Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram
https://e-journal.undikma.ac.id/index.php/prismasains/index
e-mail: prismasains.pkpsm@gmail.com

July 2025. Vol. 13, No. 3
p-ISSN: 2338-4530
e-ISSN: 2540-7899
pp. 430-448

Mathematical Anxiety and Resilience as an Influence of Mathematical Literacy Skills

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Received: February 2025; Revised: May 2025; Published: July 2025

Abstract

Mathematical literacy is essential for applying mathematical concepts to real-life problems, yet its development is often hindered by psychological factors such as anxiety and resilience. Mathematics anxiety negatively affects students' cognitive and problem-solving abilities, while resilience supports emotional regulation and sustained learning. This study aims to examine the combined influence of mathematics anxiety and resilience on students' mathematical literacy. The research method used was qualitative with a phenomenological approach. The data collection process, including validity, reliability, and subject selection, was conducted using the Winstep application. Three subjects were selected according to three levels of mathematical literacy. The data analysis process involved administering tests, questionnaires, and interviews, with the test questions focusing on probability material. The results of the study indicate that students with high anxiety levels and low resilience have lower mathematics literacy scores. They are unable to complete all the ability indicators. Similarly, students with moderate anxiety and moderate resilience also showed low literacy scores. They were able to complete questions on the comprehension and representation indicators.

Keywords: Mathematical Anxiety; Resilience; Mathematical Literacy Skills

How to Cite: Bilhaki, R., & Faradillah, A. (2025). Mathematical Anxiety and Resilience as an Influence of Mathematical Literacy Skills. *Prisma Sains : Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, *13*(3), 430-448. doi:https://doi.org/10.33394/j-ps.v13i3.15468

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INTRODUCTION

It is imperative to consider the psychological dimension of mathematics learning, with anxiety being a pronounced factor (Suadiyatno, Firman, Hanan, & Sumarsono, 2020). Mathematical anxiety is characterised by a state of tension, anxiety and fear when engaging in mathematical learning, with the potential to disrupt the cognitive processes involved in problem solving (Khasawneh, Gosling, & Williams, 2021; Nurjanah & Alyani, 2021). The level of mathematical anxiety among the students was at a low to moderate level, but there were generally some students who experienced a very high level of mathematical anxiety (Szczygieł, 2020). This is evidenced by the findings of Gabriel (2020), as the subject has indicated that maths anxiety can disrupt students' learning, resulting in substandard performance and challenges in comprehending the subject matter. Therefore, to help learners succeed and develop in recognising and managing anxiety when faced with mathematical problems, it is important to address mathematical anxiety (Budhathoki et al., 2022; Suren & Ali Kandemir, 2020).

Efforts to reduce mathematics anxiety require learning resilience (Faradillah & Wulandari, 2021). It is imperative to understand the significance of student resilience in the context of anxiety, as this quality plays a pivotal role in fostering competence. Consequently, this enables students to improve their self-regulation skills, reduce stress, and build self-confidence (Donolato, Toffalini, Giofrè, Caviola, & Mammarella, 2020; Wang, Gao, Wang, &

Zhang, 2024). Mathematical resilience is an attitude to overcome fear and anxiety in solving and finding mathematical solutions so that new skills can be formulated as needed (Iswanto & Faradillah, 2023; Johnston-Wilder, Lee, & Mackrell, 2021). Learners who possess high resilience have been observed to demonstrate an ability to persevere in the face of challenges, particularly in the domain of mathematical problem-solving (Xenofontos & Mouroutsou, 2023).

It is imperative that learners possess robust literacy skills in order to equip them with the necessary tools to successfully navigate the intricacies of learning and to establish a meaningful connection between mathematical problem solving and real-life applications through mathematical literacy. The possession of good literacy skills is also of key importance in helping learners to overcome feelings of anxiety and to develop resilience (Anderson, Bousselot, Katz-Buoincontro, & Todd, 2021). Mathematical literacy is defined as the ability of students to interpret, formulate, interpret and communicate mathematical problems in the form of concepts, steps and facts in different situations during the learning process (Kolar & Hodnik, 2021; Ozkale & Ozdemir Erdogan, 2022). However, mathematical literacy in Indonesia remains suboptimal. The Programme for International Student Assessment (PISA) 2022 data indicates that Indonesia is positioned 67th out of 81 countries with regard to the performance of students in responding to literacy questions. This finding suggests the necessity for enhancement in this area (Bilad, Zubaidah, & Prayogi, 2024). PISA results indicate that Indonesian learners encounter difficulties in establishing connections between abstract mathematical concepts and concrete real-world scenarios. While these students demonstrate proficiency in memorising formulae and equations, their capacity to visualise the practical applications of these concepts is comparatively diminished. This observation indicates an issue with mathematical literacy(Bolstad, 2020). It is therefore crucial to emphasise the significance of mathematical literacy, as it enables learners to analyse, reason, communicate and explain their mathematical thinking by employing mathematical concepts, facts, procedures and tools effectively (Hwang & Ham, 2021; Kolar & Hodnik, 2021).

In addition, the selection of variables in this study is based on relevant previous studies, including the study by Gabriel (2020). This study shows that mathematics anxiety can interfere with students' cognitive processes, thereby negatively affecting their ability to solve mathematical problems. Consequently, it is imperative for students to develop self-regulating skills and emotional management in mathematics learning in order to overcome anxiety and improve their learning outcomes. Furthermore, research by Hiller (2022) examined the relationship between mathematical anxiety, self-efficacy and mathematical literacy among Greek students using data from two national PISA samples in 2003 and 2012. The study found that mathematics anxiety and self-efficacy have a very strong relationship with mathematics achievement, explaining up to 34% of the total variation in this achievement, particularly among students from low socio-economic backgrounds. Further research is needed to identify the factors that contribute to academic resilience, particularly those related to science and mathematics literacy, using data from the 2015 PISA survey in China. The findings suggest that improving teacher qualifications and providing additional time for science and mathematics learning can facilitate better academic outcomes for students from disadvantaged backgrounds. This study also highlights the importance of environmental awareness and a holistic approach in promoting students' academic success (Jin, Fang, Cheung, & Sit, 2022). The present study was conducted with the objective of investigating the effect of mathematical anxiety on students' mathematical performance. The study found that anxiety has a significant negative impact on mathematical ability, while resilience acts as a positive protective factor (Donolato et al., 2020).

A review of the extant literature has identified several research gaps that can be addressed by further research. The review found that previous studies have identified a relationship between anxiety and other psychological factors and students' literacy abilities. The research

gap in terms of lack of integrated studies using Rasch analysis to triangulate anxiety, resilience, and literacy skills. The novelty of this study can be seen from three aspects, namely integrating two psychological factors in influencing mathematical literacy, using a phenomenological approach with data from Indonesia, and data processing using Winsteps. This study therefore aims to address this gap by integrating all three variables using Rasch analysis, in order to gain a deeper, more holistic understanding. The purpose of this study is to analyse mathematical anxiety and resilience as an influence of mathematical literacy skills.

METHOD

Participants

The population for this study comprised 128 grade XII students at a public high school in Jakarta, and four classes were selected as the sample space. The data received is in the form of subjects to be selected by means of WinSteps with a Wright map table. In the WinSteps application, researchers will select the Wright Map tool to select subjects and generate three students as samples based on the categories of high, medium, and low anxiety-resilience. The Wright Map is a visual feature used in educational data analysis, generated through Winstep software, to describe the relationship between participants' abilities and the level of difficulty of test items (I. I. Putri, Rahmat, & Riza, 2024). The purpose of the feature is to map ability distribution and provide insights into the effectiveness of tests. The feature of the system lies in its ability to identify areas for improvement in teaching and learning (Iswanto & Faradillah, 2023). In addition, the results of the student resilience questionnaire were subjected to a descending ranking and then correlated with anxiety levels utilising Winsteps.

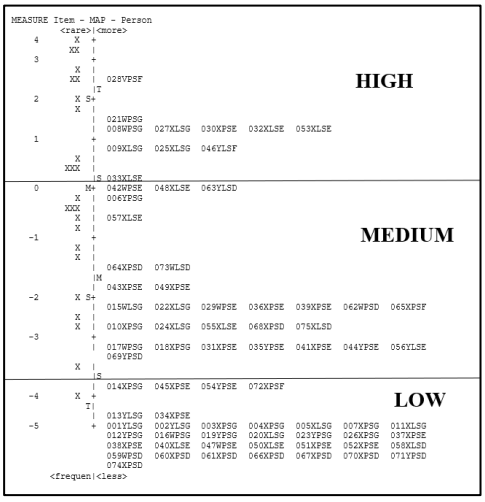


Figure 1. Wright Map resilience results

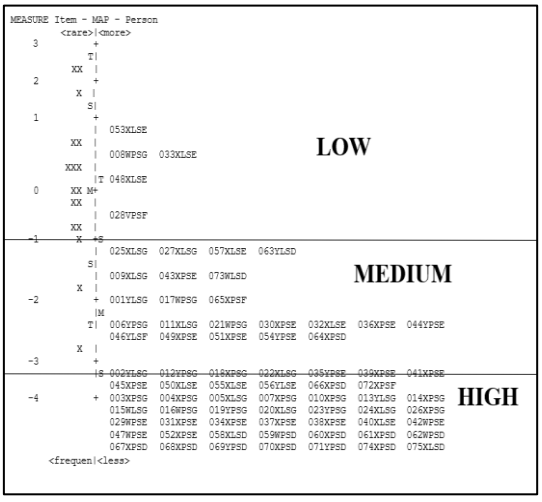


Figure 2. Wright Map anxiety results

Figures 1 and 2 show the results of the Wright maps created by the researchers, based on the Wright maps above, with the MAP axis distance limits used to divide the subject categories based on the distance from S to S, with 13% of subjects having high resilience, 48% having low resilience, and the rest having moderate resilience. For anxiety, 64% of subjects were classified as high anxiety, 12% as low anxiety, and the remainder as moderate anxiety. After data processing, three subjects were selected on the basis of their anxiety resilience category to take a mathematical literacy test on basic probability. Once the test was completed, the interview process began. The subjects of the research comprised female and male students. The following are the codes of the subjects that have been selected.

Table 1. Subject of Anxiety-Resilience

Num	Characteristics	Code
1	High Anxiety Low Resilience Female Low Math Abillity	S1
2	Medium Anxiety Medium Resilience Female Medium Math Abillity	S2
3	Low Anxiety High Resilience Male High Math Abillity	S3

Table 1 is a table of subject codes from the results of differences in mathematical resilience and anxiety categories. The subjects were selected by the researcher on the basis that they corresponded to the results of the Wright Map, which had been processed, producing two categories that appeared with high frequency and were related. The three subjects were selected because they represent different levels of anxiety and resilience, ranging from high to moderate to low. This selection helps researchers observe contrasting differences and understand patterns more clearly. In addition, the limited number of subjects is part of a qualitative approach, particularly phenomenological studies, which emphasize depth of understanding of individual experiences rather than the number of participants (Tuffour, 2017). Although the number of subjects is small, this approach allows researchers to explore experiences in depth and detail. However, it should be noted that this limitation also means that the results of the study cannot be generalized to the entire population. The main focus is on describing the meaning of experiences, not statistical representation.

Research Design and Collecting Data

This study uses a qualitative research method and adopts a phenomenological approach. The qualitative method was chosen as it allows researchers to explore the subjective experiences of learners and gain an in-depth understanding of how resilience and anxiety affect their learning process. The study uses a phenomenological approach, which involves the collection of data through participant observation, with the aim of identifying the essential phenomena of the participant's life experience (Frechette, Bitzas, Aubry, Kilpatrick, & Lavoie-Tremblay, 2020). The data collection techniques employed in this study make use of a variety of methods. To begin with it should be noted that this technique involves the administration of tests and interviews. The research was carried out over a period of six months and involved a series of procedures, starting with the preparation of mathematical literacy tests and resilience questionnaires. Subsequent to the preparatory stage, the initial phase of the study involved the creation of a mathematical anxiety questionnaire instrument. This instrument incorporated indicators and questions derived from Putri (2020). The instrument is still in English and will be translated into Indonesian, which will then undergo a validation and reliability process. Content validation is a process that involves ensuring that items in a measurement instrument comprehensively cover the intended domain (Elangovan & Sundaravel, 2021). The validation of content was conducted by two validators an English teacher who served as the language tester and a Mathematics lecturer who acted as the content tester. It was the consensus of the experts that the questionnaire was suitable for use, albeit with a number of improvements. Subsequent to this, enhancements were implemented, the results of which are as follows:

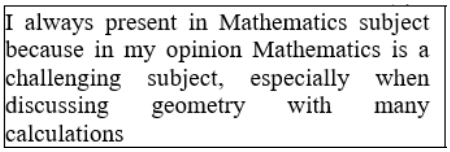

I always present in Mathematics subject because in my opinion Mathematics is a challenging subject, especially when discussing geometry with many calculations

Figure 3. Before content validation

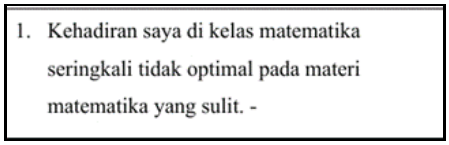

1. Kehadiran saya di kelas matematika seringkali tidak optimal pada materi matematika yang sulit. -

Figure 4. After content validation

The questionnaire before and after linguistic and content validation by experts is shown in Figures 3 and 4. As can be seen in Figure 3, the questionnaire contains questions that are relevant to the material to be studied. However, the questionnaire that has been subjected to content and language validation is designed to be general and adapted to language that is easy for students to understand.

The next stage of this study is construct validation, following content validation of the questionnaire. This process involved the distribution of questionnaires to students enrolled in both junior high and senior high schools. A total of 863 respondents were obtained, spread across four provinces on the island of Java. After the data was collected, it was processed using the WinSteps application. The validation process was conducted on the item fit. The purpose of this study is to assess the extent to which the items in a measurement instrument conform to the Rasch model. The menu has been designed to facilitate the identification of any malfunctions, thereby ensuring the instrument's ability to provide accurate and reliable results. results (Fitri, 2024). Subsequent to the validation stage, the subsequent stage is reliability, which is to be conducted using the summary table menu. The following table presents the key statistics that facilitate the evaluation of the consistency and accuracy of the results, thereby ensuring the reliability of the instruments employed (Owan, Abang, Idika, Etta, & Bassey, 2023).

Table 2. Misfit Order of the Items

Item	Outfit MNSQ	Outfit ZSTD	PTMEA-CORR
27	2.03	9.90	-0.57
29	1.73	9.90	-0.13
28	1.45	9.49	-0,02
21	1.37	7.79	0.18
30	1.33	6.55	0.29
3	1.29	6.01	0.34
12	1.29	6.38	0.37
26	1.15	3.39	0.39
1	1.13	2.91	0.24
16	0.86	-3.33	0.29
8	0.80	-4.78	0.37
15	0.87	-3.14	0.87
5	0.85	-3.69	0.86

The results in Table 2 show that there are three criteria, namely MNSQ, ZSTD, and PTMEA-CORR, that are required to meet the fit criteria. The items in Table 2 have more than two criteria that do misfit, hence they are considered invalid. The range of values employed as a reference point to ascertain the outcomes is as follows The following statistical models were employed MNSQ ($0.5 < x < 1.5$); ZSTD ($-2.0 < x < 2.0$); and PT.MEASURE-CORR ($0.4 < x < 0.85$) (Widyaningrum, Lutfiyana, Faradillah, & Miatun, 2024). Following a thorough analysis, it was concluded that 17 out of the 30 mathematical anxiety questions met all the established criteria, thereby strengthening the validity of the findings. The item was then tested using a summary table in WinSteps and declared reliable. The mathematical anxiety questionnaire has 17 validated and reliable statements that cover all indicators of mathematical

anxiety, including cognitive, affective and physiological aspects. This makes the questionnaire a comprehensive tool for measuring mathematical anxiety levels among students.

Instrument

Instruments in the context of research refer to tools or methods used to collect data (Taherdoost, 2021). The researchers utilised instruments in this study to assess literacy abilities, resilience, and anxiety levels among students. In the mathematical literacy test instrument, researchers adopted indicators and questions from Widyaningrum & Lutfiyana (2024) that had previously undergone a validation and reliability processThe acquisition of mathematical literacy skills is contingent on the demonstration of the following competencies: (1) comprehension; (2) analysis; (3) representation; and (4) communication.

Moreover, with regard to the resilience questionnaire, the researchers employed a questionnaire that had previously been validated and subjected to reliability testing by Faradillah and Septiana (2022). Students who possess resilience have been shown to exhibit the following indicators: (1) the ability to adapt to certain situations and conditions; (2) self-awareness; (3) confidence; (4) the belief that they understand what others understand; and (5) the ability to face and solve problems in learning mathematics. The researchers administered a mathematical anxiety instrument that includes indicators derived from Putri (2020).

Table 3. Mathematical Anxiety Indicators

Num	Mathematical Anxiety Indicators	Description	Sample Item
1	Cognitive	The process of acquiring knowledge through the senses in accordance with functional behaviour involving students.	I always attend math class because I'm interested in the complex calculations involved in mathematics.
2	Affective	These aspects involve emotions and attitudes that can influence student engagement, motivation and learning outcomes. These include emotions, attitudes, values, beliefs, persistence and emotional engagement.	I always answer questions in class with confidence, even if the answer is wrong.
3	Physiological	Physical health conditions that cause symptoms such as trembling hands, headaches, excessive sweating, indigestion and an irregular heartbeat usually occur in response to stress or mental strain.	The announcement of exam results always results in a marked rise in heart rate.

As illustrated in Table 3, indicators can be perceived from not only a psychological standpoint, but also from an affective and cognitive perspective. It is evident that these three factors can be discerned through the subjects who have completed the questionnaire, which has been meticulously designed according to the specified indicators.

RESULTS AND DISCUSSION

S1

The 1st indicator of mathematical literacy is understanding. The following are the results of the S1 answers. As illustrated in Figure 5, the responses of S1 to the comprehension indicator are presented. The figure indicates that S1 is experiencing difficulties in comprehending the questions. In accordance with the mathematical literacy indicator for comprehension, S1 received a score of 0, indicating an inability to describe mathematical information and concepts. S1 encountered challenges in articulating mathematical information and concepts, which consequently impeded their capacity to apply these concepts in problem-solving scenarios. This finding indicates that a profound comprehension of mathematical concepts is instrumental in enhancing analysis in mathematical literacy (Kolar & Hodnik, 2021).

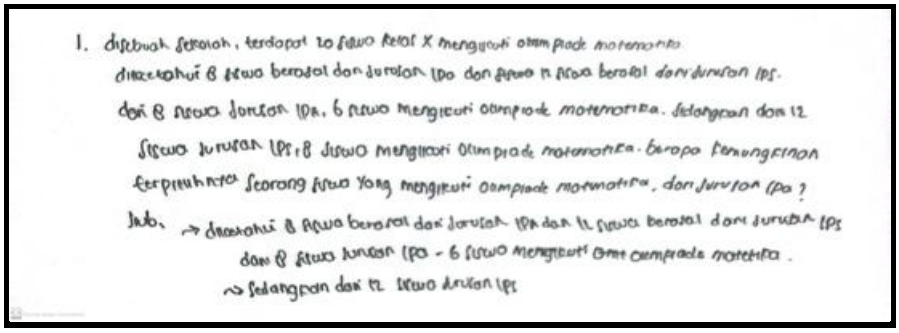


Figure 5. Results of Responses for S1 on First Indicator

During the interview, S1 stated that he experienced feelings of panic when attempting to understand the test questions. Consequently, when reading the questions, S1 repeatedly read them in an attempt to comprehend their meaning, yet S1 was unable achieve this. This phenomenon may be interpreted as students encountering challenges in comprehending the material, which manifests in difficulties understanding questions and inability to articulate the question's essence in their own words (Nanda & Azmy, 2020). Anxiety has been demonstrated to manifest as confusion when answering exam questions, given that feelings of anxiety frequently disrupt concentration and the ability to think clearly (Luo, Subramaniam, & Steen, 2020). Therefore, the necessity for resilience in addressing this issue is paramount. In this context, resilience, defined as the ability to recover from or adapt to adversity, is a critical factor. Students who demonstrate resilience can develop strategies to manage their anxiety, thereby improving their comprehension of the material and their ability to respond to questions more effectively (Ramadianto, Kusumadewi, Agiananda, & Raharjanti, 2022).

The 2nd indicator of mathematical literacy is analysis. The following are the results of the S1 answers. As illustrated in Figure 6, the responses of S1 to the analysis indicators are evident. In response to the same inquiries, S1 stated that he lacked the capacity to provide a thorough analysis. According to the mathematical literacy indicators for analysis, S1 scored 0, indicating that S1 was unable to accurately analyse the information in the questions and was also unable to distribute or organise the information into smaller components. This inability can impede comprehension of mathematical concepts and their application in a broader context. Consequently, the cultivation of analytical competencies is imperative to enhance the mathematical literacy of S1 students (Cevikbas, Kaiser, & Schukajlow, 2022). This was due to the fact that, during the interview, S1 revealed that he found it challenging to analyse literacy questions. This phenomenon can be attributed to the subjects' difficulty in comprehending the questions. The findings of this study indicate that students experienced difficulty in the following two areas: (1) breaking down information into more manageable components, and (2) identifying statements in the questions. (Chew & Cerbin, 2021). Nevertheless, the cultivation of resilience facilitates the effective overcoming of challenges, with anxiety being

transformed into motivation to identify solutions and academic abilities being enhanced through effective adaptation. strategies.(Fullerton, Zhang, & Kleitman, 2021).

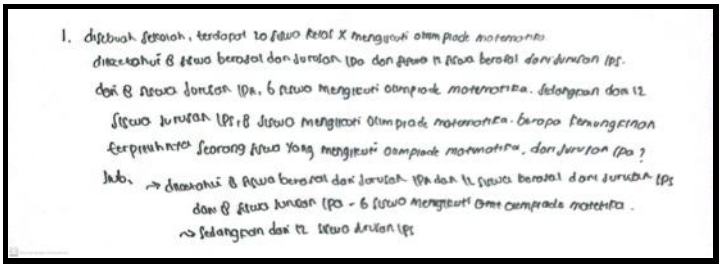


Figure 6. Results of Responses for S1 on Second Indicator

The 3rd indicator of mathematical literacy is representation. The following are the results of the S1 answers. As demonstrated in Figure 7, it is evident that S1 was incapable of resolving the issue. In the S1 case study, the progression of students through the mathematical model stage was characterised by an initial focus on the revelation of known concepts and questions that required resolution. In the literacy ability indicator for representation, S1 scored 0 because S1 was unable to transform significant information into various mathematical forms. This phenomenon is often attributed to students' challenges in recalling formulae and the associated solution methods. In the field of mathematics, the efficacy of repetition in enhancing information retention has been empirically substantiated. Conversely, the absence of repetition has been demonstrated to result in the loss of information from memory (Hartman, Hart, Nelson, & Kirschner, 2023). Even when interviewed about interpretation, S1 admitted that he actually knew the idea of making a table for probabilities, but he forgot while working on it. Anxiety has been proven to interfere with students' concentration and working memory, making them more prone to forgetting (Matsumoto & Kawaguchi, 2020). This is evidenced by S1, who only completed the mathematical model stage. In contrast, resilience is defined as the ability to recover from difficulties.

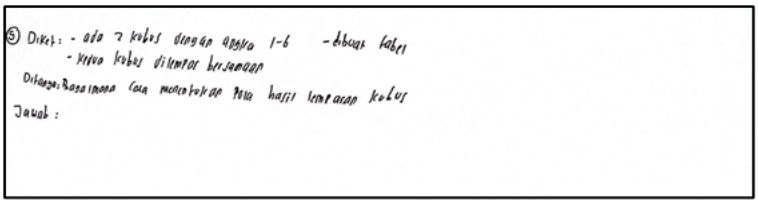


Figure 7. Results of Responses for S1 on Third Indicator

The 4th indicator of mathematical literacy is communication. The following are the results of the S1 answers. S1 scored 3 in mathematical literacy in the last indicator, marked S1. This was due to the fact that the problem was solved correctly and efficiently. The strategy employed in this case was both appropriate and effective. The solution produced was both complete and accurate. However, in this case, S1 was unable to provide a satisfactory explanation or conclusion regarding the issue due to dishonest behaviour, namely copying the work of a friend. In this particular instance, S1 was unable to furnish a satisfactory explanation or conclusion regarding the issue because they had engaged in dishonest behaviour by cheating their classmate. Cheating is widely regarded as a form of dishonest and harmful behaviour, as it deprives individuals of the opportunity to gain a deeper understanding of the material (Chirumamilla, Sindre, & Nguyen-Duc, 2020). Furthermore, the act of cheating can lead to an increase in anxiety, as S1 may experience trepidation regarding the prospect of being apprehended or the inability to sustain the outcomes attained through unethical means. This phenomenon also hinders the development of resilience, as S1 does not learn how to confront challenges or cope with academic pressure (Eshet, Grinautsky, & Steinberger, 2024).

Consequently, it is imperative for S1 to cultivate the capacity to confront challenges with integrity in order to fortify their mental resilience and enhance their critical thinking abilities.

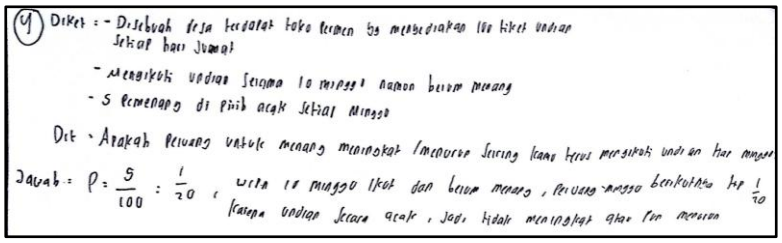


Figure 8. Results of Responses for S1 on Fourth Indicator

S2

The 1st indicator of mathematical literacy is understanding. The following are the results of the S2 answers. As demonstrated in Figure 9, S2 response to the comprehension question is evident. The figure indicates that S2 demonstrated an understanding of the question, as evidenced by the comprehensive information provided. Consequently, S2 received a score of 3 on the comprehension literacy indicator, as evidenced by their demonstrated understanding of the information and mathematical concepts presented in the question. However, during the interview, he indicated that he had comprehended the question but was uncertain about which formula to use. This phenomenon is referred to as learning disorientation. Learning disorientation is a condition in which students experience feelings of confusion, loss, or an inability to comprehend the material being studied (Eschenbacher & Fleming, 2020). This phenomenon is often triggered by academic anxiety. This anxiety can interfere with students' ability to think clearly and relate the information they have understood to its practical application (Almaiah et al., 2022). In this context, resilience is key, as students who can bounce back from confusion and overcome anxiety are more effective in finding solutions and understanding material deeply. By developing resilience, S2 students can learn to manage anxiety and boost their confidence in tackling future academic challenges (Simamora, 2020).

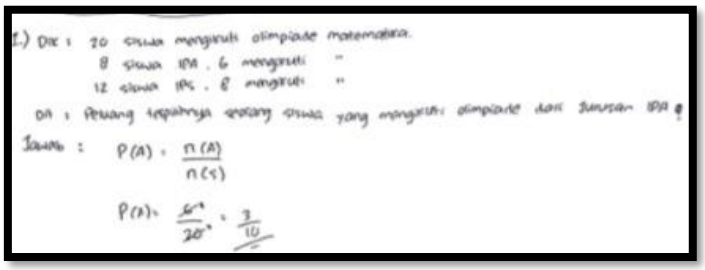


Figure 9. Results of Responses for S2 on First Indicator

The 2nd indicator of mathematical literacy is analysis. The following are the results of the S2 answers. As illustrated in Figure 10, the response from S2 regarding their analytical skills is presented. Researchers have observed that S2 is effective in initiating analysis with complete information, employing keywords, and identifying the correct answer through the application of the formula in this instance. In terms of the literacy ability indicator, S2 was awarded one point for their analysis of the questions, as they demonstrated a high level of accuracy in their interpretation of the information provided. S2 demonstrated deficiencies in its capacity to discern patterns and relationships between information components. with clear evidence that S2 made a mistake in his answer to the question. In response to the inquiry regarding the causative factors that led to the identified error, S2 stated that they were uncertain about the precision of the formula. Indeed, as posited by the researcher, the formula was indeed correct. However, the researcher posited that an erroneous substitution had been made in the process of analysing the numbers that were required to be substituted into the formula. The incident experienced by S2 can be referred to as an analytical error. Although S2 demonstrated

competence in comprehending and articulating explanations, and in employing the appropriate formula, the concerns that emerged indicated cognitive anxiety, which in turn influenced the decision-making process during the analysis and application of the formula (Feng, Han, Zheng, & Kamran, 2022). This error underscores the significance of resilience in confronting academic challenges, where S2 must learn to overcome doubts and enhance self-confidence in their analytical abilities. The development of strategies to manage anxiety and strengthen conceptual understanding is a potential means by which S2 can improve the accuracy of their analysis and the outcomes achieved (Owan et al., 2023).

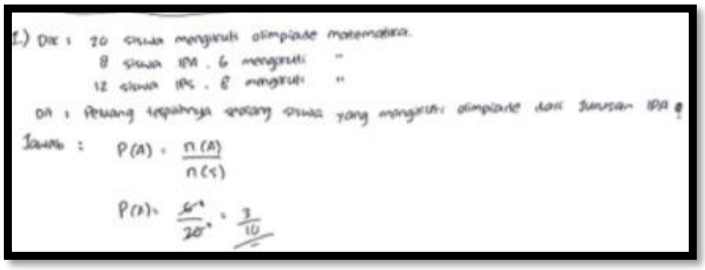


Figure 10. Results of Responses for S2 on Second Indicator

The 3rd indicator of mathematical literacy is representation. The following are the results of the S2 answers. As shown in Figure 11, S2 response to the representation indicator is clear. In this response, S2 uses a table as a means to determine the answer to the question mentioned above. In addition, S2 notes that he frequently employs the use of visual aids, such as tables or graphs, to facilitate the resolution of mathematical problems. S2 also posits the hypothesis that such ideas can serve as a rapid method of answering mathematical questions. This incident can be referred to as a representation strategy. A representation strategy is defined as a method of describing or presenting data, concepts, or information with a view to facilitating understanding (Mainali, 2021). In this case, S2 scored 3 points in the literacy ability indicator for representation because they were able to use various mathematical forms, such as equations, tables, graphs, and diagrams, to represent information clearly and effectively. It is evident that S2 demonstrated resilience, defined as the ability to adapt and find effective solutions despite experiencing pressure, by relying on representation strategies (Chausson et al., 2020). This finding suggests that the development of representation skills can contribute to increased self-confidence and anxiety management in the context of mathematics learning.

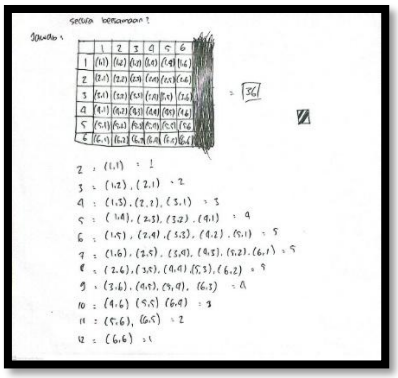


Figure 11. Results of Responses for S2 on Third Indicator

The 4th indicator of mathematical literacy is communation. The following are the results of the S2 answers. It would appear that S2 response is not sufficiently thorough. The question posits a query regarding the probability of its occurrence. It is evident that S2 did not furnish a conclusion that would substantiate their response. The error committed by S2 can be categorised as a process skill error, wherein the student demonstrated an inability to select the appropriate strategy to resolve the issue, consequently resulting in an erroneous sequence of

steps, which in turn gave rise to inaccurate calculations and a misleading final answer (Güner & Erbay, 2021). In this instance, S2 was awarded 1 point in the communication indicator listed in the mathematical literacy section. This was due to S2's accurate problem-solving ability. However, their efficiency was deemed inadequate, and the strategy employed proved to be either inappropriate or ineffective. Consequently, this led to an incomplete or inaccurate solution. This phenomenon may be attributed to the presence of anxiety, which has been demonstrated to impede cognitive functions such as concentration and critical thinking (Yasmin, Muhammad Umar Farooq, & Syed Kazim Shah, 2023). Consequently, students may feel compelled to respond expeditiously, potentially overlooking crucial elements in the process. This situation underscores the significance of cultivating resilience in S2. By enhancing their capacity to cope with pressure and learn from mistakes, S2 can more effectively manage anxiety and enhance accuracy in their future work. The cultivation of robust resilience in S2 students is of paramount importance, for it enables them to maintain a dual focus: on the final outcome, and on the meticulous cognitive processes that underpin the attainment of accurate and precise conclusions (Susnjak, 2024).

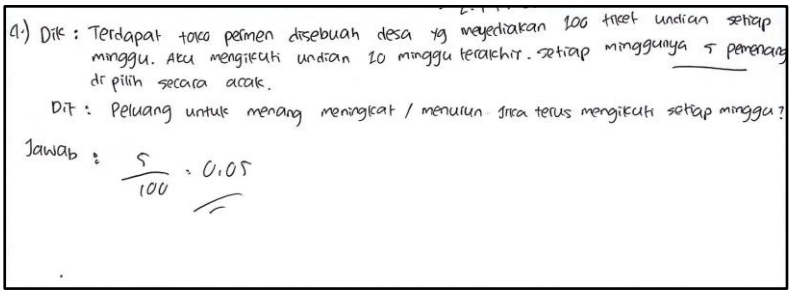


Figure 12. Results of Responses for S2 on Fourth Indicator

S3

The 1st indicator of mathematical literacy is understanding. The following are the results of the S3 answers. As illustrated in Figure 13, the S3 response is evident in relation to the comprehension indicator. The performance exhibited by S3 is indicative of a profound conceptual understanding and critical analysis skills, which are imperative in the learning and problem-solving process. This is evidenced by their adeptness in identifying key information, writing keywords, and systematically analysing them to formulate steps for problem resolution. This faculty entails the comprehension of ideas, principles and the relationships between disparate concepts, as opposed to the mere memorisation of facts (Ruiz-Martín & Bybee, 2022).

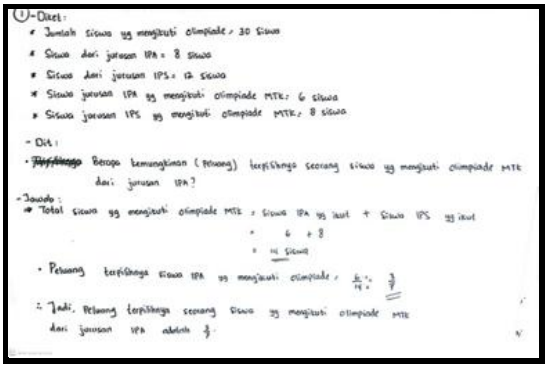


Figure 13. Results of Responses for S3 on First Indicator

In this case, S3 received 3 points for the literacy indicators in terms of understanding and describing mathematical information and concepts clearly and accurately using formal language. Therefore, S3 responses that demonstrate deep conceptual understanding and critical analysis skills reflect the ability to overcome anxiety that may arise in the learning process

(McLeod & Dulsky, 2021). By being able to identify key information and analyse it systematically, S3 students demonstrate high resilience, which is the ability to remain focused and think clearly even when faced with challenges. These skills not only help S3 better understand the material, but also reduce feelings of anxiety that often interfere with the learning process.

The 2nd indicator of mathematical literacy is analysis. The following are the results of the S3 answers. As illustrated in Figure 14, S3 response to the analysis indicator is evident. S3 has been demonstrated to possess the capacity to comprehend the question, and to undertake a thorough analysis of it. S3 asserts that the following methodology is to be employed in order to analyse the issue under discussion. S3 said i read the problem once, looking at the numbers to be worked on. For example, in this problem, there are 20 students. Eight are from science and 12 are from social studies. From that number, six are selected from science and eight from social studies. After that, I write down what is known using my own words so that when answering, I understand the question. After that, I use the basic probability formula $P(A) = \frac{n(A)}{n(S)}$ and then substitute what I have already written. With n(A) being 6, because the question is about the probability of participating in the science Olympiad. Next, n(S) is the combination of science and social studies. So 6 + 8 = 14. S3's ability to provide effective explanations for mathematical models is a prominent strength in mathematical literacy for analysis points with a score of 3 because he clearly identifies patterns and relationships between components of information and accurately identifies or formulates questions in relevant and important problems to solve them. In this context, students have been shown to possess proficient verbal skills, which can support them in comprehending the meaning of problems and in developing mathematical models to solve mathematical problems (Tong, Uyen, & Quoc, 2021). In accordance with the findings of preceding studies, it was hypothesised that an elevated level of anxiety would be associated with a diminished capacity to solve mathematical problems. This hypothesis was supported by the evidence that anxiety can impede students' verbal and mathematical representation abilities (Živković, Pellizzoni, Mammarella, & Passolunghi, 2023). The ability to understand problems and transform real-life situations into equations is indicative of resilience, defined as the ability to adapt and find solutions when faced with challenges. It is evident that S3 has demonstrated mental toughness and creativity in problem solving by establishing a correlation between mathematical concepts and real-life experiences. This correlation is indicative of a core resilience, which is characterised by the ability to think outside the box and come up with innovative solutions to challenges.

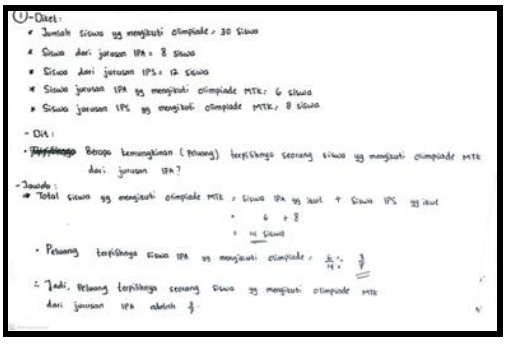
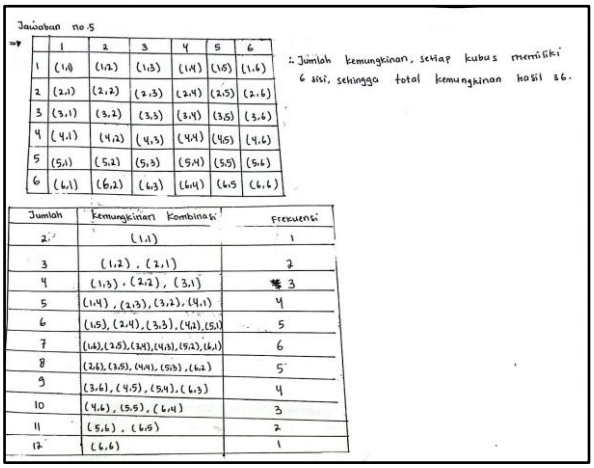


Figure 14. Results of Responses for S3 on Second Indicator

The 3rd indicator of mathematical literacy is representation. The following are the results of the S3 answers. Figure 15 shows the S3 response to the representation indicator. It is evident that S3 have successfully completed their problems in full, employing the correct and appropriate formulas. The utilisation of tables as visual representations was also employed to facilitate the problem-solving process, thereby enabling the subjects to more readily comprehend and organise the information necessary to solve the mathematical problems.

Therefore, S3 received 3 points for this representation indicator because it was able to use various mathematical forms, such as equations, tables, graphs, and diagrams, to represent information clearly and effectively. This success demonstrates that they possess a high level of resilience, enabling them to maintain concentration and not be affected by anxiety that may arise when confronted with challenges. The implementation of effective learning strategies, such as the utilisation of tables, has been demonstrated to facilitate the overcoming of potential anxiety and to enhance confidence in the execution of tasks, thereby leading to enhanced comprehension and the attainment of satisfactory outcomes (Lugosi & Uribe, 2022).


Jawaban no.5

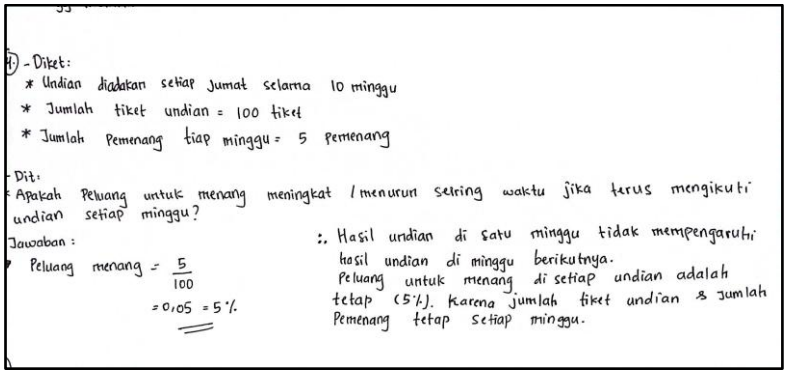
	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

∴ Jumlah kemungkinan, setiap kubus memiliki 6 sisi, sehingga total kemungkinan hasil 36.

Jumlah	Kemungkinan kombinasi	Frekuensi
2	(1,1)	1
3	(1,2), (2,1)	2
4	(1,3), (2,2), (3,1)	3
5	(1,4), (2,3), (3,2), (4,1)	4
6	(1,5), (2,4), (3,3), (4,2), (5,1)	5
7	(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)	6
8	(2,6), (3,5), (4,4), (5,3), (6,2)	5
9	(3,6), (4,5), (5,4), (6,3)	4
10	(4,6), (5,5), (6,4)	3
11	(5,6), (6,5)	2
12	(6,6)	1

Figure 15. Results of Responses for S3 on Third Indicator

The 4th indicator of mathematical literacy is communation. The following are the results of the S2 answers. It is evident that S3 students have demonstrated an aptitude for problem-solving and the formulation of accurate and lucid conclusions. It is evident that S3 was awarded a total of three points for the communication indicator. This was due to the fact that he articulated the solution in a lucid and coherent manner, employing rational justifications that, while discernible, necessitated a modicum of cognitive effort to comprehend. Furthermore, S3 demonstrated an ability to solve the problem accurately and efficiently. The strategy employed in this case was both appropriate and effective. The solution that was produced was both complete and accurate.


4) - Diket:
* Undian diadakan setiap Jumat selama 10 minggu
* Jumlah tiket undian = 100 tiket
* Jumlah Pemenang tiap minggu = 5 pemenang

- Dit:
Apakah Peluang untuk menang meningkat / menurun seiring waktu jika terus mengikuti undian setiap minggu?

Jawaban :
Peluang menang = $\frac{5}{100}$
= 0,05 = 5 %.

∴ Hasil undian di satu minggu tidak mempengaruhi hasil undian di minggu berikutnya.
Peluang untuk menang di setiap undian adalah tetap (5%). Karena jumlah tiket undian & jumlah Pemenang tetap setiap minggu.

Figure 16. Results of Responses for S3 on Fourth Indicator

This ability to overcome challenges is indicative of their academic prowess. This success demonstrates that S3 students possess a high level of resilience, enabling them to maintain composure and concentration, even in the face of academic anxiety. S3 students have been shown to possess the ability to manage anxiety and maintain clear thinking, thus enabling them to analyse information effectively and draw accurate conclusions. This suggests that they have not only assimilated the material but are also able to cope with pressure in a constructive manner (Imreh, Hu, & Le Guyader, 2024).

Table 4. The Result Score of Mathematical Literacy Research Subjects

Subject	Indicators			
	1	2	3	4
S1	S1 does not demonstrate comprehension of the mathematical information and concepts presented in the question, so the score for the comprehension indicator is 0.	The analysis indicator score is 0 because S1 is unable to accurately analyse the information in the question and organise it into smaller components.	S1 is unable to convert important information into various mathematical forms, resulting in a score of 0 for the representation indicator.	S1 was able to solve the problem accurately and efficiently, so the score for the communication indicator is 3. The strategy used was both appropriate and effective. The solution produced was complete and accurate. However, S1 acknowledged that the answer belonged to someone else.
S2	S2 has achieved a score of 3 for the comprehension indicator because they have demonstrated a good understanding of the information and mathematical concepts presented in the question.	S2 is unable to recognise patterns and relationships between information components, which results in a score of 1 for the analysis indicator.	S2 score for the representation indicator is 3 because they can use different mathematical tools, such as equations, tables, graphs and diagrams, to clearly and effectively represent information.	The communication indicator score is 1 because, although S2 solved problems quite accurately, they were not very efficient. The strategies employed were either inappropriate or ineffective. The solutions produced were either incomplete or inaccurate.
S3	S3 has achieved a score of 3 for the comprehension indicator because they have demonstrated a good understanding of the information and mathematical concepts presented in the question.	The score for the analysis indicator is 3 because S3 can clearly identify patterns and relationships between information components, as well as accurately identifying or formulating questions relating to important and relevant problems.	S3 score for the representation indicator is 3 because they can use different mathematical tools, such as equations, tables, graphs and diagrams, to clearly and effectively represent information.	The score for the communication indicator is 3 because S3 can explain solutions clearly and in a structured manner. Although the explanations are understandable, they require some cognitive effort to comprehend.

Table 4 shows the results of the mathematics literacy research on the research subjects. The results indicate that the understanding indicator had the highest score, while the analysis indicator had the lowest score.

CONCLUSION

The conclusion of this study is that, first, S1 appears to be in the low mathematical literacy category. It is clear that high levels of anxiety and low resilience in facing academic

challenges have a negative impact on literacy skills in terms of comprehension, analysis, representation and communication. This, in turn, serves to impede the development of essential literacy skills. Second, S2 in the moderate anxiety and moderate resilience categories fell into the medium mathematical literacy ability group, his was reflected in their difficulty in analyzing concepts in depth and applying formulas correctly in contextual problem situations. Although students were able to answer some questions, their answers did not demonstrate coherent and comprehensive reasoning skills. Indicators that were lacking in S2 included analysis and communication due to anxiety that affected their cognitive performance. These findings emphasize the importance of targeted pedagogical interventions to improve students' self-confidence and mathematical literacy skills in facing learning challenges. Approaches such as school counseling, growth mindset interventions, and differentiated instruction can synergistically help reduce anxiety and strengthen students' academic resilience in the context of mathematics learning. S3 evinces a high level of mathematical literacy, as evidenced by its adept analysis and comprehension. However, it is important to evaluate whether there are deficiencies in certain indicators that could affect their overall mathematical literacy. In this case, it can be posited that there is an impact between resilience and mathematical anxiety on the performance of mathematical literacy tests. Therefore, it is very important to develop educational policies that emphasise a balance between the affective and cognitive aspects of learning mathematics in order to support comprehensive and sustainable mathematical literacy.

RECOMMENDATION

Based on the findings of this study, it is recommended that educational institutions place a greater emphasis on strengthening the emotional aspects of learning, particularly with regard to managing mathematical anxiety and building academic resilience among students. It is believed that these three strategies will create a more supportive learning environment, reduce the negative impact of anxiety and enhance students' resilience in tackling mathematical challenges. Therefore, educational policies should strike a balance between cognitive and affective aspects in order to support the development of comprehensive and sustainable mathematical literacy.

REFERENCES

Almaiah, M. A., Alfaisal, R., Salloum, S. A., Hajjej, F., Thabit, S., El-Qirem, F. A., … Al-Maroof, R. S. (2022). Examining the Impact of Artificial Intelligence and Social and Computer Anxiety in E-Learning Settings: Students' Perceptions at the University Level. *Electronics (Switzerland)*, *11*(22), 1–22. https://doi.org/10.3390/electronics11223662

Anderson, R. C., Bousselot, T., Katz-Buoincontro, J., & Todd, J. (2021). Generating Buoyancy in a Sea of Uncertainty: Teachers Creativity and Well-Being During the COVID-19 Pandemic. *Frontiers in Psychology*, *11*(January), 1–17. https://doi.org/10.3389/fpsyg.2020.614774

Bilad, M. R., Zubaidah, S., & Prayogi, S. (2024). Addressing the PISA 2022 Results: A Call for Reinvigorating Indonesia's Education System. *International Journal of Essential Competencies in Education*, *3*(1), 1–12. https://doi.org/10.36312/ijece.v3i1.1935

Bolstad, O. H. (2020). Secondary teachers' operationalisation of mathematical literacy. *European Journal of Science and Mathematics Education*, *8*(3), 115–135. https://doi.org/10.30935/scimath/9551

Budhathoki, B. B., Acharya, B. R., Belbase, S., Kshetree, M. P., Khanal, B., & Panthi, R. K. (2022). High School Students' Mathematics Anxiety: Discouragement, Abuse, Fear, and Dilemma Induced through Adults' Verbal Behaviour. *International Journal of Learning, Teaching and Educational Research*, *21*(6), 247–269. https://doi.org/10.26803/ijlter.21.6.15

Cevikbas, M., Kaiser, G., & Schukajlow, S. (2022). A systematic literature review of the

current discussion on mathematical modelling competencies: state-of-the-art developments in conceptualizing, measuring, and fostering. In *Educational Studies in Mathematics* (Vol. 109). Springer Netherlands. https://doi.org/10.1007/s10649-021-10104-6

Chausson, A., Turner, B., Seddon, D., Chabaneix, N., Girardin, C. A. J., Kapos, V., … Seddon, N. (2020). Mapping the effectiveness of nature-based solutions for climate change adaptation. *Global Change Biology*, *26*(11), 6134–6155. https://doi.org/10.1111/gcb.15310

Chew, S. L., & Cerbin, W. J. (2021). The cognitive challenges of effective teaching. *Journal of Economic Education*, *52*(1), 17–40. https://doi.org/10.1080/00220485.2020.1845266

Chirumamilla, A., Sindre, G., & Nguyen-Duc, A. (2020). Cheating in e-exams and paper exams: the perceptions of engineering students and teachers in Norway. *Assessment and Evaluation in Higher Education*, *45*(7), 940–957. https://doi.org/10.1080/02602938.2020.1719975

Donolato, E., Toffalini, E., Giofrè, D., Caviola, S., & Mammarella, I. C. (2020). Going Beyond Mathematics Anxiety in Primary and Middle School Students: The Role of Ego-Resiliency in Mathematics. *Mind, Brain, and Education*, *14*(3), 255–266. https://doi.org/10.1111/mbe.12251

Elangovan, N., & Sundaravel, E. (2021). Method of preparing a document for survey instrument validation by experts. *MethodsX*, *8*(April), 101326. https://doi.org/10.1016/j.mex.2021.101326

Eschenbacher, S., & Fleming, T. (2020). Transformative dimensions of lifelong learning: Mezirow, Rorty and COVID-19. *International Review of Education*, *66*(5–6), 657–672. https://doi.org/10.1007/s11159-020-09859-6

Eshet, Y., Grinautsky, K., & Steinberger, P. (2024). To behave or not (un)ethically? The meditative effect of mindfulness on statistics anxiety and academic dishonesty moderated by risk aversion. *International Journal for Educational Integrity*, *20*(1), 1–18. https://doi.org/10.1007/s40979-024-00151-w

Faradillah, A., & Septiana, C. (2022). Mathematical Resilience: Validity and Reliability With Rasch Model and Spss in Senior High School. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(4), 3545. https://doi.org/10.24127/ajpm.v11i4.5204

Faradillah, A., & Wulandari, S. (2021). Daya Matematis : Jurnal Inovasi Pendidikan Matematika. *Daya Matematis: Jurnal Inovasi Pendidikan Matematika*, *9 (2)*(July), 96–103. Retrieved from 0AAbstract

Feng, J., Han, P., Zheng, W., & Kamran, A. (2022). Identifying the factors affecting strategic decision-making ability to boost the entrepreneurial performance: A hybrid structural equation modeling – artificial neural network approach. *Frontiers in Psychology*, *13*(October), 1–13. https://doi.org/10.3389/fpsyg.2022.1038604

Fitri, M. R. (2024). *Analysis of Item Response Theory in Science Literacy Assessment Containing Local Wisdom and Pancasila Student Profile*. *13*(2), 229–243.

Frechette, J., Bitzas, V., Aubry, M., Kilpatrick, K., & Lavoie-Tremblay, M. (2020). Capturing Lived Experience: Methodological Considerations for Interpretive Phenomenological Inquiry. *International Journal of Qualitative Methods*, *19*, 1–12. https://doi.org/10.1177/1609406920907254

Fullerton, D. J., Zhang, L. M., & Kleitman, S. (2021). An integrative process model of resilience in an academic context: Resilience resources, coping strategies, and positive adaptation. *PLoS ONE*, *16*(2 February), 1–22. https://doi.org/10.1371/journal.pone.0246000

Gabriel, F., Buckley, S., & Barthakur, A. (2020). The impact of mathematics anxiety on self-regulated learning and mathematical literacy. *Australian Journal of Education*, *64*(3), 227–242. https://doi.org/10.1177/0004944120947881

Güner, P., & Erbay, H. N. (2021). Metacognitive Skills and Problem-Solving. *International Journal of Research in Education and Science*, 715–734. https://doi.org/10.46328/ijres.1594

Hartman, J. R., Hart, S., Nelson, E. A., & Kirschner, P. A. (2023). Designing mathematics standards in agreement with science. *International Electronic Journal of Mathematics Education*, *18*(3), em0739. https://doi.org/10.29333/iejme/13179

Hiller, S. E., Kitsantas, A., Cheema, J. E., & Poulou, M. (2022). Mathematics anxiety and self-efficacy as predictors of mathematics literacy. *International Journal of Mathematical Education in Science and Technology*, *53*(8), 2133–2151. https://doi.org/10.1080/0020739X.2020.1868589

Hwang, J., & Ham, Y. (2021). Relationship between mathematical literacy and opportunity to learn with different types of mathematical tasks. *Journal on Mathematics Education*, *12*(2), 199–222. https://doi.org/10.22342/JME.12.2.13625.199-222

Imreh, G., Hu, J., & Le Guyader, S. (2024). Improving light microscopy training routines with evidence-based education. *Journal of Microscopy*, *294*(3), 295–307. https://doi.org/10.1111/jmi.13216

Iswanto, A., & Faradillah, A. (2023). Analysis of Mathematical Reasoning Ability in Trigonometry Materials Viewed from Students' Mathematical Resilience. *Mosharafa: Jurnal Pendidikan Matematika*, *12*(3), 477–492. https://doi.org/10.31980/mosharafa.v12i3.821

Jin, S., Fang, G., Cheung, K. C., & Sit, P. S. (2022). Factors associated with academic resilience in disadvantaged students: An analysis based on the PISA 2015 B-S-J-G (China) sample. *Frontiers in Psychology*, *13*(September), 1–15. https://doi.org/10.3389/fpsyg.2022.846466

Johnston-Wilder, S., Lee, C., & Mackrell, K. (2021). Addressing Mathematics Anxiety through Developing Resilience: Building on Self-Determination Theory. *Creative Education*, *12*(09), 2098–2115. https://doi.org/10.4236/ce.2021.129161

Khasawneh, E., Gosling, C., & Williams, B. (2021). What impact does maths anxiety have on university students? *BMC Psychology*, *9*(1), 1–9. https://doi.org/10.1186/s40359-021-00537-2

Kolar, V. M., & Hodnik, T. (2021). Mathematical literacy from the perspective of solving contextual problems. *European Journal of Educational Research*, *10*(1), 467–483. https://doi.org/10.12973/EU-JER.10.1.467

Lugosi, E., & Uribe, G. (2022). Active learning strategies with positive effects on students' achievements in undergraduate mathematics education. *International Journal of Mathematical Education in Science and Technology*, *53*(2), 403–424. https://doi.org/10.1080/0020739X.2020.1773555

Luo, Z., Subramaniam, G., & Steen, B. (2020). Will Anxiety Boost Motivation? The Relationship between Anxiety and Motivation in Foreign Language Learning. *Malaysian Journal of ELT Research*, *17*(1), 53–71.

Mainali, B. (2021). Representation in teaching and learning mathematics. *International Journal of Education in Mathematics, Science and Technology*, *9*(1), 1–21. https://doi.org/10.46328/ijemst.1111

Matsumoto, N., & Kawaguchi, J. (2020). Negative item memory and associative memory: Influences of working memory capacity, anxiety sensitivity, and looming cognition. *Journal of Behavior Therapy and Experimental Psychiatry*, *68*(March), 101569. https://doi.org/10.1016/j.jbtep.2020.101569

McLeod, S., & Dulsky, S. (2021). Resilience, Reorientation, and Reinvention: School Leadership During the Early Months of the COVID-19 Pandemic. *Frontiers in Education*, *6*(March), 1–13. https://doi.org/10.3389/feduc.2021.637075

Nanda, D. W., & Azmy, K. (2020). POOR READING COMPREHENSION ISSUE IN EFL

CLASSROOM AMONG INDONESIAN SECONDARY SCHOOL STUDENTS: Scrutinizing the causes, impacts and possible solutions. *Englisia: Journal of Language, Education, and Humanities*, *8*(1), 12. https://doi.org/10.22373/ej.v8i1.6771

Nurjanah, I., & Alyani, F. (2021). Kecemasan Matematika Siswa Sekolah Menengah pada Pembelajaran Matematika dalam Jaringan. *Jurnal Elemen*, *7*(2), 407–424. https://doi.org/10.29408/jel.v7i2.3522

Owan, V. J., Abang, K. B., Idika, D. O., Etta, E. O., & Bassey, B. A. (2023). Exploring the potential of artificial intelligence tools in educational measurement and assessment. *Eurasia Journal of Mathematics, Science and Technology Education*, *19*(8). https://doi.org/10.29333/ejmste/13428

Ozkale, A., & Ozdemir Erdogan, E. (2022). An analysis of the interaction between mathematical literacy and financial literacy in PISA*. *International Journal of Mathematical Education in Science and Technology*, *53*(8), 1983–2003. https://doi.org/10.1080/0020739X.2020.1842526

Putri, H. E., Wahyudy, M. A., Yuliyanto, A., & Nuraeni, F. (2020). Development of instruments to measure mathematical anxiety of elementary school students. *International Journal of Learning, Teaching and Educational Research*, *19*(6), 282–302. https://doi.org/10.26803/IJLTER.19.6.17

Putri, I. I., Rahmat, A., & Riza, L. S. (2024). *Assessing Undergraduate Cognitive System Thinking Instruments in Genetics Lectures : A Rasch Model Analysis*. *16*, 3924–3937. https://doi.org/10.35445/alishlah.v16i3.5621

Ramadianto, A. S., Kusumadewi, I., Agiananda, F., & Raharjanti, N. W. (2022). Symptoms of depression and anxiety in Indonesian medical students: association with coping strategy and resilience. *BMC Psychiatry*, *22*(1), 1–11. https://doi.org/10.1186/s12888-022-03745-1

Ruiz-Martín, H., & Bybee, R. W. (2022). The cognitive principles of learning underlying the 5E Model of Instruction. *International Journal of STEM Education*, *9*(1). https://doi.org/10.1186/s40594-022-00337-z

Simamora, R. M. (2020). The Challenges of Online Learning during the COVID-19 Pandemic: An Essay Analysis of Performing Arts Education Students. *Studies in Learning and Teaching*, *1*(2), 86–103. https://doi.org/10.46627/silet.v1i2.38

Suadiyatno, T., Firman, E., Hanan, A., & Sumarsono, D. (2020). Examining the Effect of Contextual Teaching-Learning and Anxiety Towards Students' Speaking Skills. *Journal of Languages and Language Teaching*, *8*(1), 100. https://doi.org/10.33394/jollt.v8i1.2266

Suren, N., & Ali Kandemir, M. (2020). The effects of mathematics anxiety and motivation on students' mathematics achievement. *International Journal of Education in Mathematics, Science and Technology*, *8*(3), 190–218. https://doi.org/10.46328/IJEMST.V8I3.926

Susnjak, T. (2024). *education sciences ChatGPT : The End of Online Exam Integrity ?* 1–20.

Szczygieł, M. (2020). When does math anxiety in parents and teachers predict math anxiety and math achievement in elementary school children? The role of gender and grade year. In *Social Psychology of Education* (Vol. 23). Springer Netherlands. https://doi.org/10.1007/s11218-020-09570-2

Taherdoost, H. (2021). Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects Hamed Taherdoost. Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Coll. *International Journal of Academic Research in Management (IJARM)*, *2021*(1), 10–38. Retrieved from https://hal.science/hal-03741847

Tong, D. H., Uyen, B. P., & Quoc, N. V. A. (2021). The improvement of 10th students' mathematical communication skills through learning ellipse topics. *Heliyon*, *7*(11), e08282. https://doi.org/10.1016/j.heliyon.2021.e08282

Tuffour, I. (2017). A Critical Overview of Interpretative Phenomenological Analysis: A

Contemporary Qualitative Research Approach. *Journal of Healthcare Communications*, *02*(04). https://doi.org/10.4172/2472-1654.100093

Wang, X., Gao, Y., Wang, Q., & Zhang, P. (2024). Relationships between Self-Efficacy and Teachers' Well-Being in Middle School English Teachers: The Mediating Role of Teaching Satisfaction and Resilience. *Behavioral Sciences*, *14*(8). https://doi.org/10.3390/bs14080629

Widyaningrum, A., Lutfiyana, R. D., Faradillah, A., & Miatun, A. (2024). *Survey of Rasch Model Analysis of Mathematical Literacy Abilities of Senior High School Students*. *5*(1), 57–66.

Xenofontos, C., & Mouroutsou, S. (2023). Resilience in mathematics education research: a systematic review of empirical studies. *Scandinavian Journal of Educational Research*, *67*(7), 1041–1055. https://doi.org/10.1080/00313831.2022.2115132

Yasmin, F., Muhammad Umar Farooq, & Syed Kazim Shah. (2023). Impact of Exam-Oriented Education System on Undergraduate Students' Cognitive, Affective and Psychomotor Competencies. *International Journal of Linguistics and Culture*, *4*(1), 109–125. https://doi.org/10.52700/ijlc.v4i1.180

Živković, M., Pellizzoni, S., Mammarella, I. C., & Passolunghi, M. C. (2023). The relationship betweens math anxiety and arithmetic reasoning: The mediating role of working memory and self-competence. *Current Psychology*, *42*(17), 14506–14516. https://doi.org/10.1007/s12144-022-02765-0