasil belajar matematika ranah kognitif yang dikembangkan mengacu pada model PISA. *Suska: Journal of Mathematics Education, 3*(2), 130-139.

Anastasha, D. A. (2020). Pengaruh model pembelajaran inquiry terhadap pemahaman matematika siswa kelas V berdasarkan jenis kelamin di SD Negeri Kota Padang. *Jurnal Serambi Akademica, 8*(1), 1–14. Retrieved from https://ojs.serambimekkah.ac.id/index.php/serambi-akademika /article/view/1808.

Anisa, R. N., Ruswana, A. M., & Zamnah, L. N. (2021). Analisis kemampuan pemahaman konsep matematis peserta didik SMP pada materi aljabar. *JKIP (Jurnal Keguruan Dan Ilmu Pendidikan), 2*(3), 237–242. https://doi.org/10.25157/j-kip.v2i3.6271.

Aripin, U., Setiawan, W., & Hendriana, H. (2019). Critical thinking profile of mathematics in integral materials. *Journal of Educational Experts, 2*(2), 97–106. https://doi.org/10.30740/jee.v2i2p97-106.

Cahtini, C., Soekisno, R. bambang A., & Yumiati. (2023). Pengaruh model pembelajaran problem based learning dan discovery learning terhadap kemampuan pemahaman matematis ditinjau dari gaya belajar siswa. *Pendas : Jurnal Ilmiah Pendidikan Dasar, 8*(2), 1391–1405. https://doi.org/ 10.23969/jp.v8i2.9635.

Efendi, R. N., & Nugraha, U. (2024). Analisis kebutuhan pengembangan modul elektronik matematika berbasis discovery learning. *Jurnal Pendidikan Tematik Dikdas*, *9*(1), 17–24. https://doi.org/10.22437/jptd. v9i1.26413.

Kahar, M. S., Layn, M. R., & Mandasari, I. (2018). Pengaruh penerapan model pembelajaran interactive conceptual interaction (ICI) dalam pemecahan

masalah matematika peserta didik. *Jurnal Noken: Ilmu-Ilmu Sosial*, *3*(2), 56. https://doi.org/10.33506/jn.v3i2.108.

Kase, F. M. Y., Nesti, R. D. H., Senid, P. P., Senia, M. E., & Djawa, R. (2021). Analisis kesulitan siswa berdasarkan kemampuan pemahaman matematis dalam menyelesaikan soal cerita pada materi FPB dan KPK. *Fraktal: Jurnal Matematika Dan Pendidikan Matematika*, *2*(2), 29–42. https://doi.org/10.35508/fractal.v2i2.5638.

Khansa, S. L., Pramudya, I., & Kuswardi, Y. (2018). Penerapan model pembelajaran discovery learning dengan startegi ARIAS untuk meningkatkan pemahaman konsep dan motivasi pada materi relasi dan fungsi. *Jurnal Pendidikan Matematika Dan Matematika (JPMM)*, *2*(4), 259–272.

Luritawaty, I. P. (2018). Pembelajaran take and give dalam upaya mengembangkan kemampuan pemahaman konsep matematis. *Mosharafa: Jurnal Pendidikan Matematika, 7*(2), 179-188. https://doi.org/10.31980/mosharafa.v7i2.499.

Maharani, B. Y., & Hardini, A. T. A. (2016). *Penerapan model pembelajaran discovery learning berbantuan benda konkret untuk meningkatkan hasil belajar IPA*. (Doctoral dissertation, Program Studi Pendidikan Guru Sekolah Dasar FKIP-UKSW).

Mahtuum, Z. A., Nurhayati, A., Hidayat, W., & Rohaeti, E. E. (2020). Analisis kemampuan pemahaman matematis siswa kelas vii smp budi luhur pada materi perbandingan. *Jurnal Pembelajaran Matematika Inovatif*, *3*(2), 137–144. https://doi.org/10.22460/jpmi.v3i1.p137-144.

Manalu, A. C. S., & Afrilianto, M. (2020). Peningkatan kemampuan pemahaman matematis siswa kelas VIII SMP pasundan 9 Bandung pada materi persamaan garis lurus dengan menggunakan pendekatan konstektual. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *3*(4), 363–370. https://doi.org/10.22460/jpmi.v3i4.363-370.

Mariza, D. F. (2015). Pengaruh model pembelajaran discovery learning terhadap hasil belajar siswa pada materi pokok suhu dan kalor. *INPAFI (Inovasi Pembelajaran Fisika)*, *3*(2). https://doi.org/10.24114/inpafi.v3i2.5130.

Pebrianti, W., & Puspitasari, N. (2023). Kemampuan pemahaman konsep pada materi sistem persamaan linear dua variabel ditinjau dari perbedaan gender siswa SMP kelas VIII. *Jurnal Inovasi Pembelajaran Matematika:*

PowerMathEdu, *2*(1), 55–70. https://doi.org/10.31980/powermathedu.v2i1.2733.

Priyambodo, S. (2016). Peningkatan kemampuan pemahaman konsep matematis siswa dengan metode pembelajaran personalized system of instruction. *Mosharafa: Jurnal Pendidikan Matematika*, *5*(1), 10–17. https://doi.org/10.31980/mosharafa.v5i1.340.

Purwati, R. P. (2020). Upaya peningkatan keaktifan belajar peserta didik dengan pendekatan discovery learning menggunakan google classroom. *Habitus: Jurnal Pendidikan, Sosiologi, & Antropologi*, *4*(1), 202. https://doi.org/10.20961/habitus.v4i1.45725.

Rahayu, D., Muttaqien, M., & Solikha, M. (2023). Pengaruh model pembelajaran discovery learning berbantu educandy terhadap hasil belajar siswa. *Jurnal Edukasi*, *1*(2), 234–246. https://doi.org/10.60132/edu.v1i2.149.

Ridia, N. S., & Afriansyah, E. A. (2019). Perbandingan kemampuan pemahaman matematis siswa melalui auditory intellectualy repetition dan student teams achievement division. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(3), 515–526. https://doi.org/10.31980/mosharafa.v8i3.586.

Rohaeti, E. E., & Bernard, M. (2018). The students' mathematical understanding ability through scientific-assisted approach of geogebra software. *Infinity Journal*, *7*(2), 165. https://doi.org/10.22460/infinity.v7i2.p165-172.

Santoso, G., & Sari, P. K. (2019). Proceedings of educational initiatives research colloquium 2019. In *International Society for educational Initiative (ISEI)*. Retrieved from https://repository.umj.ac.id/3560/8/Final%20Proceeding%20COLOCIUM.pdf.

Sugandi, A. I., & Bernard, M. (2018). Penerapan pendekatan kontekstual terhadap kemampuan pemahaman dan komunikasi matematis siswa SMP. *Jurnal Analisa*, *4*(1), 16–23. https://doi.org/10.15575/ja.v4i1.2364.

Sunarto, M. T., Laa, S. P. Y. O., Mahtuum, Z. A., Siagian, G. T., & Afrilianto, M. (2021). Meningkatkan kemampuan pemahaman matematis siswa smp melalui pendekatan kontekstual. *Mosharafa: Jurnal Pendidikan Matematika*, *10*(1), 85–94. https://doi.org/10.31980/mosharafa.v10i1.730.

Yani, C. F., Maimunah, Roza, Y., Murni, A., & Daim, Z. (2019). Analisis kemampuan pemahaman matematis siswa pada materi bangun ruang sisi lengkung. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(2), 203–214. https://doi.org/10.31980/mosharafa.v8i2.553.

Yulaistin, S., & Roesdiana, L. (2022). Analisis kemampuan pemahaman konsep matematis siswa kelas IX SMP pada materi translasi. *Didactical Mathematics*, *4*(1), 31–39. https://doi.org/10.31949/dm.v4i1.2010.