An Analysis of Students' Mathematical Problem-Solving Ability on Students of SMK As-Salaam Jatibarang Based on Learning Independence

Farid Gunadi[1]; Wiwit Damayanti Lestari[*2]; Rikana[3]
Program Studi Pendidikan Matematika, FKIP, Universitas Wiralodra[1,2,3]
E-mail: faridgunadi@unwir.ac.id[1], wiwitdamayantilestari@unwir.ac.id[2], rikana@unwir.ac.id[3]

Abstract

The purpose of this study is to find out an overview of students' mathematical comprehension ability based on high, medium, and low learning independence. This research is a qualitative method research. The subjects in this study were students of class XI TKJ SMK As-Salaam Jatibarang in the odd semester of the 2021/2022 academic year. The data collection methods used are tests, questionnaires, interviews and documentation, as well as field notes. The results of the questionnaire will be selected according to the learning independence category, and the test results will be analyzed using the ATLAS.ti 8 application and interviews to students according to the category of learning independence that has been selected according to the results of the learning independence questionnaire. The results of this study are students of class XI TKJ SMK As-Salaam Jatibarang who have high learning independence will have high mathematical comprehension ability, students who have low learning independence will have low mathematical comprehension ability, but students who have learning independence will have high mathematical comprehension ability.

Keywords: *Students Mathematical Problem Solving Ability; Problem Solving; Learning Independence.*

Abstrak

Tujuan penelitian ini adalah untuk mengetahui gambaran tentang kemampuan pemahaman matematis siswa berdasarkan kemandiran belajar tinggi, sedang, dan rendah, Penelitian ini adalah penelitian metode kualitatif deskriptif. Subjek dalam penelitian ini adalah siswa kelas XI TKJ SMK As-Salaam Jatibarang semester ganjil tahun ajaran 2021/2022. Metode pengumpulan data yang digunakan adalah tes, angket, wawancara dan dokumentasi, serta catatan lapangan. Hasil angket akan dipilih sesuai kategori kemandirian belajar, serta hasil tes dianalisis menggunakan aplikasi ATLAS.ti 8 dan wawancara kepada siswa sesuai kategori kemandirian belajar yang sudah dipilih sesuai hasil angket kemandirian belajar. Hasil dari penelitian ini adalah siswa kelas XI TKJ SMK As-Salaam Jatibarang yang berkemandirian belajar tinggi akan memiliki kemampuan pemahaman matematis yang tinggi, siswa yang berkemandirian belajar rendah akan memiliki kemampuan pemahaman matematis yang rendah,

*Correspondence:
Email: wiwitdamayantilestari@unwir.ac.id

namun siswa yang memiliki kemandirian belajar sedang ternyata memiliki kemampuan pemahaman matematis tinggi.

Kata Kunci: *Kemampuan Pemecahan Masalah Matematis Siswa; Pemecahan Masalah; Kemandirian Belajar.*

INTRODUCTION

Mathematics is one of the fields that has very important disciplines in education, and becomes a means in intellectual abilities, as well as supporting the development of modern technology (Reski et al., 2019). Mathematics is a lesson that must be mastered well, but in general, mathematics subjects are often considered difficult by some students, so it is not surprising that there are many students who do not like this lesson. Mathematics is one of the basic sciences that has a very important role in the world of education, because mathematics is a tool that can be used to shape students to think scientifically (Hendra, 2018). Mathematics is also still seen as one of the fields of study that is disliked and even most hated by students who study it, because they argue that mathematics is difficult to learn (Nuryana & Rosyana, 2019).

According to the National Council of Teachers of Mathematics, there are five basic skills in mathematics, namely problem solving skills, reasoning and proof skills, connections, communication skills and representation skills (Hidayat & Sariningsih, 2018). In mathematics learning, problem solving is the core in a learning is a basic ability in every learning process. A problem solving is an attempt by a person to solve a mathematical problem using a concept or method that has been mastered (Firdaus et al., 2020). However, the mathematical problem-solving ability of every student in Indonesia is still relatively low. The results of the TIMSS (Trends in International Mathematics and Science Study) survey in 2015 showed that Indonesia was ranked in the bottom 4 out of 43 countries that participated in TIMMS with an average score of 397 (Firdaus et al., 2020).

In early 2020, there was an outbreak that spread around the world called Covid-19. Indonesia is one of the countries that take preventive measures, one of which is by keeping a distance. The government issued a policy to change the

implementation of conventional to online learning. During the current pandemic, students are encouraged to study independently even though they are still monitored by teachers and their parents. Problem solving is defined as a process of active activity that includes the methods and strategies that students have in solving an existing problem until they find the correct or appropriate answer (Maharani & Bernard, 2018). But in fact, in learning, students often view the final answer of a problem as the ultimate goal in solving the problem that given by the teacher (Mariam et al., 2019). In fact, in the process of solving a problem that given by the teacher to the students is the main goaL in the learning of solving mathematical problems.

Facts in the field are still very low regarding mathematical problem-solving ability that seen by their learning independence (Mayasari & Rosyana, 2019). A factor that also determines the success of mathematics learning is the student's learning independence (Reski et al., 2019). Therefore, students' learning independence is very influential in mathematics learning. Learning independence is an effort made to carry out learning activities in an independent way on the basis of their own motivation to master a certain material so that it can be used to solve the problem at hand (Amalia et al., 2018). The independence in learning mathematics is one of the many factors that greatly affect students' mathematical problem-solving ability, because learning independence requires students to be able to take initiative, overcome problems, and be able to do things independently by not excluding the social life around them (Firdaus et al., 2020). Learning independence is a learning activity carried out by students without relying on the help of others, both friends and teachers in achieving learning goals, namely to master the material or knowledge well and the students' own awareness and be able to apply their knowledge in solving problems in everyday life (Prihasyto et al., 2019).

Based on the description above and some of the results of previous studies, the fact is that Indonesian students have low average problem-solving ability in terms of their learning independence, so the purpose of this study is to find out

how the mathematical problem-solving ability of students has based on learning independence.

RESEARCH METHODS

This research is a descriptive qualitative research. The research steps used are preparation, implementation, and reporting. The research was conducted in the odd semester of the 2021/2022 academic year. The subjects in this study were class XI students of TKJ SMK As-Salaam Jatibarang odd semester in the 2021/2022 school year, with a population of 16 students then selected 3 students with high, medium, and low abilities who were sampled. Methods of collecting data by using tests, questionnaires, interviews, documentation and field notes. The test to measure students' mathematical problem solving ability consists of 3 description questions.

The ability to solve mathematical problems is in accordance with the steps according to Polya (Cahyani & Setyawati, 2016) as follows: understanding the problem, making plans, implementing the completion plan, and checking again. To find out the mathematical problem-solving ability of each student who is categorized into 3 categories, namely: high category, medium category, and low category. The range of the problem-solving ability grouping scale is obtained from the following calculations (Senjaya, 2017):

Category 1 (high) : $\mu + 1\sigma <$ Score $\leq$ maximum score

Category 2 (medium) : $\mu - 1\sigma <$ Score $\leq \mu + 1\sigma$

Category 3 (low) : minimum score < Score $\leq \mu - 1\sigma$

Here's the coding according to the researcher:

P: Researcher

B1: Students who have High learning independence

B2: Students who have Medium learning independence

B3: Students who have Low learning independence

S1: Question number 1

S2: Question number 2

S3: Question number 3

Questionnaires are used to obtain data on learning independence. According to Budiyon, the questionnaire method is a way of collecting data through submitting written questions to research subjects, respondents, or data sources and the answers are also given in writing (Firdaus et al., 2020). The questionnaire was given to the student with 25 statements that had to be answered with 5 alternative choices of answers: very often (SS), often (S), sometimes (KD), rarely (J), rarely (JS), to find out the independence of learning. Indicators of learning independence in this study use indicators according to Yudhanegara and Lestari (Rahmadani et al., 2017), namely: (a) learning initiatives; (b) have the ability to self-determination; (c) diagnose learning needs; (d) creativity and initiative in utilizing learning resources and choosing learning strategies; (e) monitor, regulate, and control learning; (f) able to restrain himself; (g) make your own decisions; (h) able to overcome the problems.

Interviews are used to find out students' mathematical problem-solving abilities, from interview activities that conducted by researchers to get accurate answers from students. This interview was conducted with 3 students who had high, medium, and low problem-solving abilities. Interviews are conducted to students who have been selected according to categories in learning independence to confirm test results and questionnaires.

Documentation is carried out for the purposes of the necessary data. Budiyono argues that the documentation method is a way of collecting data by looking at it in existing documents (Firdaus et al., 2020). Documentation techniques are used to obtain research data in the form of documents, photos and videos.

RESULTS AND DISCUSSIONS

The sample in this study was determined based on data obtained from the results of the student learning independence questionnaire. On Thursday, November 12, 2021, researchers distributed a learning independence questionnaire to class XI students of TKJ SMK As-Salaam Jatibarang. After that, the researchers conducted a scoring of the learning independence questionnaire

sheet that had been answered by the students. Students who have a score between 77.6 to 125 are included in the category of high learning independence, students who have a score between 64.4 to 77.6 are included in the medium category, while students who have a score between 0 to 64.4 are included in the category of low learning independence. Based on the results of the scoring, it is known that of the 16 students who answered the learning independence questionnaire, 6 students who entered the category of high learning independence, 9 students who entered the category of medium learning independence and 1 student who falls into the category of low learning independence. Based on the average questionnaire score, it was obtained that class XI students of TKJ SMK As-Salaam Jatibarang have learning independence in the moderate category.

The results of the student's mathematical problem-solving ability test based on learning independence are classified into 3 categories, namely students who have a score between 20 to 30 classified into the category of high problem solving ability, students who have a score between 10 to 20 classified into medium category, while students who have a score between 0 to 10 classified into low category. Based on the results of the scoring, it is known that of the 11 students who did the problem-solving ability test questions were grouped into 3 categories, namely 6 students with high category problem solving ability, 3 students with problem solving ability in the medium category and 2 students with problem solving ability with low category. Based on the results obtained, the average problem-solving ability possessed by class XI students of TKJ SMK As-Salaam Jatibarang is a high category.

Based on the scoring of the results of the questionnaire and the test has been done by students, the next step is to conduct interviews with students who have learning independence in each category, namely high, medium and low categories of 1 student each. Table 1 below is the data on students' mathematical problem-solving ability scores based on the learning independence to be interviewed.

Table 1. Student Mathematical Problem Solving Ability Score Results Based on Learning Independence

Student Initials	Scoring Category	Questionnaire	Test score	Student Code
AG	High	91	21	B1
NV	Medium	66	21	B2
DA	Low	51	1	B3

Based on the results of the interviews that have been conducted, the analysis of how students answer the test questions given is as follows:

1. B1 Data Source

Here are the results of the B1 interview in answering S1.

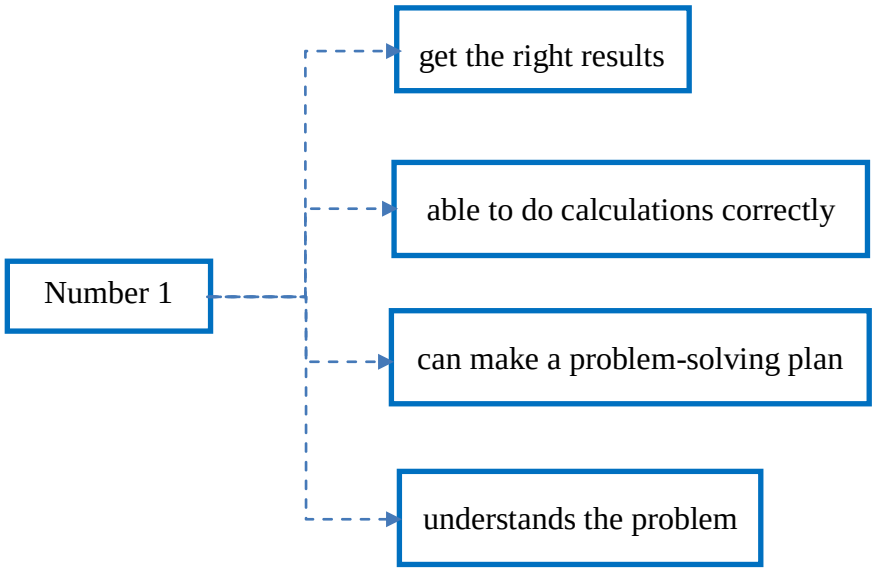

Figure 1. B1 Interview Results in Answering S1

Based on figure 1, it is obtained that B1 in answering S1 really understands the problem and can make a problem-solving plan that leads to the right solution and is able to do calculations correctly so as to get the right results. Meanwhile, when answering S2, based on figure 2, it was obtained that B1 did not understand the problem so that the plan to understand the problem was not right and got incorrect results.

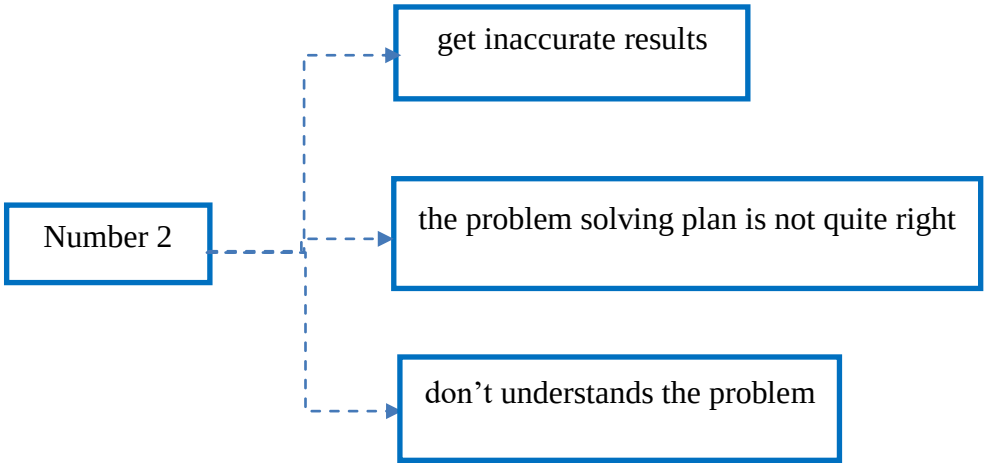

Figure 2. B1 Interview Results in Answering S2

Meanwhile, B1 when answering S3, based on figure 3, it is found that B1 can understand the problem and make the right problem-solving plan so as to get the right results.

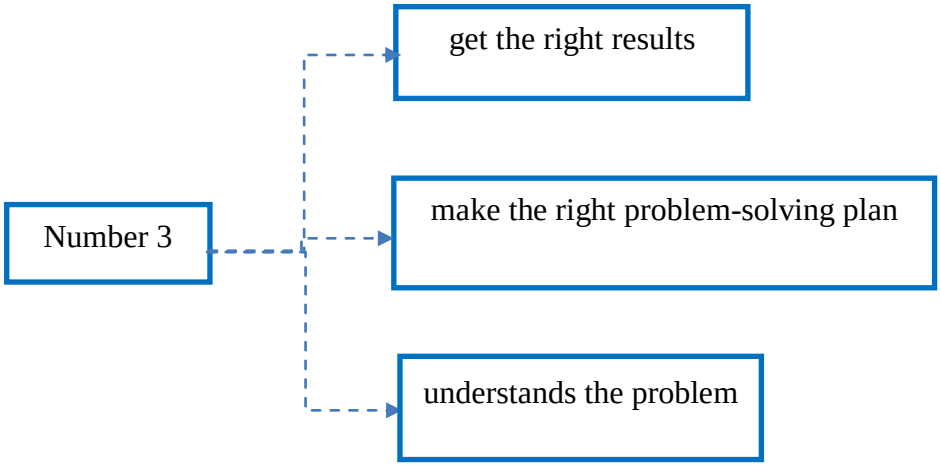

Figure 3. B1 Interview Results in Answering S3

2. Data Source B2

Based on figure 4, it is found that in the B2 data source when answering S1, it does not understand the problem but can make a problem-solving plan that leads to the right solution and is able to perform calculations correctly so as to get the correct results.

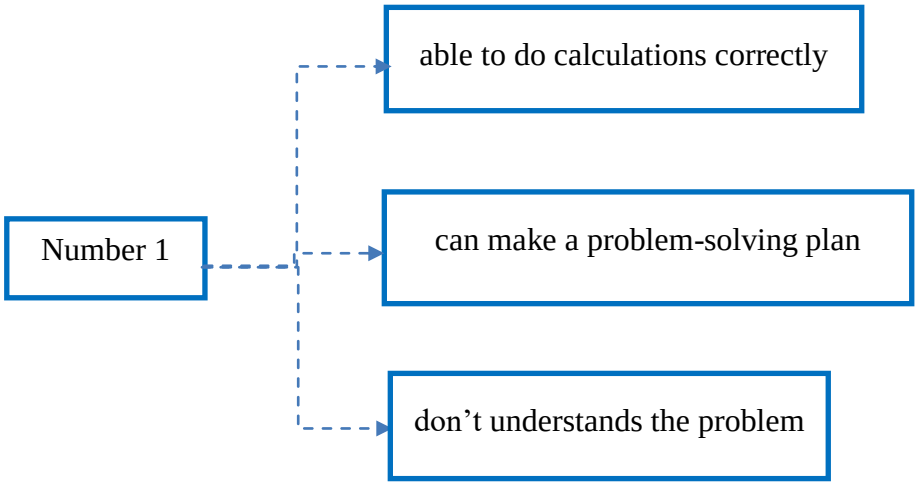

Figure 4. B2 Interview Results in Answering S1

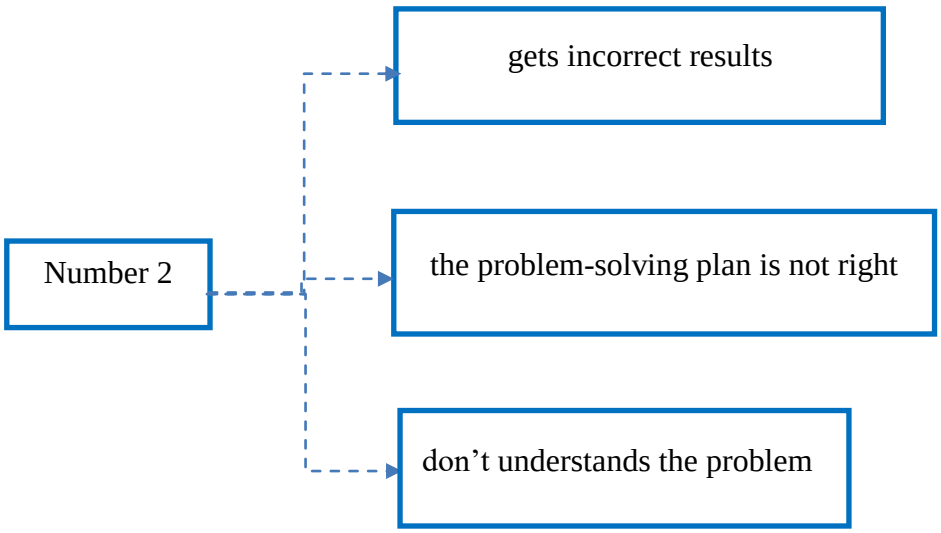

Figure 5. B2 Interview Results in Answering S2

Meanwhile, when answering S2, in figure 5, it is found that B2 does not understand the problem so that the problem-solving plan is not right and gets incorrect results. Meanwhile, B2 when answering S3, in figure 6, it is obtained that B2 can understand the problem and make the right problem solving plan so as to produce the right one.

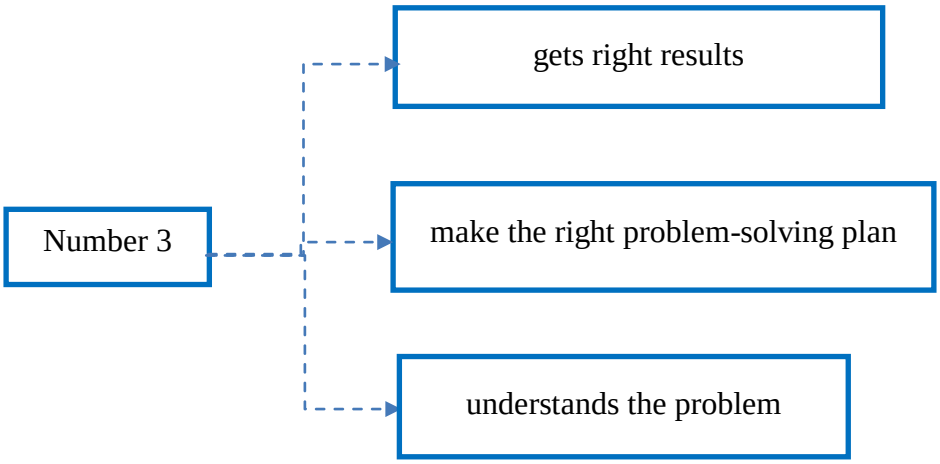

Figure 6. B2 Interview Results in Answering S3

3. B3 Data Source

Based on figure 7, it is found that in the B3 data source when answering S1, unable to understand the problem and unable to make a problem-solving plan that leads to the correct solution and is not able to perform calculations correctly so as not to get the correct result.

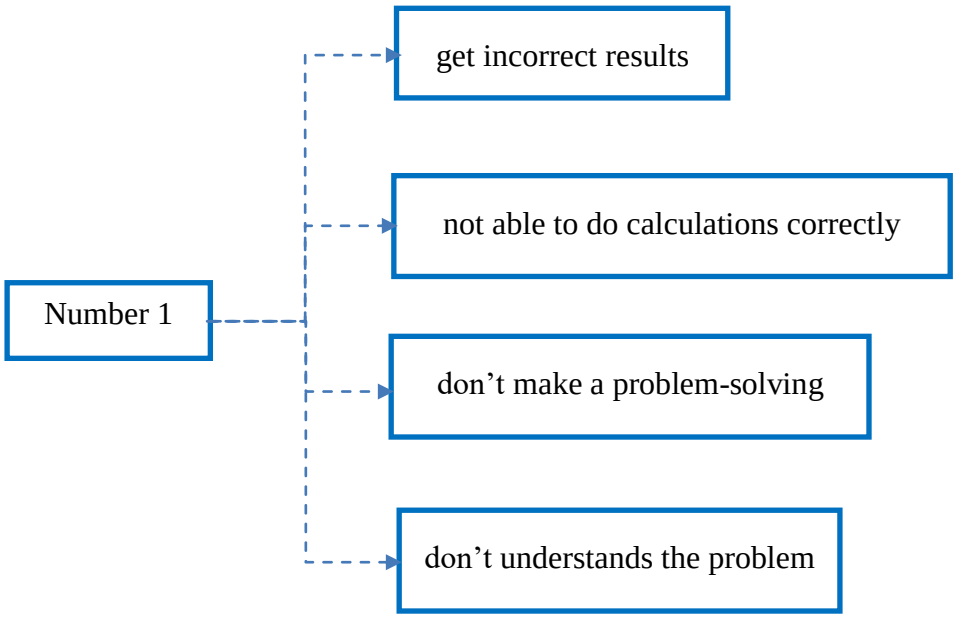

Figure 7. B3 Interview Results in Answering S1

Meanwhile, when answering S2, in figure 8, it is found that B3 does not understand the problem so that the plan to understand the problem is not correct and gets improper results.

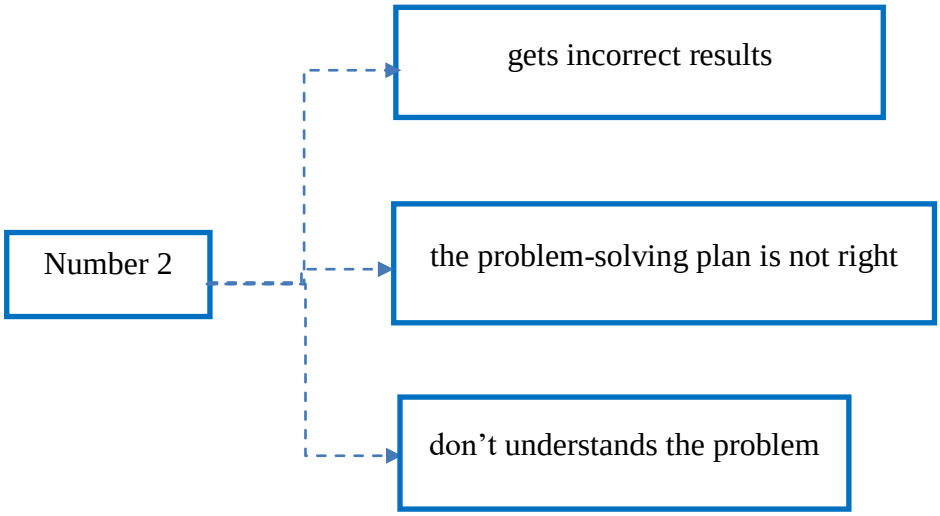

Figure 8. B3 Interview Results in Answering S2

In answering S3, in figure 9, it is found that B3 cannot understand the problem and make an improper problem-solving plan so as to get the right results.

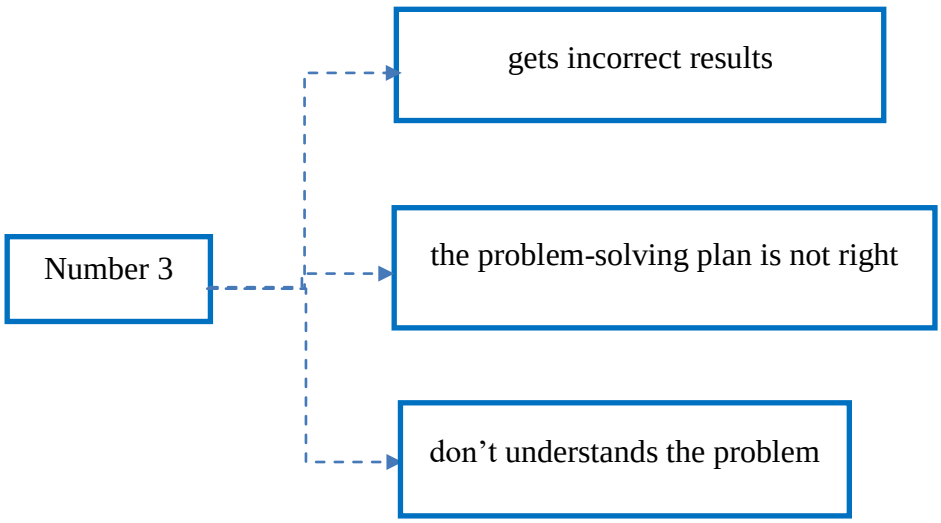

Figure 9. B3 Interview Results in Answering S3

Based on the data that has been obtained, learning independence is very helpful for students in doing problem-solving ability problems and in the learning process. Learning independence also greatly affects students in solving a problem

given by the teacher. Learning independence greatly affects problem-solving ability.

Based on the data presented, it shows that B1 who has high learning independence will have high problem-solving ability. While B2 has moderate independence but has high problem-solving ability. And B3 has low learning independence, it has low problem-solving ability. In other words, the higher the learning independence that students have, the higher the mathematical problem-solving ability, on the other hand, if students have low learning independence, they will have low mathematical problem-solving ability. However, not all who have moderate learning independence have moderate problem-solving abilities.

The implication of this study is that there is a relationship between student learning independence and the student's problem-solving ability, so that students' mathematical problem-solving ability can be improved by increasing their learning independence. The limitations in this study are: inviting students to be willing to help this research according to plan by having 4 meetings, but in fact more than 4 meetings for research. In addition, inviting students who have been selected to conduct interviews is a little bit of an obstacle because at the time of the first meeting to conduct an interview there was a mistake and had to be re-interviewed with the selected respondents. In addition, due to the Covid-19 pandemic, there are difficulties when asking teachers for schedules to conduct meetings with students whose schedules clash with teaching and learning activities due to time constraints.

CONCLUSION

Based on the results obtained in this study, it can be concluded that: Based on the average questionnaire score, it was obtained that class XI students of TKJ SMK As-Salaam Jatibarang have learning independence with a moderate category. Based on the test results, it was obtained that the average problem-solving ability possessed by class XI students of TKJ SMK As-Salaam Jatibarang is a high category. There is a relationship between learning independence and students' mathematical problem-solving ability. Students who have high learning

independence then have high problem-solving ability, students who have moderate learning independence but have high problem-solving ability, and students who have low learning independence then have low problem-solving ability

REFERENCES

Amalia, A., Syafitri, L. F., Triyana, V., & Sari, A. (2018). Masalah Matematik Dengan Self Efficacy Dan Kemandirian Belajar Siswa Smp. *Urnal Pembelajaran Matematika Inovatif*, *1*(5), 887–894.

Cahyani, H., & Setyawati, R. W. (2016). Pentingnya Peningkatan Kemampuan Pemecahan Masalah Melalui PBL untuk Mempersiapkan Generasi Unggul Menghadapi MEA. *PRISMA, Prosiding Seminar Nasional Matematika*, 151–160.

Firdaus, A. E., Pujiastiuti, H., & C. A. H, F. . (2020). Matematis Ditinjau Dari Kemandirian Belajar Siswa. *Jurnal Inovasi Dan Riset Pendidikan Matematika*, *1*(4), 367–382.

Hendra, H. (2018). Peningkatan Hasil Belajar Matematika Siswa Kelas Xi Ipa Sman Negeri 1 Bangkinang Melalui Model Pembelajaran Kooperatif Tipe Stad. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *2*(2), 29–41. https://doi.org/10.31004/cendekia.v2i2.47

Hidayat, W., & Sariningsih, R. (2018). KEMAMPUAN PEMECAHAN MASALAH MATEMATIS DAN ADVERSITY QUOTIENT SISWA SMP MELALUI PEMBELAJARAN OPEN ENDED. *Jurnal JNPM (Jurnal Nasional Pendidikan Matematika)*, *2*(1), 109–118. https://doi.org/10.1016/S0962-8479(96)90008-8

Maharani, S., & Bernard, M. (2018). Analisis Hubungan Resiliensi Matematik Terhadap Kemampuan Pemecahan Masalah Siswa Pada Materi Lingkaran. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *1*(5), 819. https://doi.org/10.22460/jpmi.v1i5.p819-826

Mariam, S., Nurmala, N., Nurdianti, D., Rustyani, N., Desi, A., & Hidayat, W. (2019). Analisis Kemampuan Pemecahan Masalah Matematis Siswa MTsN Dengan Menggunakan Metode Open Ended Di Bandung Barat. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *3*(1), 178–186. https://doi.org/10.31004/cendekia.v3i1.94

Mayasari, M., & Rosyana, T. (2019). Pengaruh Kemandirian Belajar terhadap Kemampuan Pemecahan Masalah Matematis Siswa SMP. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, *3*(1), 11. https://doi.org/10.31331/medivesveteran.v3i1.646

Nuryana, D., & Rosyana, T. (2019). Analisis Kesalahan Siswa Smk Dalam

Menyelesaikan Soal Pemecahan Masalah Matematik Pada Materi Program Linear. *Jurnal Pendidikan Matematika*, *3*(1), 11–20.

Prihasyto, M., Nindiasari, H., & Syamsuri, S. (2019). Pendekatan Problem Centered Learning Terhadap Kemampuan Pemecahan Masalah Dan Kemandirian Belajar Matematika Ditinjau Dari Gaya Belajar. *TIRTAMATH: Jurnal Penelitian dan Pengajaran Matematika*, *1*(1), 16. https://doi.org/10.48181/tirtamath.v1i1.6884

Rahmadani, D., Siagian, P., & Napitupulu, E. (2017). Pengembangan Perangkat Pembelajaran Berbasis Masalah Untuk Meningkatkan Kemandirian Belajar Siswa Sma Negeri 2 Binjai. *Pjpm*, *12*(2), 1–5.

Reski, R., Hutapea, N., & Saragih, S. (2019). Peranan Model Problem Based Learning (PBL) terhadap. *Juring: Journal for Research in Mathematics Learning*, *2*(1), 49–057.

Senjaya, A. J. (2017). *Statistika Terapan Untuk Penelitian Bidang Pendidikan dan Pengajaran*. fkipunwir Press.