

# The Effect of Adversity Quotient and Self-Efficacy on The Ability of Understanding Mathematical Concepts of Vocational High School Students

Wulan Rahmayanti<sup>1\*</sup>, Leni Marlana<sup>2</sup>

Universitas Muhammadiyah Prof. Dr. Hamka, DKI Jakarta, Indonesia

Email : [rahmaulan2000@gmail.com](mailto:rahmaulan2000@gmail.com)<sup>1</sup>, [lenimarlena@uhamka.ac.id](mailto:lenimarlena@uhamka.ac.id)<sup>2</sup>

## INFORMASI ARTIKEL

Tersedia Online pada:

27 Agustus, 2025

### Kata Kunci:

Adversity Quotient, Self-Efficacy, Pemahaman Konsep Matematis.

### Keywords:

Adversity Quotient, Self-Efficacy, Mathematical Concept Understanding



This is an open access article under the [CC BY](https://creativecommons.org/licenses/by/4.0/) 4.0 license.

Copyright © 2025 by Author. Published by Universitas Islam Zainul Hasan Genggong

## Abstrak

Penelitian ini bertujuan untuk melihat apakah ada pengaruh AQ dan SE, baik secara parsial maupun simultan terhadap kemampuan pemahaman konsep matematis pada siswa SMK. Metode penelitian yang digunakan adalah penelitian kuantitatif dengan populasi seluruh siswa kelas XI, dan sampel sebanyak 95 siswa. Data dikumpulkan melalui angket untuk mengukur variabel AQ dan SE, serta lima butir soal essay pada materi statistika untuk mengukur kemampuan pemahaman konsep matematis. Hasil analisis menunjukkan bahwa nilai signifikansi AQ dan SE secara berturut-turut sebesar  $0.041(<0.05)$  dan  $0.858(>0.05)$ . Artinya, secara parsial hanya AQ yang memiliki pengaruh terhadap kemampuan pemahaman konsep matematis siswa. Namun, hasil uji F memperlihatkan nilai signifikansi  $0.029(<0.05)$ , sehingga secara simultan AQ dan SE berpengaruh terhadap kemampuan tersebut, dengan kontribusi sebesar 5.4%.

## Abstract

This study aims to see whether there is an influence of AQ and SE, both partially and simultaneously on the ability to understand mathematical concepts in vocational students. The research method used is quantitative research with a population of all grade XI students, and a sample of 95 students. Data were collected through questionnaires to measure AQ and SE variables, as well as five essay questions on statistics material to measure the ability to understand mathematical concepts. The analysis results showed that the significance values of AQ and SE were  $0.041(<0.05)$  and  $0.858(>0.05)$ . This means that partially only AQ has an influence on students' mathematical concept understanding ability. However, the results of the F test showed a significance value of  $0.029(<0.05)$ , so that simultaneously AQ and SE affect the ability, with a contribution of 5.4%.

## INTRODUCTION

Mathematics plays an important role in education because it serves as a means of thinking logically, systematically, critically, and creatively which is needed in various aspects of life (Amalia et al., 2024; Karim & Nurrahmah, 2018). In SMK, mathematics is a compulsory subject that is included in the national content group and provides basic knowledge to support the mastery of expertise lessons (Armianti, 2018). Therefore, understanding mathematical concepts is very important for students in supporting the expertise competencies they learn. Good mathematics skills are needed to help students analyze, solve problems, and apply scientific concepts related to the field of expertise they are studying, so that mathematics becomes one of the important aspects in shaping students' overall competence in SMK (Meidianti et al., 2022; Radiusman, 2020; Setyowati, 2022).

Basically, students who have a good understanding of concepts are not just memorizing formulas, but include the ability to interpret the meaning of concepts, link between concepts, and apply them in various situations (Surven et al., 2022). Thus, concept mastery is the main basis for students in solving problems and as a basis for building more complex knowledge (Lestari, 2023). However, in reality there are still many vocational students who have difficulty in understanding mathematical concepts in depth due to the lack of mastery of basic concepts obtained from previous levels of education, which has an impact on obstacles in learning more complex material. This is supported by research conducted by Ardila & Hartanto (2017), which shows that students' low understanding of mathematical concepts is one of the factors that affect student learning outcomes.

\*Corresponding author.

E-mail addresses: [rahmaulan2000@gmail.com](mailto:rahmaulan2000@gmail.com)

In addition, Rismen et al. (2021) revealed that students' low understanding of concepts is caused by a lack of effort in doing exercises independently, where when given assignments, students tend to copy answers from smarter friends, and have difficulty applying concepts when faced with math problems given by the teacher. These difficulties are not only caused by external factors such as teaching methods or cognitive aspects, but are also strongly influenced by internal student factors. In this study, two important factors that are believed to play a role in the process of understanding mathematical concepts are Adversity Quotient (AQ) and Self Efficacy (SE).

Adversity Quotient, as explained by Stoltz (1997) in (Sugiarti et al., 2020), refers to a person's ability to endure, respond, and overcome difficulties. In addition, Himmah dan Ayun (2024) explained that AQ is the ability of students to persist, struggle, and survive in the face of various learning difficulties. In addition, Irmawanti (2023) revealed that a student can be said to have AQ ability if he is brave in taking a risk and when facing a problem he feels challenged. Based on some of these definitions, it can be concluded that AQ is a person's ability to survive, overcome obstacles, and bounce back from failure. Students with high levels of AQ tend to be more able to face challenges in learning, persevere in doing difficult tasks, and do not give up easily when they fail, including in understanding mathematical concepts (Putra et al., 2023; Safira et al., 2024).

In addition to AQ, another factor that affects the understanding of mathematical concepts is Self-Efficacy (SE). Bandura in (Juniawan, 2020) defines Self-Efficacy as a form of student belief in their ability to complete the tasks/work given at school. In line with that, Ismit dan Lukmana (2023) explained that SE plays a role in influencing a person's mindset, motivation, and belief in carrying out an action to achieve the desired goal. Thus, students who have high self-confidence and desire to learn tend to understand concepts more easily (Rahmi et al., 2020). Students with a high level of SE tend to be more able to complete various tasks, both easy and difficult (Hasmatang, 2019). They will be more confident in facing math problems and have a tendency to be more active in the learning process.

Based on the description above, both AQ and SE have an influence on students' concept understanding ability. In addition, based on the results of searching 1000 articles using PoP software for the last 10 years, it shows that research examining the relationship between AQ, SE, and mathematical ability is still rare. Most of the existing studies tend to focus only on one of the variables or on other aspects of mathematical ability such as reasoning and problem solving. Like the research conducted by Safira et al. (2024) which showed the effect of AQ on students' ability to understand mathematical concepts. Then, the results of research conducted by Rahmi et al. (2020) also showed the effect of SE on concept understanding ability, although it was not significant. In addition, Roza (2021) showed the influence of AQ and SE, both partially and simultaneously on students' statistical reasoning ability.

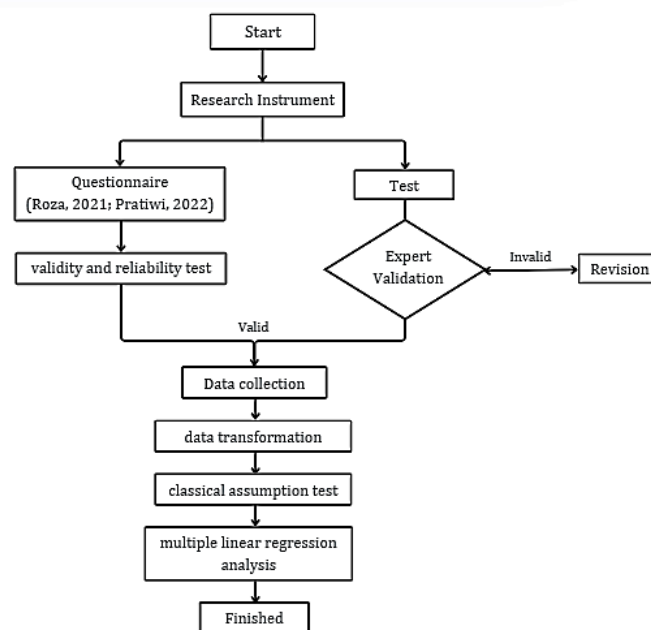
Therefore, this study aims to fill this void by further examining the effect of AQ and SE simultaneously on students' mathematical concept understanding ability at the vocational level. This research is expected to enrich the literature in the field of mathematics education, especially regarding the role of AQ and SE in influencing students' understanding of mathematical concepts at the vocational level.

## **METHODS**

This research is a quantitative study conducted from April to May 2025 at Bina Nusa Mandiri Vocational School, East Jakarta. The population in this study were all grade XI students majoring in DKV, TKJ, Culinary, and AP. The number of samples in this study was 95 students who were determined using the Slovin formula. The research procedure includes the stages of instrument preparation, data collection implementation, and data analysis. The instruments used consist of Likert-scale Adversity Quotient (AQ) and Self-Efficacy (SE) questionnaires, each adapted from Roza (2021) and Pratiwi (2022), and have gone through validity and reliability tests. Of the 16 statement items in the AQ questionnaire, 15 items were declared valid. Meanwhile, in the SE questionnaire, of the 12 statement items, 11 items were declared valid. The

reliability test results show that the AQ questionnaire has a Cronbach's alpha value of 0.865, while the SE questionnaire is 0.818, both of which are greater than 0.6, so the two questionnaires are reliable. The ability to understand mathematical concepts was measured using a five-item essay test, with statistical material, which had been validated by experts. Data collection techniques were carried out through distributing questionnaires and conducting written tests.

Before conducting data analysis, the researchers first converted the ordinal-scale questionnaire data into interval-scale data using Winsteps software. This step was necessary because regression analysis requires data in either interval or ratio form. Once the transformation was completed, the data underwent a series of classical assumption tests, including normality, linearity, multicollinearity, and heteroscedasticity tests, to ensure that all prerequisites for regression analysis were met. The normality test aimed to verify that the residual data followed a normal distribution, with a required significance value greater than 0.05. The linearity test was conducted to determine whether there was a linear relationship between the independent and dependent variables, where the significance value should exceed 0.05. The multicollinearity test assessed whether an excessively high correlation existed between independent variables, with the tolerance value expected to be above 0.01 and the VIF value below 10, indicating the absence of multicollinearity. Lastly, the heteroscedasticity test evaluated whether the variance of residuals remained consistent across all observations; a significance value greater than 0.05 indicated no signs of heteroscedasticity. These tests are important so that the regression model used meets the basic assumptions and produces valid and reliable estimates. After all assumptions were met, the data was analyzed using multiple linear regression analysis with the help of SPSS software. This model was chosen because it allows to see the contribution of each independent variable (AQ and SE), both simultaneously and partially, to the dependent variable, namely students' concept understanding ability. The following is the research flow chart.



**Figure 1.** flowchart of the Research

## RESULTS AND DISCUSSION

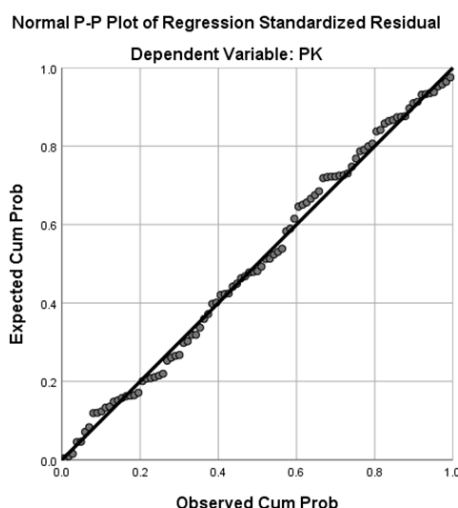
Prior to performing multiple linear regression analysis, the researchers conducted several classical assumption tests, which included normality, multicollinearity, and heteroscedasticity tests. The purpose of the normality test was to assess whether the research data followed a normal distribution, thereby meeting one of the essential prerequisites for

regression analysis. The results of the normality test in this study, involving a total sample of 95 participants ( $N = 95$ ), are presented as follows.

**Table 1.** Summary of Kolmogorov-Smirnov Normality Test Results

		Unstandardized Residual
N		95
Most Extreme Differences	Absolute	0.057
	Positive	0.046
	Negative	-0.057
Test Statistic		0.057
Asymp. Sig. (2-tailed)		0.200

From Table 1 above, the significance value is 0.200 (0.05) and Figure 2 shows that the data distribution follows the diagonal line pattern. Therefore, it can be concluded that the data is normally distributed. In addition, the linearity test results show a linear relationship between the AQ variable and Concept Understanding, as indicated by the significance value of 0.148 ( $>0.05$ ). The same thing is also seen in the relationship between SE variable and Concept Understanding, where the significance value is 0.159 ( $>0.05$ ) which indicates a linear relationship pattern.



**Figure 2.** Normal P-P Plot Results

Additionally, to ensure that there isn't a very strong correlation among independent variables that could affect the accuracy of the regression model, a multicollinearity test was conducted. This test aims to detect the presence or absence of excessive correlation between independent variables, which if it occurs can cause the analysis results to be biased. The results of the multicollinearity test in this study are presented below.

**Table 2.** Summary of Multicollinearity Test Results

Model	Sig.	Collinearity Statistics	
		Tolerance	VIF
Constant	.000		
AQ	.041	.519	1.927
SE	.858		

From Table 2 above, it is obtained that the tolerance value is  $0.519 > 0.100$  and the VIF value is  $1.927 < 10.000$ , so it can be concluded that there is no multicollinearity in the regression model. This indicates that the independent variables used are not too correlated with each other

so that they do not affect the accuracy of the regression coefficient estimates. Furthermore, heteroscedasticity testing is carried out to determine whether the residual variance in the regression model remains or varies at different levels of predicted values. This test is important because heteroscedasticity can make the regression parameter evaluation less efficient and disturb the accuracy of the model. The results of the heteroscedasticity test in this study are shown in Table 3 below.

**Table 3.** Summary of Glejser Heteroscedasticity Test

Model	Standardized Coefficients Beta	t	Sig.
(Constant)		10.574	.000
AQ	.061	.425	.672
SE	.050	.348	.728

Referring to Table 3, the significance values obtained are 0.672 and 0.728, both of which exceed 0.05, indicating that the regression model is free from heteroscedasticity problems. Since all classical assumption tests have been met, the next step is to conduct multiple linear regression analysis to test the effect of the two variables on students' understanding of mathematical concepts. A summary of the multiple regression analysis results is presented in Table 4 below.

**Table 4.** Multiple regression summary

Variables	Unstandardized Coefficients B	t	Sig.
(Constant)	66.957	28.636	.000
AQ	6.582	2.070	.041
SE	-.598	-.179	.858
F	= 3.665		.029
Adjusted R <sup>2</sup>	= .054		

Based on Table 4, the significance value for the AQ variable is below 0.05, which indicates that AQ has a significant partial influence on students' ability to understand mathematical concepts. In contrast, the SE variable shows a significance value above 0.05, indicating that, when viewed individually, SE does not exert a significant influence on this ability. However, the F test results, which assessed the simultaneous effect of both variables, showed a significance value below 0.05. This finding confirms that AQ and SE together have a significant impact on students' understanding of mathematical concepts, contributing 0.054, or 5.4%, to the observed variation. The remaining 94.6% of the variation is due to other factors not explored in this study.

This finding is in line with the results of research by Safira et al. (2024) which shows that there is an influence between AQ on understanding mathematical concepts by 7.453%. This is also supported by Pertiwi et al. (2019) which states that AQ is an important factor that can affect student success in the learning process. This shows that individual resilience in facing challenges and difficulties contributes to the success of understanding mathematical material. On the other hand, the results of this study contradict the results of research conducted by Rahmi et al. (2020) which showed that there was an effect of SE on concept understanding ability, although the effect was not significant. These results indicate that the research conducted makes a new contribution to this field of study, because it produces findings that are different from previous studies.

This may occur due to differences in the characteristics of the population studied, the instruments used, and there are other factors that are more dominant in influencing students' ability to understand mathematical concepts, such as learning motivation, learning style, self -



confidence, and others. In the context of education, students' self-confidence in their abilities plays a very important role in determining learning success. One aspect that represents this belief is SE, which is considered as one of the important factors in supporting the learning process because it plays a role in building students' confidence in their ability to complete learning tasks and face academic challenges (Hasmatang, 2019). Students who have a high level of SE usually have stronger motivation to learn, do not give up easily, and have the willingness to keep trying despite facing various difficulties in the learning process (Nurani et al., 2021). This condition can indirectly support a better understanding of the material and have an impact on improving learning outcomes.

Although partially SE does not have a significant effect on students' mathematical concept understanding ability. However, simultaneously, the two variables have a significant influence on students' mathematical concept understanding ability. This indicates that the combination of AQ and SE can complement each other in supporting the understanding of mathematical concepts. This finding is in line with the results of research conducted by Fitriani dan Pujiastuti (2021) which show that SE affects math learning outcomes with a percentage effect of 65.3%. This shows that students' belief in their own abilities is one of the factors that play a role in achieving learning outcomes, especially in mathematics. However, not all studies show consistent results. Research by Haqqul dan Saraswati (2023) found that self-efficacy has no significant effect on students' mathematical problem solving ability. This difference in results shows that the effect of self-efficacy on students' mathematics abilities can vary depending on the type of ability being measured, the characteristics of the population, and the context of the study.

Although SE is theoretically considered an important factor in supporting the learning process, in practice, self-confidence alone is not enough to guarantee a good understanding of concepts if it is not accompanied by effective learning strategies, resilience in the face of difficulties, and a conducive learning environment. Without the ability to manage challenges and apply appropriate learning methods, even students with high SE can have difficulty in understanding the material in depth. Thus, students who have high AQ tend to be more persistent, do not give up easily, and are able to find solutions when facing difficulties in understanding the subject matter (Pertwi et al., 2019). On the other hand, SE or individual belief in their own abilities also plays an important role. Students who have high SE will be more confident in undergoing the learning process, so they are more active in seeking understanding and are not afraid to try various learning strategies (Ismi & Lukmana, 2023). Therefore, the combination of AQ and SE plays a role in creating learning conditions that support the formation of deeper concept understanding.

## CONCLUSIONS AND SUGGESTIONS

Based on the analysis above, it can be concluded that partially only the AQ variable has a significant influence on students' ability to understand mathematical concepts. Meanwhile, the SE variable does not show a significant influence individually. However, the result of multiple linear regression analysis shows a significance value of  $0.029 < 0.05$ , which indicates a significant influence between AQ and SE variables simultaneously on students' ability to understand mathematical concepts. Future researchers are advised to expand the scope of research by adding other related variables, in order to obtain a more comprehensive understanding of the factors that influence students' mathematical concept understanding ability.

## REFERENCES

- Amalia, R. A., Santika, S., & Hermanto, R. (2024). ANALISIS KEMAMPUAN PEMAHAMAN KONSEP MATEMATIS PESERTA DIDIK DITINJAU DARI ADVERSITY QUOTIENT. *Pedagogy: Jurnal Pendidikan Matematika*, 9, 176–192. <https://doi.org/https://doi.org/10.30605/pedagogy.v9i2.4865>
- Ardila, A., & Hartanto, S. (2017). FAKTOR YANG MEMPENGARUHI RENDAHNYA HASIL BELAJAR MATEMATIKA SISWA MTS ISKANDAR MUDA BATAM. *PYTHAGORAS*:

- Jurnal Program Studi Pendidikan Matematika*, 6(2).  
<https://doi.org/10.33373/pythagoras.v6i2.966>
- Armianti, A. (2018). Mengembangkan higher order of thinking skill melalui pembelajaran matematika pada siswa sekolah menengah kejuruan. *Lemma: Letters of Mathematics Education*, 4(1).
- Fitriani, R. N., & Pujiastuti, H. (2021). Pengaruh Self-Efficacy Terhadap Hasil Belajar Matematika. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 05(03), 2793–2801.
- Haqqul, A., & Saraswati, S. (2023). Pengaruh Self-Efficacy Terhadap Kemampuan Pemecahan Masalah Matematika Pada Materi Statistika Kelas VIII. *Cartesian: Jurnal Pendidikan Matematika*, 2(2), 119–128.
- Hasmatang, H. (2019). Pentingnya Self Efficacy pada Diri Peserta Didik. *Seminar Nasional Biologi*, 296–298.
- Himmah, W. I., & Ayun, Q. (2024). Pengaruh Adversity Quotient Terhadap Prestasi Belajar Matematika. *Afeksi: Jurnal Penelitian Dan Evaluasi Pendidikan*, 5(6).  
<https://afeksi.id/jurnal/index.php/afeksi>
- Irmawanti, L. (2023). *Pengaruh Adversity Quotient dan Self Efficacy Terhadap Kemampuan Berpikir Kritis Siswa pada Pelajaran Matematika di MAN 3 Kediri*. IAIN Kediri.
- Ismi, N., & Lukmana, D. A. (2023). PENGARUH SELF-EFFICACY TERHADAP KEMAMPUAN PEMECAHAN MASALAH MATEMATIKA. *Media Bina Ilmiah*, 17(8), 1935–1942.
- Juniawan, E. A. (2020). PENGARUH MATHEMATICS SELF EFFICACY TERHADAP PRESTASI BELAJAR MATEMATIKA SISWA KELAS VIII MTs. DAAR EL QOLAM. *GeoMath*, 1(1).
- Karim, A., & Nurrahmah, A. (2018). ANALISIS KEMAMPUAN PEMAHAMAN MATEMATIS MAHASISWA PADA MATA KULIAH TEORI BILANGAN. *Jurnal Analisa*, 4(1), 24–32.  
<https://doi.org/10.15575/Analisa.xxx.xxx>
- Lestari, D. A. (2023). IMPLEMENTASI PENDIDIKAN INKLUSI PADA SISWA SLOW LEARNER DI MI AN-NAZWA CIKEUSAL KABUPATEN SERANG. *Jurnal Anak Bangsa*, 2(1), 1–120. <https://doi.org/10.46306/jas.v2i1>
- Meidianti, A., Kholifah, N., & Sari, N. I. (2022). Kemampuan Pemahaman Konsep Matematis Peserta Didik dalam Pembelajaran Matematika. 2(2), 134–144.
- Nurani, M., Riyadi, R., & Subanti, S. (2021). PROFIL PEMAHAMAN KONSEP MATEMATIKA DITINJAU DARI SELF EFFICACY. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 10(1), 284–292. <https://doi.org/10.24127/ajpm.v10i1.3388>
- Pertiwi, N. L. C., Wiarta, I. W., & Ardana, I. K. (2019). Hubungan antara Adversity Quotient (AQ) dengan Hasil Belajar Matematika. *Journal of Education Technology*, 3(2), 73–80.
- Pratiwi, L. D. K. (2022). *Hubungan Antara Self-Efficacy dan Motivasi Belajar dengan Kemampuan Literasi Matematika Siswa kelas VIII SMP Negeri 12 Denpasar*. Universitas Pendidikan Ganesha.
- Putra, R. A., Nurjanah, Juandi, D., & Jufri, L. H. (2023). Adversity Quotient in Mathematics Learning. *Plusminus: Jurnal Pendidikan Matematika*, 3(3), 385–398.  
<https://doi.org/10.31980/plusminus.v3i3.1503>
- Radiusman, R. (2020). STUDI LITERASI: PEMAHAMAN KONSEP ANAK PADA PEMBELAJARAN MATEMATIKA. *FIBONACCI: Jurnal Pendidikan Matematika Dan Matematika*, 6(1), 1. <https://doi.org/10.24853/fbc.6.1.1-8>
- Rahmi, Febriana, R., & Elsa Putri, G. (2020). Pengaruh Self-Efficacy terhadap Pemahaman Konsep Matematika Siswa Pada Pembelajaran Model Discovery Learning. *Edumatica: Jurnal Pendidikan Matematika*, 10(01), 27–34.
- Rismen, S., Astuti, S., & Lovia, L. (2021). ANALISIS KEMAMPUAN PEMAHAMAN KONSEP MATEMATIS SISWA. *LEMMA*, 7(2), 123–134.
- Roza, M. (2021). *Pengaruh Adversity Quotient dan Self-Efficacy Terhadap Kemampuan Penalaran Statistik Siswa*. IAIN Kerinci.
- Safira, A., Mayang Purnama, I., & Bhakti, Y. B. (2024). Pengaruh Adversity Quotient (AQ) terhadap Kemampuan Pemahaman Konsep Matematika Siswa. *Prosiding Diskusi Panel Nasional Pendidikan Matematika*, 467–472.
- Setyowati, L. W. (2022). *Pemahaman Konsep Matematika Siswa Ditinjau dari Adversity Quotient*. UNIVERSITAS ISLAM NEGERI SUNAN AMPEL SURABAYA.

- Sugiarti, R., Nurlaili, A., & Febriani, U. F. (2020). PENGARUH ADVERSITY QUOTIENT TERHADAP MOTIVASI BERPRESTASI PADA SISWA CERDAS ISTIMEWA. *Philanthropy Journal of Psychology*, 4(1), 82–92. <http://journals.usm.ac.id/index.php/philanthropy82>
- Surven, S., Sarumaha, A., & La'ia, H. T. (2022). ANALISIS KEMAMPUAN PEMAHAMAN KONSEP MATEMATIKA SISWA PADA MATERI SPLTV KELAS X SMK NEGERI 1 TOMA TAHUN PEMBELAJARAN 2021/2022. *AFORE: Jurnal Pendidikan Matematika*, 1(1), 26–40. <https://jurnal.uniraya.ac.id/index.php/Afore>