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The Role of Learning Styles in Mediating the Effects of Resilience, Learning Climate, and Self-Efficacy on Vocational Students' Mathematical Reasoning

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ABSTRACT: This study aims to analyze the influence of mathematical resilience, learning climate, and self-efficacy on the mathematical reasoning ability of vocational school students, considering learning style as a mediator and independent variable. Using a quantitative approach with an explanatory-predictive design, data were collected from 200 students at two vocational schools in Dampit East Java and analyzed with PLS-SEM. The results showed that out of the ten hypotheses tested (H1–H10), six hypotheses were significantly accepted. H1, H2, and H3 show that mathematical resilience, learning climate, and self-efficacy have a direct influence on mathematical reasoning. H4 shows that learning styles also make a direct contribution even with low influence. H5 and H6 show that mathematical resilience and learning climate have an effect on learning style, but self-efficacy (H7) does not. Learning style plays a significant role as a mediator in the relationship between mathematical resilience (H8) and learning climate (H9) to mathematical reasoning, but is not significant in mediating self-efficacy (H10). The dual role of learning styles as mediators and independent variables emphasizes the importance of a learning approach tailored to the characteristics of students. These findings suggest that improving mathematical reasoning is not enough to rely only on cognitive aspects, but also requires strengthening affective factors (resilience, self-efficacy) and the learning environment. The contribution of this research provides an empirical basis for the development of learning strategies in vocational schools, especially in the context of technological limitations. Implicitly, teachers need to pay attention to the variety of learning styles and build a supportive learning climate to increase student resilience and confidence. Theoretically, this study enriches the literature by demonstrating the integration of affective variables and learning styles in a model of mathematical reasoning enhancement in vocational education, as well as opening up new directions for further research in the context of non-technological secondary education.

Keywords: mathematical resilience, learning climate, *self-efficacy*, learning style, reasoning ability.

ABSTRAK: *Penelitian ini bertujuan untuk menganalisis pengaruh resiliensi matematika, iklim belajar, dan efikasi diri terhadap kemampuan penalaran matematika siswa sekolah kejuruan, dengan mempertimbangkan gaya belajar sebagai mediator dan variabel bebas. Menggunakan pendekatan kuantitatif dengan desain eksplanatori-prediktif, data dikumpulkan dari 200 siswa di dua sekolah kejuruan di Dampit Jawa Timur dan dianalisis dengan PLS-SEM. Hasil penelitian menunjukkan bahwa dari sepuluh hipotesis yang diuji (H1–H10), enam hipotesis diterima secara signifikan. H1, H2, dan H3 menunjukkan bahwa resiliensi matematika, iklim belajar, dan efikasi diri memiliki pengaruh langsung terhadap penalaran matematika. H4 menunjukkan bahwa gaya belajar juga memberikan kontribusi langsung meskipun dengan pengaruh yang rendah. H5 dan H6 menunjukkan bahwa* *resiliensi matematika dan iklim belajar berpengaruh terhadap gaya belajar, tetapi efikasi diri (H7) tidak. Gaya belajar memainkan peran penting sebagai mediator dalam hubungan antara resiliensi matematika (H8) dan iklim belajar (H9) terhadap penalaran matematika, tetapi tidak signifikan dalam memediasi efikasi diri (H10). Peran ganda gaya belajar sebagai mediator dan variabel independen menekankan pentingnya pendekatan pembelajaran yang disesuaikan dengan karakteristik siswa. Temuan ini menunjukkan bahwa peningkatan penalaran matematika tidak cukup hanya mengandalkan aspek kognitif, tetapi juga membutuhkan penguatan faktor afektif (resiliensi, efikasi diri) dan lingkungan belajar. Kontribusi penelitian ini memberikan dasar empiris bagi pengembangan strategi pembelajaran di sekolah kejuruan, terutama dalam konteks keterbatasan teknologi. Secara implisit, guru perlu memperhatikan keragaman gaya belajar dan membangun iklim belajar yang suportif untuk meningkatkan resiliensi dan kepercayaan diri siswa. Secara teoritis, penelitian ini memperkaya literatur dengan menunjukkan integrasi variabel afektif dan gaya belajar dalam model peningkatan penalaran matematika dalam pendidikan kejuruan, serta membuka arah baru untuk penelitian lebih lanjut dalam konteks pendidikan menengah non-teknologi.*

Kata kunci: *efikasi diri, gaya belajar, iklim belajar, kemampuan penalaran, resiliansi matematika.*

INTRODUCTION

Mathematics learning has a strategic role in shaping logical, analytical, and systematic thinking skills. This ability is necessary not only for academic purposes, but also in everyday life and the world of work. One of the key competencies in learning mathematics is mathematical reasoning, which includes the ability to recognize patterns, build logical arguments, and verify conclusions (Cheng et al., 2021). Mathematical reasoning is an important part of building students' numeracy literacy and critical thinking, especially in the midst of 21st century challenges that demand strong problem-solving skills.

In the context of mathematics learning in Vocational High Schools (SMK), there are several significant challenges related to the mastery of vocational competence and contextual mathematical understanding. Vocational students, who tend to focus on specific fields such as mechanical engineering, accounting, or building construction, often face difficulties in understanding abstract mathematical concepts. This can have an impact on their reasoning abilities, which are influenced by low motivation to study mathematics and the perception of mathematics's irrelevance to their major (Purbaningrum & Mahmudi, 2024) This is exacerbated by low motivation to learn mathematics and the perception that mathematics is not relevant to their vocation, as revealed by research showing that vocational school students tend to lose interest in learning mathematics when they do not see a direct relationship between the material taught and the vocational field they are engaged in (Dwiguningtyas et al., 2025).

Research shows that mathematical reasoning ability is not only determined by cognitive ability, but also by affective and environmental factors such as mathematical resilience, self-efficacy, learning climate, and learning style (Santosa & Bahri, 2022; Supriadi et al., 2024). Mathematical resilience refers to a student's mental resilience in the face of the challenges of learning mathematics, while self-efficacy relates to a student's confidence in his or her ability to complete math

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tasks. On the other hand, a supportive learning climate can create a conducive classroom atmosphere, increasing student motivation and engagement. In addition, appropriate learning styles, namely visual, auditory, and kinesthetic, play a role in helping students absorb and understand mathematics material optimally.

This research is based on Bandura's social-cognitive theory and constructivism theory, which emphasizes that the learning process is the result of an interaction between personal, environmental, and behavioral factors (Baştan & Dülek, 2023; Du, 2023; Singh et al., 2008). Mathematical resilience, self-efficacy, and learning climate are interconnected factors that influence mathematical reasoning in vocational high school students. Research indicates that a positive learning climate can enhance students' mathematical resilience and self-efficacy, which in turn improves their mathematical reasoning abilities (Bacatan, 2024; Maulana et al., 2024). Additionally, learning styles may play a role in how these factors interact, although specific details on this relationship are not provided in the available contexts. The mediating effect of school climate on the relationship between mathematical resilience and students' mathematical disposition has also been highlighted, suggesting that a supportive environment is crucial for fostering these skills (Shaojie et al., 2024). Information is missing on the specific impact of learning styles in this context. Therefore, a model can be developed that maps the relationship between mathematical resilience, self-efficacy, and learning climate as exogenous variables, with mathematical reasoning ability as an endogenous variable, and learning style as a mediator variable. However, there are still few studies that multivariate analyze the influence of resilience, learning climate, and self-efficacy with learning style as a mediator on the mathematical reasoning of vocational school students, especially in a vocational education environment based on pesantren that has technological limitations.

Therefore, this study aims to simultaneously analyze the direct, indirect, and total influence of mathematical resilience, learning climate, and self-efficacy on the mathematical reasoning ability of vocational school students, considering learning style as a mediator and predictor variable. In full, the objectives of this study are as follows: 1) Analyze the direct influence of mathematical resilience, learning climate, and self-efficacy on the mathematical reasoning ability of vocational school students; 2) Analyze the direct influence of mathematical resilience, learning climate, and self-efficacy on students' learning styles; 3) Analyze the direct influence of learning style on mathematical reasoning skills; 4) Analyze the indirect influence (mediation) of learning style in the relationship between: a) mathematical resilience to mathematical reasoning, b) learning climate to mathematical reasoning, and c) self-efficacy to mathematical reasoning. (5) Analyze the total influence of mathematical resilience, learning climate, and self-efficacy on the mathematical reasoning of vocational school students, either directly or through the mediation of learning styles. The findings of this study are expected to make a theoretical contribution to the development of affective-cognitive-based learning models, as well as practical contributions in designing mathematics learning strategies that are adaptive, contextual, and in accordance with the needs of students in vocational education.

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RESEARCH METHOD

This study uses a quantitative approach with a design *explanatory-predictive* which allows the analysis of causal relationships between variables in a multivariate manner (Creswell & Creswell, 2018). The analysis method used is *Partial Least Squares Structural Equation Modeling* **(**PLS-SEM) with the help of SmartPLS software version 4 (Hair et al., 2019). This design is suitable for explanatory and prediction research involving many constructs with relatively moderate sample sizes.

The research will be carried out in 2024 with the population in this study being all class X students in two vocational schools in Dampit District, Malang Regency. The sample determination was carried out by *purposive sampling technique* with the following considerations: (1) The two selected vocational schools, namely SMK Al Munir Dampit and SMK Bina Bangsa Dampit, represented a diversity of academic and vocational backgrounds (technical and non-technical). (2) The results of initial observation and discussion with BK teachers show that there are variations in learning styles (visual, auditory, kinesthetic) and students' perceptions of different learning climates in the two schools. (3) Access and research permission have been officially granted by the school. The number of samples in this study is 200 students, consisting of 125 students of Al Munir Vocational School and 75 students of Bina Bangsa Vocational School. The justification for sample size follows the rule of Hair et al., (2019), which is at least 10 times the number of indicators in the most constructs**.** The learning climate construct has 6 indicators, so the minimum sample requirement is 10 × 6 = 60 respondents. The number of 200 students was considered adequate for the multivariate structural analysis. In addition, calculations using *power analysis* show that this amount has met the power value > 0.80 at a significance level of 5%.

Data collection was carried out offline and directly at schools for 14 days at each location: SMK Bina Bangsa Dampit (July 26–August 3, 2024) and SMK Al Munir Dampit (August 3–13, 2024). This schedule adjustment ensures that there is no overlap and maintains consistency in implementation.

The instruments used consisted of: (1) Mathematical Resilience Scale, adapted from *Connor-Davidson Resilience Scale (CD-RISC)* (Connor & Davidson, 2003), consists of 5 items (example: "I don't give up easily even though it's hard"), using a Likert scale of 1–5. It has been validated in content by 2 mathematics education experts. (2) Learning Climate Scale, adapted from *Learning Climate Questionnaire* (Richard, 2020), consists of 6 items (e.g.: "The teacher supports me in learning"), Likert scale 1–5. This scale measures the dimensions of teacher support, peer interaction, and task orientation. (3) Self-Efficacy Scale, referring to the theory Bandura, (2006), includes 3 items that measure self-confidence, independence, and decision-making courage (example item: "I'm confident in solving math problems without help"). (4) Learning Style Questionnaire, developed based on the Felder-Silverman model (Lohri-Posey, 2021), is made up of 3 main subscales: visual, auditory, and kinesthetic, each consisting of 3 items (example: "I understand the material better if it is presented in the form of

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images"). Validation in the Indonesian context has previously been carried out by Alawiyah et al. (2022). (5) The Mathematical Reasoning Test, consisting of 5 description questions, is prepared based on the Independent Curriculum Mathematics Learning Outcomes for class X. Indicators include: (1) making assumptions, (2) compiling logical arguments, (3) using patterns, (4) verifying results, and (5) generalizing concepts.

Before the questionnaire and test instruments are used for data collection, the instrument test is carried out first, namely through validity tests and reliability tests. Questionnaire Instrument (Non-Test), a questionnaire instrument is used to measure several non-cognitive variables in research, such as mathematical resilience, learning climate, self-efficacy, and learning style. Feasibility Test of Questionnaire Instruments (non-Cognitive): (1) Content Validity Test: the validity of the content of the questionnaire instrument is carried out through *expert judgment* by three expert lecturers in the field of mathematics education. Experts assessed the suitability of the questionnaire items with the theoretical indicators of each variable. The results of the assessment show that all items of the instrument are appropriate and relevant, so that they are declared to be substantially valid. (2) Reliability Test**:** performed using *Cronbach's Alpha* coefficient, with a result of 0.82. This value exceeds the minimum threshold of 0.70, which indicates that the instrument has a high internal consistency and is suitable for measuring the variables in question. Mathematical Reasoning Test Instrument (Cognitive Test), a mathematical reasoning test instrument is used to measure students' ability to think logically, make assumptions, manipulate mathematical concepts, draw conclusions, verify arguments, and identify patterns. Test Instrument Feasibility Test: (1) Content Validity Test: Mathematical reasoning test questions are developed based on mathematical reasoning indicators that are relevant to the curriculum and learning objectives. The validity of the content was tested through *expert judgment* by three expert lecturers in the field of mathematics and learning evaluation. The results of the assessment showed that each question item was in accordance with the targeted indicators and cognitive level, so that it was declared valid in terms of content**.** (2) Reliability Test: for the test instrument, the reliability coefficient is calculated using the formula KR-20 (if the question is multiple-choice) or *Cronbach's Alpha* (if the question is in the form of a description). The results of the analysis showed that the instrument had high reliability (> value of 0.70), so it could be trusted to measure students' mathematical reasoning abilities consistently.

Based on the theoretical framework and the relationship between variables that have been explained earlier, the hypothesis in this study is formulated as in the following Table 1.

Table 1. Research Hypothesis

No.	**Hipotesis**	**Influence**	**Variable exogenous → endogenous**	**Mediation**

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H1	Mathematical resilience has a direct effect on mathematical reasoning	Immediately	Resilience → Reasoning	Not
H2	The learning climate has a direct effect on mathematical reasoning	Immediately	Learning climate → Reasoning	Not
H3	Self-efficacy has a direct effect on mathematical reasoning	Immediately	Self-efficacy → Penalaran	Not
H4	Learning style has a direct effect on mathematical reasoning	Immediately	Learning Style → Reasoning	Not
H5	Mathematical resilience affects learning style	Immediately	Resilience → Learning Style	Not
H6	Learning climate affects learning style	Immediately	Learning climate → Learning Style	Not
H7	Self-efficacy affects learning style	Immediately	Self-efficacy → Learning Style	Not
H8	Learning style mediates the influence of resilience on mathematical reasoning	Indirect	Resilience → Learning Style → Reasoning	Yes
H9	Learning style mediates the influence of learning climate on mathematical reasoning	Indirect	Learning climate → Learning Style → Reasoning	Yes
H10	Learning style mediates the influence of self-efficacy on mathematical reasoning	Indirect	Self-efficacy → Learning Style → Reasoning	Yes

Meanwhile, the data analysis technique is carried out in two stages according to the guidelines Hair et al., (2019): (1) Evaluation of the reflective measurement model (outer model) to assess the validity (convergent, discriminant) and reliability (Cronbach's alpha, composite reliability) of the instrument. (2) Hypothesis test, including: evaluation of structural models (inner models) to assess the significance of direct, indirect, and total influences between variables with bootstrapping tests and blindfolding analysis for predictive relevance ($Q^2 > 0.05$). The f-square value is used to categorize the power of direct influence, and the Upsilon value V is used to measure the power of mediating influence (Ogbeibu et al, 2020)).

Stage 1: Feasibility Test of Research Instruments with Evaluation of Reflective Measurement Models (*Outer Model*), i.e. conducting a) Validity Test is used to test research instruments by testing *Convergent Validity* with *Loading Factor* (> 0.708), EAVE> 0.7, Communility > 0.5. Also test *Discriminant Validity*,

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with Cross Loading (> 0.7), AVE root > latent variable correlation, HTMT (< 0.9) (Hair et al, 2023). b) Reliability Test, used to test the consistency of research instruments or the consistency of respondents' answers, using Cronbach's Alpha (> 0.9) and Composite Realibity (> 0.9) tests. (Hair et al, 2023).

Stage 2: Research Hypothesis Test, the output of the research hypothesis test is the analysis of the direct and indirect influence of exogenous variables on endogenous variables. In another aspect, there is also an answer to the formulation of the research problem in the form of descriptive analysis. The contents of the research hypothesis test section include (1) Structural Model Evaluation**,** The evaluation of the structural model in SEM PLS 4 is allocated to analyze the results of the determination coefficients of chi square, R2, Q2, SRMR, NFI, d_G and, d_Uls (Hair et al, 2023). (2) *Bootstrapping*, the procedural step of bootstrapping is the process of assessing significance to measure (a) direct influence, (b) indirect influence, (c) and overall influence (Hair et al, 2023). Significance level through R2 values, adjusted R2, F2, *outer loading* and *cross loading*. The procedure of bootstrapping will appear t statistics in determining the influence of exogenous variables on endogenous variables. P value as an indicator of significance will also be obtained from the *bootstrapping*. The sample of the original research results is used as a regression coefficient in completing structural equations (Henseler & Sarstedt, 2013). (3) *Blindfolding,* This method is a data analysis procedure in SmartPLS4 that provides predictive correlation in latent variables (Henseler & Sarstedt, 2013). Research that has predictive relevance is the result of scientific research that can be held in the long term. The analysis process uses a count, if $Q^2 > 0.05$, the model is relevant in determining scientific research results, or independent variables that have been procedurally tested to be able to cause events in actualized dependent variables.

This research has received official permission from the Postgraduate University of Islam Malang (UNISMA) to be carried out in two Vocational High Schools (SMK), namely SMK Al Munir Dampit and SMK Bina Bangsa Dampit. In addition, the vocational school has also provided a letter stating that the research has been carried out in the two schools properly and in accordance with the agreed procedures. The research permit from UNISMA and the letter from the vocational school ensure that this research has received approval from the authorities and meets academic procedures in accordance with the institution's policies.

To maintain the ethics of the research, all participants were provided with clear information about the objectives, procedures, and risks of the research through informed consent, stating that the study had no impact on student grades or other aspects. Participants provided voluntary consent with a full understanding of their rights in the study. The identity of the respondents is kept confidential, and the data collected is only used for academic purposes. The researcher is committed to safeguarding personal data in accordance with applicable ethical principles and ensuring that there is no misuse of data. This research was carried out in compliance with the regulations and ethics policies set by UNISMA.

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RESULT AND DISCUSSION

Results

Primary data collection is an independent (exogenous) variable: mathematical resilience, learning climate, *self efficacy*, and *interwinning* variables: learning style by distributing questionnaires, while to measure endogenous variable data, namely in the form of mathematical reasoning test questions for students in Vocational High Schools (SMK). The collection of exogenous, interwining, and endogenous data in this study was carried out at An Nur Al Munir Dampit Malang from August 3 to August 13, 2024 with 125 respondents and SMK Bina Bangsa Dampit Malang from July 26, 2023 to August 3, 2024, with 75 respondents, so that the total respondents used in this study were 200 respondents.

Details of the number of respondents/students at SMK Bina Bangsa Dampit Malang and SMK An Nur AL Munir Dampit Malang, are summarized in Table 2 below.

Table 2. Respondents of SMK Dampit Malang

SMK Dampit Malang	Sum	Presentase (%)
SMK An Nur AL Munir	125	62,5
SMK Bina Bangsa	75	37,5
Sum	200	100

Source: *(Maulana et al., 2024)*

Furthermore, questionnaire data and test question data were analyzed using the ***Partial Least Squares Structural Equation Modeling (PLS-SEM)*** method through *the SmartPLS 4 software,* and an evaluation test was carried out for the measurement model (*outer* model), to test the instrument used must be valid and reliable, and research hypothesis testing was carried out, including: 1) Structural model evaluation; 2) *Bootstrapping*; 3) *Blindfolding*. The full results are explained in the following description.

Evaluation of Measurement Models (Outer Model)

This evaluation aims to ensure that Instruments used in this study has met the standards and passed the validity and reliability test, through the testing of *Convergent Validity, Discriminant Validity, Indicator Reliability,* and *Internal Consistency Reliability,* (Ghasemy et al., 2021). Validity and reliability testing can be seen through the main model diagram of the results *Output PLS Algorithm* from *software SmartPLS 4* in the form of a measurement model diagram (*outer model*) is seen in Figure 1, and the data *Outer Loudings* More details of the measurement items can be seen in Table 3.

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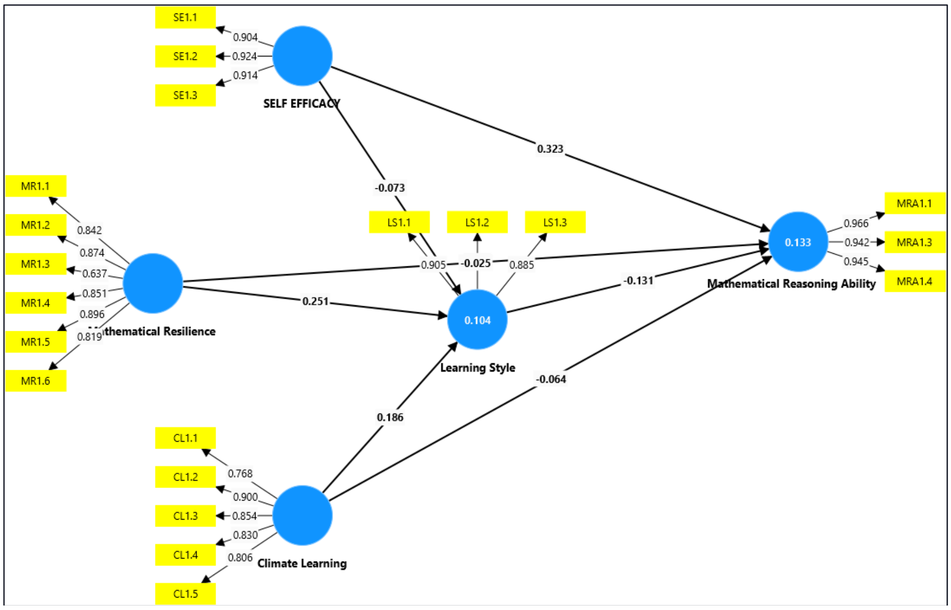

Figure 1. Main Model Diagram PLS *Output Algorithm Outer* Model

The initial step is to test *Convergent Validity* The aim is to determine the validity of each relationship between the indicator and its latent constructs or variables. In this study, it is proven from the diagram of the main model of the results *Output* PLS *Algorithm* Form *Outer* The model as seen in Figure 2. Based on Figure 2, it shows that all measurement items for each variable have met the validity test, because in the diagram all the values *Louding Factor (LF)* > 0.70 and there is 1 measurement item that is rated *LF > 0.60,* according to (Dutta & Mandal, 2018) and (G. David Garson, 2018), declaring that all measurement items have met the test *Convergent Validity*. Validation results by viewing values *outer Loadings* and test the reliability of research instruments through tests *Cronbachs Alpha, Composite Reliability, dan Average Variance Extracted* More seen in Table 3 below.

Table 3. Outer Loadings, Cronbachs Alpha, Composite Reliability, dan Average Variance Extracted

Variable	Item Measurements	Outher Loading > 0.70	Desc.	Cronbach Alpha > 0.70	Composite Reliability > 0.70	AVE > 0.50	Desc.
Self Efficacy	SE 1.1	0.904	Valid	0.902	0.923	0.835	Reliabel
	SE 1.2	0.924	Valid				
	SE 1.3	0.914	Valid				
Climate Learning	CL 1.1	0.768	Valid	0.907	0.939	0.684	Reliabel
	CL 1.2	0.900	Valid				
	CL 1.3	0.854	Valid				
	CL 1.4	0.830	Valid				
	CL 1.5	0.806	Valid				
Resilience Mathematics	MR1.1	0.752	Valid	0.890	0.916	0.693	Reliabel
	MR1.2	0.874	Valid				
	MR1.3	0.637	Valid				
	MR1.4	0.851	Valid				
	MR1.5	0.896	Valid				

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	MR1.6	0.819	Valid				
Learning Style	LS1.1	0.905	Valid	0.873	0.880	0.797	Reliabel
	LS1.2	0.889	Valid				
	LS1.3	0.885	Valid				
Mathematical Reasoning Ability	MRA1.1	0.966	Valid	0.740	0.880	0.557	Reliabel
	MRA1.1	0.942	Valid				
	MRA1.1	0.943	Valid				

Note: Recommendations from (Ghasemy et al., 2021) *the one-tailed 95% percentile confidence intervals (5%, 95%) of the reliability and validity statistics have been provided. CR = Composite Reliability; AVE = Average Variance Extracted.*

Based on Table 3 shows that the value of *Loading Factor* (LF) or *outer loudings* is not all > 0.70 for all measurement items. There are some values < 0.70 such as PM 5.2, and PM 5.5. Indicators that have a *Loading Factor* (LF) value of < 0.70 are not used in subsequent analysis. Each variable has an AVE value of > 0.50, thus based on the LF value > 0.70 and the AVE value > 0.50, it can be concluded that the measurement items of all variables have met *the good* Convergent Validity test.

Furthermore, the reliability of the instrument (measurement) of each variable is tested, namely *Indicator Reliability* and *Internal Consistency Reliability*. In Table 3, the *Internal Consistency Reliability* can be seen through the value of *Composite Reliability (CR)* The high indicates the consistency value of each indicator in measuring its construct. Value *Composite Reliability (CR)* > 0.70. As for testing *Indicator Reliability* digunakan*Cronbach's Alpha*. This value reflects the reliability of all indicators in the model. Value of *Cronbach's Alpha* > 0.70, (Ghasemy et al., 2021). Based on the results of the analysis, it shows that all the *Composite Reliability (CR)* and *Cronbach's Alpha* > 0.70, it can be concluded that *Indicator Reliability* and *Internal Consistency Reliability* the measurement variable has met the test of the reliability level criteria or All constructs have good reliability. Based on the evaluation of the measurement model against the Main Model Figure 1, it is concluded that the measurement model has met the validity and reliability test so that it can be further evaluated. Furthermore, an evaluation test of the structural model was carried out for hypothesis testing.

Evaluation of Structural Models (Inner Model)

Structural model evaluation is the evaluation of hypothesis testing. The influence between the variables presented in *path coefficient* or coefficients. According to (Edeh et al., 2023; Ghasemy et al., 2021), structural model evaluation testing includes (1) SmartPLS4 Multicollinearity Assumption Test, testing *kolinearitas* is a mandatory requirement before *bootstrapping* in the process of analyzing the strucutral equation model. (2) Model Fit Evaluation. And (3) Structural Model Analysis, which is a test Hypotheses in PLS-SEM is carried out through the *bootstrapping* with a value *t table statistic* 1.96 or *p-value* 0.05 indicates that there is a significant influence between variables. Testing *confidence interval 95% path coefficient*, the size or value of the confidence interval of the magnitude of the influence (*path coefficient*) between 95% variables, this is used to see the minimum and maximum value of the influence

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between the variables produced. (3) Testing *F Square*, describe the category of direct influence of variables in *level structural*. According to Hair et al, (2023), value interpretation *F Square* is a low influence (*F Square* = 0.02), medium (*F Square* = 0.15), and high (*F Square* = 0.35). Meanwhile, to see the categories of indirect influences obtained by squafixing the mediation coefficient (*Upsilon V*), namely the effect of low mediation (0.01), the effect of moderate mediation (0.075), and the effect of high mediation (0.175).

SmartPLS4 Multicollinearity Assumption Test

Assumption test in multicollinearity is a mandatory requirement before *bootstrapping* in the process of analyzing *structural equation models*. The interpretation of a data obtained from SmartPLS 4 can be reviewed in (1) the value of the VIF inner model and (2) the VIF *Accumulative List* Model . Many researchers choose to use the VIF *accumulative list* model , because overall data interpretation can be directly analyzed whether it meets the IF requirements. The condition for VIF passing is a VIP coefficient value of ≤ 5.00, so if the VIF value does not meet these requirements, then a symptom of multicollinearity occurs which leads to data not being *bootstrapped*.

Tabel 4. Collinearity Statistics (VIP)-Inner Model

Exogenous, Interwening, and Endogenous Variable Construction	**VIF < 5**
Mathematical Resilience (MR) -> Climate Learning (CL)	1.108
Selfl Efficacy (SE) -> Climate Learning (CL)	1.045
Self Efficacy (SE) -> Mathematical Resilience (MR)	1.000

The results of the collinearity test (see Table 4) show that the Inner VIF values of all combinations of exogenous latent variables, intertwining variables, and endogenous variables are all lower than 5. Thus, there is no collinearity in the structural model. Thus, the bootstrapping procedure can be used to test research hypotheses.

Evaluation of Model Quality and Fit

Inner Model Feasibility Analysis via R Square

The test in this case is central because if one of the variables targeted by the free construct is in *an extra low fit* or ≤ 0.10, then the analysis cannot be carried out through *bootstrapping* to review the direct and indirect influences according to the hypothesis design. *The test output* of the model is carried out through the R *Square* value which is part of the *inner model of PLS SEM*. R *Square* itself is the way used in reviewing how bound constructs can be explained by free constructs. *The R square test*, describes the large variation of endogenous variables that can be explained by exogenous variables or other endogenous variables in the model. This is also clarified in the *Path Coefficient* and *P-Values* model in Figure 2 below.

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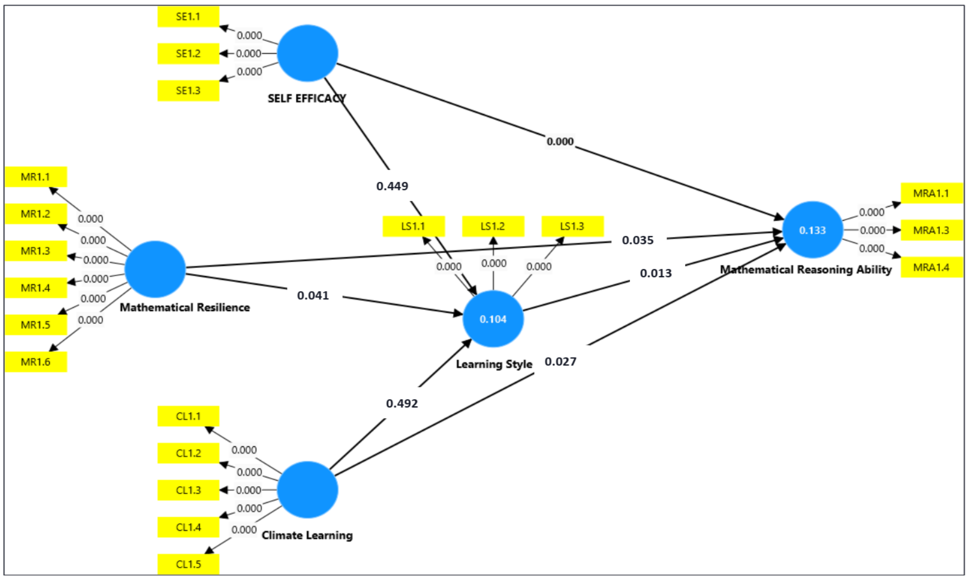

Figure 2. Bootstrapping Calculation Results Using SMARTPLS 4

Coefficient of determination (*R Square*) indicates according to (G. David Garson, 2018) Interpretive Value *R square* were 0.19 (low influence), 0.33 (moderate influence), and 0.66 (high influence). Figure 2, shows that The results of testing the indirect influence hypothesis between exogenous variables and endogenous variables, for more details can be seen in Table 5 below.

Table 5. R Square Determination Coefficient

Variable	*R Square*	*R-square ladjusted*	Interpretation
Learning Style (LS)	0.323	0.312	Moderate (about 0.33)
Mathematical Reasoning Ability (MRA)	0.302	0.376	Moderate (about 0.33)

Based on the results of Table 5, it was obtained that the model obtained from the research data was moderate or *r square adjusted* of 0.190 and 0.118 means weak. The R square determination coefficient in Table 5 can be concluded if mathematical resilience (RM), self efficacy (SE) and learning climate (IB) together have an influence on learning style (GB) of 0.323 with an *adjusted R Square* value of 0.312. The entire exogenous construct (RM, SE and IB) affects GB by 31.2 %. Therefore, the conclusion of the influence of RM, SE and IB on GB is weak. The R Square value of RM, SE, IB, and GB against PM is 0.302 and *the adjusted R Square* is 0.376. This means that exogenous constructs together (RM, IB, and GB) exert a moderate influence of 37.6% on mathematical reasoning ability. The results can be concluded that if the exogenous constructs together exert a low influence on the endogenous constructs. The cumulative value of *R Square Adjusted* is 62% of the 100% obtained from the combined construct of mathematical reasoning ability. So it can be concluded that 38% of mathematical reasoning ability is determined by other variables that have not been studied.

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SmartPLS4 Standardized Root Mean Residual and Non Fit Index Feasibility Analysis

The structural equation model in *SmartPLS 4,* in addition to determining its feasibility through *R Square*, was also analyzed using *standardized root mean residual and non fit indexes*. One thing that is the main basis of the model criteria is (1) the SRMR value ≤ 0.10, (2) the value of the d_uls of ≥ 0.05, (3) the d_G value of ≥ 0.05, (4) chi-square of ≤ 3.00 or expected to be small, and (5) NFI of ≥ 0.80 can be said to be *a good fit*.

Table 6. Standarized Root Mean Residual & Non-Fit

Test	Saturated model	Estimated model	Kriteria *Estimated Model*	Interpretasi
SRMR	0.108	0.108	≤ 0.10	*Good Fit*
d_ULS	0.849	0.866	≥ 0.05	*Good Fit*
d_G	0.373	0.372	≥ 0.05	*Good Fit*
Chi-square	335.993	334.262	≤ 3.00	*Fit*
NFI	0.851	0.852	≥ 0.80	*Good Fit*

Based on Table 6, it can be categorized if all models are in the *good fit criteria*, except in the form of *chi-squares* which are in the vulnerable ≥ 3.00 where they do not meet the *good fit criteria* but the research model is stated in the form of *fit* or feasible because the vulnerable value is not far from 3.00. Based on these results, it can be said that the results of research and development of the existing model are *robust*. A new thing about *SmartPLS 4* is the degree of reliability of data that can be measured from (1) d_Uls and (2) d_G, so that for the new interpretation with the obtained *estimated model* results ≥ 0.05 data collected in the study has *goodfit* criteria in terms of reliability.

Eligibility Analysis through Predictive Relevance Q Square

Predictive relevance (Q2) is a test stage through *blindfolding*, which aims to provide a presentation of results if the dependent variable has a predictive relationship with the intended independent variable. The conclusion of *q square* is quite simple, if the value of ∑Q2 ≥ 0, then the construct has the status *of predictive relevance* to the independent variable.

Tabel 7: Q^2 Predictive Relevance Value

Indicator	Q^2predict	PLS-SEM_RMSE	PLS-SEM_MAE
LS1.1	0.012	4.353	3.454
LS1.2	0.050	5.254	4.168
LS1.3	0.052	5.987	4.875
MRA1.1	0.012	2.687	2.246
MRA1.3	0.012	2.631	2.240
MRA1.4	0.011	2.710	2.298

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Based on Table 7, it can be seen that the Q2 results for the RM, SE, and IB variables for GB, have *predictive relevance* because ≥ 0.000. The exogenous variables as a whole (RM, IB, SE and GB) have a Q2 of ≥ 0.000 each against the mathematical reasoning variables. On the basis of various processing of final data from *blindfolding*, the data is feasible to continue in *bootstrapping* analysis in knowing the research hypothesis.

Structural Model Analysis (Hypothesis Testing)

The analysis of this model is related to the hypothesis testing in PLS-SEM carried out through *the bootstrapping* method. Furthermore, hypothesis testing is carried out by testing the significance and relevance of *the cooffecient path*, the significance value of the path coefficient of each path that connects between latent variables through *the Bootstrapping* procedure will be analyzed, the results as seen in Table 8 below.

Table 8. Testing the Direct Influence Hypothesis (Path Coefficient and P-Values)

Track Model	***Path Coefficient***	***T Statistics***	***P-Values***	**95% lInterval Confidence Path Coefficient**		***F Square***	**Description**
				Lower limit	**Upper limit**		
H1 : MR => MRA	0.167	1.989	0.035	0.078	0.123	0.175	Accepted
H2 : CL => MRA	0.026	1.969	0.027	0.119	0.172	0.305	Accepted
H3 : SE => MRA	0.325	4.678	0.000	0.188	0.463	0.125	Accepted
H4 : LS => MRA	0.045	2.551	0.013	-0.028	0.013	0.017	Accepted
H5 : MR => LS	0.063	2.044	0.041	0.011	0.133	0.012	Accepted
H6 : CL => LS	0.002	0.687	0.492	-0.009	0.003	0.005	Rejected
H7: SE => LS	0.002	0.757	0.449	-0.002	0.008	0.002	Rejected

Based on Table 8, the results of the study related to direct influence are obtained, as follows.

The first hypothesis (H1) is accepted, Mathematical resilience (MR) *has a significant influence on Mathematical Reasoning Ability* (MRA) *(*0.167), t *statistic* (1.989>1.96), p value (0.035<0.05). Indicates that the increase in the latency-based resilience can have an effect on the reasoning of the students in the SMK, and the decrease in the resilience of the students also affects the decrease in the reasoning ability of the students, even though the influence is produced (*f square* = 0.175).

The second hypothesis (H2) is accepted, there is an influence of the learning climate between (IB) on *Mathematical Reasoning Ability* (MRA) and path *coefficient* (0.026), t *statistic* (1.969>1.96), and p value (0.027<0.05). t means that every pepper improves the learning climate, then it increases the learning style of the SMK students. In the interval of l95% increase the influence of the climate learn in increase lbaya learning is ocated between 0.119 and 0.172 category linfluence f square 0.305.

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The third hypothesis (H3) is accepted, there is a significant positive efficacy (SE) influence on (PM) mathematical reasoning *(PM) (*0.325), t *statistic* (4.678 > 1.96), and p-value (0.000 < 0.05). This means that changes in mathematical resilience can improve mathematical reasoning. Students with a high level of resilience tend to have better mathematical reasoning skills because they are able to face learning challenges with an attitude of never giving up. In the interval of 95%, the effect of mathematical resilience. increase in learning style is between 0.188 and 0.463.

The Fourth Hypothesis (H4) is accepted, showing that learning style has a significant influence on mathematical reasoning. This is supported by a path coefficient value of 0.045, t-statistic (2.551 >1.96), and p-value (0.013 < 0.05). In other words, an improvement in students' learning styles contributes positively to the improvement of their mathematical reasoning abilities. However, the effect produced is relatively low, with an f-square value of 0.017.

The Fifth Hypothesis (H5) was accepted, showing that mathematical resilience (RM) had a significant effect on learning style. The path coefficient obtained was 0.063, with t-statistic (2.044 >1.96) and p-value (0.041 < 0.05). This means that students who have higher mathematical resilience tend to have better learning styles. However, the influence exerted in this model is relatively low, with an f-square value of 0.012.

The Sixth Hypothesis (H6) is rejected, because the learning climate has no significant influence on learning style. The path coefficient obtained was very small, namely 0.002, with t-statistic (0.687 < 1.96) and p-value (0.492 > 0.05). This suggests that in the context of this study, changes in the learning climate do not have a meaningful impact on students' learning styles. In addition, the f-square value of only 0.005 further confirms the weakness of this relationship.

The Seventh Hypothesis (H7) was also rejected, suggesting that self-efficacy (SE) had no significant influence on learning style (LS). The resulting path coefficient is 0.002, with t-statistic (0.757 < 1.96) and p-value (0.449 > 0.05). Thus, students' confidence in mathematics does not show a meaningful relationship with the way they learn. The f-square value of only 0.002 further strengthens the conclusion that this relationship is not significant in this study model.

Meanwhile, to test the hypothesis of the indirect influence between exogenous variables and endogenous variables, it can be seen in Table 9 below.

Table 9. Indirect Influence Hypothesis Testing (Path Coefficient and P-Values)

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Track Model	***Path Coefficient***	***T Statistics***	***P-Values***	**95% lInterval Confidence Path Coefficient**		***UpsilonV* or *F Square***	**Ket.**
				Lower Limit	**Upper Limit**		
H8: MR => LS => MRA	0.024	1.977	0.045	0.007	0.013	0.060	Accepted
H9: CL => LS => MRA	0.042	2.453	0.015	-0.018	0.010	0.038	Accepted
H10: SE => LS => MRA	0.010	0.846	0.398	-0.010	0.038	0.029	Rejected

Based on Table 9, namely the hypothesis testing of the indirect influence *of Path Coefficient, P Values*, and *Upsilon* V test (obtained from the formula upsilon V = β2MXβ2YM.X with the criteria of (0.175) high mediation effect, (0.075) moderate mediation effect, and (0.01) low mediation effect), all of the following results were obtained.

The Eighth hypothesis (H8) accepted, variabel The learning style is significantly influenced by the mediating variable. This means that the learning style can be moderated by the influence of mathematical resilience on mathematical reasoning and the participants of the SMK. Because the value of *path coefficient* (0.024), t *statistic* (1.977 > 1.96), p-value (0.045 > 0.05). At the level structural role mediation learning line include category influence low mediation (with nilai Upsilon *V* = 0.060) (Ghasemy et al., 2021).

The nine hypothesis (H9) accepted, Variable style learning is defined as variable mediation,which means style learning can moderation influence climatic learning against Mathematical Reasoning for the Role of Mathematics in the Classroom. Because of the value of path *coefficient*.(0.042), t *statistic* (2.453 > 1.96), p-value (0.015< 0.05). In the level structural role mediation style learning line including category influence low mediation to moderate (with nilai Upsilon *Lv* l = 0.038) (Ghasemy et al., 2021).

The tenth hypothesis (H10) is rejected, the learning style variable is not explicitly defined as a mediating variable, which means that learning styles cannot moderate the influence *of self-efficacy* on the mathematical reasoning of students in vocational schools. Because the *pathlcoefficient* mediated value was obtained as (0.010), *the statistical t* (0.846 < 1.96), and the p-value (0.398l> 0.05). At the structural level, the role of learning mediation is included in the category of low mediating influence (with a *value of Upsilon V* = 0.029).

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Discussion

The result of the first hypothesis (H1) was accepted, obtained the result that Mathematical resilience has a significant effect on the mathematical reasoning ability of vocational school students. The results of the analysis showed a path coefficient of 0.167, a t-statistic of 1.989 (more than 1.96), and a p-value of 0.035 (less than 0.05), which indicates that an increase in RM can increase the PMs of students, while a decrease in RM can decrease PM, although the effect is moderate (f-square = 0.175) (Attami et al., 2020; Audina et al., 2023; Rohmah et al., 2020). Mathematical resilience is essential for improving students' reasoning skills. Research shows that students with higher resilience tend to perform better at problem-solving, as they are more persistent and confident in the face of challenges (Rohmah et al., 2020). This is important in education, where problem-solving is a key component of the curriculum.

Learning models that integrate elements of mathematical resilience, such as *Connected Mathematics Project* (CMP), proven to improve students' mathematical reasoning and resilience. This model encourages students to build their own knowledge and connect learning to real-world contexts, thereby improving their reasoning skills (Audina et al., 2023). Therefore, the direct influence of mathematical resilience on reasoning ability is very clear and supported by significant statistical data. Educators are advised to focus on developing students' mathematical resilience to improve their overall reasoning skills and mathematical literacy (Attami et al., 2020; Audina et al., 2023; Rohmah et al., 2020).

The second hypothesis (H2) was accepted, which showed that the learning climate has a significant influence on the mathematical reasoning ability of vocational school students. The results of the analysis showed a path coefficient value of 0.026, t-statistic of 1.969, and a p-value of 0.027, indicating that the better the learning climate in the classroom, the higher the students' mathematical reasoning ability (Baehaqi et al., 2023). A positive learning climate includes a supportive environment and good social interaction, which can facilitate the learning process and affect students' overall learning outcomes. Research (Nurjanah et al., 2022) supports this, emphasizing that a supportive learning environment can also improve students' mathematical communication skills, ultimately strengthening their reasoning abilities.

Although the *F-Square* 0.305 indicates that the influence of the learning climate is in the low category, this influence remains significant and practically relevant. Within the 95% confidence interval, the influence of learning climate on mathematical reasoning was in the range of 0.119 to 0.172, indicating a consistent contribution to improving students' mathematical reasoning skills as the learning climate improved. (Utami & Puspitasari, 2022) (Sahwari & Dassucik, 2022). Therefore, teachers need to prioritize learning strategies that create a positive and inclusive classroom atmosphere. In addition, students' active involvement in social interactions in the classroom can increase their motivation and confidence, which also contributes to improved mathematical reasoning (Jehabun et al., 2020).

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Overall, these findings emphasize the importance of learning climate as a key factor in supporting students' mathematics achievement.

The results of the third hypothesis (H3) was accepted, showed a significant positive influence of self-efficacy (SE) on mathematical reasoning with a path coefficient of 0.325, t-statistic of 4.678 (more than 1.96), and p-value of 0.000 (less than 0.05). This suggests that increased self-efficacy can improve students' mathematical reasoning abilities, where students with high self-efficacy are better able to cope with learning challenges. Within the 95% confidence interval, the influence of SE on PM ranges from 0.188 to 0.463, with a moderate influence category (f-square = 0.125). Self-efficacy, or belief in one's own abilities, has a significant impact on students' mathematical reasoning abilities. Research shows that self-efficacy affects students' capacity to engage in mathematical reasoning, which is essential for problem-solving and critical thinking. A study found that students with high self-efficacy showed better mathematical reasoning skills, although challenges remain for all levels of self-efficacy (Jumiarsih et al., 2020). This shows the importance of increasing self-efficacy to strengthen mathematical reasoning skills.

The relationship between self-efficacy and mathematical reasoning is supported by studies demonstrating the role of self-efficacy-mediating in the effectiveness of teaching approaches. A quasi-experimental study found that self-efficacy significantly mediated the impact of teaching methods on students' mathematical reasoning skills (Mukuka et al., 2021). It shows that educational strategies that increase self-efficacy can improve reasoning skills, confirming the importance of integrating self-efficacy development in teaching practice. In addition, self-efficacy not only affects mathematical reasoning directly, but also other factors such as learning independence and anxiety. Research shows that self-efficacy contributes to students' learning independence, which in turn improves their mathematical reasoning abilities (Haratua et al., 2024). In addition, self-efficacy is also influential in reducing math anxiety, which if left untreated can hinder performance (Pajares & Kranzler, 1995). These findings highlight the multifaceted role of self-efficacy in shaping students' mathematical abilities.

Therefore, the positive and significant influence of self-efficacy on mathematical reasoning has been widely documented, with a path coefficient of 0.325 and a significant t-value of 4.678 (Haratua et al., 2024). This suggests that increased self-efficacy can bring substantial improvements in students' reasoning skills. While self-efficacy is a critical factor, it is important to consider other educational strategies to maximize their impact on students' mathematical reasoning abilities.

The Fourth Hypothesis (H4) is accepted, showed that learning style had a significant influence on students' mathematical reasoning with a path coefficient of 0.045, t-statistic of 2.551, and p-value of 0.013. These findings are in line with previous research by Putri, Ekawati, and Fiangga (2022) and Pizon and Ytoc (2022), which confirms that the way students absorb and process information, both visually, auditory, and kinesthetic, affects their math learning outcomes. Puspita et al. and Putri et al. (2022) also stated that varied learning styles affect students'

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problem-solving strategies and can improve mathematical understanding if learning is tailored to each individual's learning style. Thus, introduction to learning styles is an important aspect in designing an effective learning approach.

Although the influence of learning style on mathematical reasoning is significant, an f-square value of 0.017 indicates that the effectiveness of this influence is still low. This indicates that there are other factors that are more dominant in influencing students' mathematical reasoning (Pizon & Ytoc, 2022) (Zulfah et al., 2021). Therefore, a more holistic approach such as problem-based learning is suggested to improve problem-solving skills (Kusumaningtyas, 2024) (Saija, 2021). According to (Nurma & Rahaju, 2021) stating that creating a supportive learning environment will increase students' motivation and contribution in the learning process. In addition, methods that consider students' learning styles can also strengthen their resilience in the face of academic challenges (Itasari et al., 2021).

The Fifth Hypothesis (H5) is accepted, showing that mathematical resilience had a significant effect on students' learning style, with a path coefficient of 0.063, t-statistic of 2.044, and p-value of 0.041. This means that students with higher levels of mathematical resilience tend to have better learning styles. These findings are supported by (Constantinescu, 2024), which suggests that resilient students tend to adopt active learning strategies, thus reinforcing the link between resilience and learning approaches. But (Ragusa et al., 2023) does not directly address this relationship, but rather highlights the influence of stress and academic self-regulation, thus not fully supporting the claim of a direct relationship between RM and GB. Nevertheless, this analysis shows that there is a positive relationship between resilience and learning styles that deserves attention in the context of education.

Although the effect is significant, its effectiveness is still relatively low with an f-square value of 0.012. This shows that resilience is not the only factor that affects students' learning styles. Therefore, a more comprehensive approach to learning is needed that not only improves academic ability but also strengthens students' resilience character. Problem-based learning strategies have been shown to be effective in supporting academic success, despite evidence from (Roche et al., 2022) focuses more on student resilience during the COVID-19 pandemic and does not specifically highlight learning strategies to increase resilience. Thus, the development of resilience character remains an important component in supporting students' learning styles and academic success as a whole (Constantinescu, 2024).

The Sixth Hypothesis (H6) is rejected because the learning climate does not have a significant influence on the learning style of students. The results of the analysis showed a path coefficient of 0.002, t-statistic 0.687, and p-value 0.492, which indicates that changes in the learning climate do not have a significant impact on students' learning styles. Even though (Rambe & Yarni, 2019) Finding that learning style affects student learning achievement, the study does not directly support the relationship between learning climate and learning style. A positive learning climate remains important in creating a supportive learning

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environment, but these results suggest that internal factors such as individual abilities and learning habits have a greater role in shaping students' learning styles.

An f-square value of 0.005 reinforces that the relationship between learning climate and learning style is very weak. This indicates that the learning climate is not a dominant variable in influencing students' learning styles, especially at SMK Bina Bangsa Dampit Malang and SMK An Nur and AL Munir Dampit Malang. Research by (Upu et al., 2020) supports this by showing that factors such as motivation and learning discipline have a more significant influence on the success of learning mathematics. Therefore, a more personalized approach and focus on developing students' internal aspects, such as motivation, discipline, and independent learning strategies, is more recommended in improving learning outcomes than relying solely on improving the learning climate.

Seventh Hypothesis (H7) rejected, showing that self-efficacy does not have a significant influence on students' learning style. The results of the analysis showed a path coefficient of 0.002, t-statistic 0.757, and a p-value of 0.449, which indicated that students' confidence level in mathematics was not significantly related to the way they learned. Even though (Alhadabi & Karpinski, 2019) stating that students with high self-efficacy tend to use more productive learning strategies, these findings show that in the context of vocational school students, self-efficacy is not the main factor in determining learning styles. This may be due to the dominance of other variables such as personality, motivation, or the support of the learning environment that have a greater influence on learning styles in this context.

Furthermore, the very small f-square value of 0.002 confirms that the influence of self-efficacy on learning style is very weak. Research by (Svartdal et al., 2021) supports these findings by showing that self-efficacy is not always directly correlated with the learning strategies students use. In a stressful or uncertain learning environment such as in vocational schools, external factors tend to have a greater role than individual self-efficacy. Therefore, a more holistic approach is needed in the development of learning strategies, taking into account internal and external factors simultaneously. According to (Konaszewski et al., 2019) It also emphasizes the importance of a thorough understanding of various psychological and environmental aspects to effectively improve mathematics learning outcomes.

The results of the study showed that H8 was accepted, that learning style plays a significant role as a mediating variable in the relationship between mathematical resilience and mathematical reasoning of vocational school students. This is evidenced by the coefficient of the mediating pathway of 0.024, t-statistic of 1.977, and p-value of 0.045, which shows that learning style is able to strengthen the positive influence of mathematical resilience on mathematical reasoning ability (Azizah & Abadi, 2022) (Olo et al., 2023). These findings underscore the importance of the role of learning styles in supporting the learning process, particularly in improving logical thinking skills and mathematical problem-solving. Previous research by (Mustikasari, 2021) It also supports that learning styles have a significant effect on mathematical reflective thinking skills, so that

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teaching approaches that are aligned with students' learning styles can improve their overall cognitive capacity.

More broadly, learning styles not only support mathematical reasoning but also help shape a learning environment that supports students' mental resilience in the face of academic challenges (Inayah & Agoestanto, 2023) (Ghifari et al., 2022). According to (Shafira et al., 2023) emphasizing that mathematical reasoning is a crucial aspect of learning that can be improved through strategies that understand students' different learning styles. Thus, the integration between mathematical resilience and the right learning style can create a more effective and adaptive learning experience. This is especially important in developing critical thinking skills and complex problem-solving skills, especially in the context of STEM education (Azizah & Abadi, 2022) (Ghifari et al., 2022). Efforts to improve mathematical reasoning in vocational schools must consider these two aspects simultaneously to achieve optimal learning outcomes.

The results of the study show that the ninth hypothesis (H9) is accepted, where learning style plays a significant role as a mediating variable in the relationship between the learning climate and the mathematical reasoning of vocational school students. The path coefficient value of 0.042, t-statistic 2.453, and p-value 0.015 showed a significant mediation effect (Arumsari, 2023). These findings emphasize that students' learning styles, whether visual, auditorial, or kinesthetic, affect how they interact with learning materials and respond to the learning climate (Rafiska & Susanti, 2023) (Roshanti et al., 2023). Students' reactivity to the learning climate is highly dependent on the match between their teaching methods and learning styles, which has an impact on the effectiveness of their mathematical reasoning.

Furthermore, a properly adapted learning style not only pays attention to individual preferences, but also contributes to creating a learning atmosphere that supports the development of critical thinking skills. Research from (Huda & Nurhuda, 2023) It shows that a conducive learning environment, when combined with an appropriate learning style approach, is able to significantly improve mathematical reasoning skills. Therefore, it is very important for educators to recognize students' learning styles in order to adapt effective learning strategies. Mathematics learning interventions that consider learning styles have been shown to strengthen students' reasoning powers and equip them with the ability to face challenges in logical and systematic thinking (Akmal et al., 2022) (Hilman et al., 2023). These findings support a more personalized and adaptive learning approach to improve the quality of mathematics education in vocational schools.

The tenth hypothesis (H10) is rejected because the results of the study show that learning style does not function significantly as a mediating variable in the relationship between self-efficacy and mathematical reasoning of vocational school students. With a path coefficient value of 0.010, t-stat 0.846, and p-value 0.398, it can be concluded that learning style is not able to strengthen the influence of self-efficacy on mathematical reasoning (Suanto et al., 2022). Although self-efficacy has been shown to have an important impact on mathematical reasoning abilities (Lestari et al., 2022), learning styles in this

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context do not act as additional reinforcements. According to (Hadiat & Karyati, 2019) It also shows that self-concept has a stronger influence on learning outcomes than learning styles themselves, reinforcing the finding that learning styles are not an effective mediating factor in this relationship.

These findings underscore the importance of focusing on developing self-efficacy in mathematics learning. Self-efficacy helps students persevere in solving complex math problems and encourages them to work harder. Therefore, empowering learning approaches, such as problem-based learning, are becoming more relevant to improve students' mathematical reasoning (Hidayah, 2024) (Lubis et al., 2022). While learning styles remain important in understanding how students absorb information, the top priority should be given to strengthening students' self-confidence (Pratiwi & Nawangsari, 2022). (Masruroh et al., 2023) It also emphasized that creating a learning environment that supports the development of independence and self-confidence has more impact on improving learning outcomes, especially in mathematics subjects.

CONCLUSION

This study tested ten hypotheses (H1–H10) regarding the relationship between mathematical resilience, learning climate, self-efficacy, learning style, and mathematical reasoning ability of vocational school students. The results of the analysis show that: (1) H1 is accepted: Mathematical resilience has a direct and significant effect on mathematical reasoning ability. (2) H2 acceptance: The learning climate has a significant direct influence on mathematical reasoning. (3) H3 is accepted: Self-efficacy has a direct and significant effect on students' mathematical reasoning. (4) H4 is accepted: Learning style has a direct effect on mathematical reasoning, although with a relatively low contribution. (5) H5 accepted: Mathematical resilience has a significant effect on students' learning styles. (6) The Sixth Hypothesis (H6) is rejected: learning climate (IB) does not have a significant influence on learning style (GB). (7) H7 rejected: There was no significant influence between self-efficacy and learning style. (8) H8 accepted: Learning style mediates the influence of mathematical resilience on mathematical reasoning significantly. (9) H9 accepted: Learning style mediates the influence of learning climate on mathematical reasoning significantly. (10) H10 rejected: Learning style does not mediate the relationship between self-efficacy and mathematical reasoning.

In addition, learning styles act as mediators in the relationship between mathematical resilience and the learning climate to mathematical reasoning, suggesting the existence of a significant indirect pathway. However, learning styles do not serve as mediators in the relationship between self-efficacy and mathematical reasoning. These results show that individual characteristics (such as resilience and self-confidence), learning environment, and learning approaches play complex and interinteracting roles in shaping students' reasoning abilities.

Theoretically, this study reinforces Bandura's social-cognitive approach and constructivism theory, where learning outcomes are influenced by the interaction between personal, environmental, and behavioral factors. These

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findings emphasize the importance of integrating affective dimensions in mathematics learning to produce more meaningful and sustainable understanding. In terms of practical implications, these results recommend that teachers in vocational schools: (1) Increase students' mathematical resilience through the habit of solving challenging open-ended questions, reflection on failures, and peer discussion. (2) Building a positive learning climate, by creating a classroom atmosphere that supports collaboration and provides space for expression. (3) Develop self-efficacy through successful learning experiences and constructive verbal support from teachers. (4) Adapting teaching strategies to students' learning styles, for example: using visual media, auditory discussions, or kinesthetic activities in mathematics learning.

These findings can be the basis for the development of character-based contextual learning interventions for vocational school students, especially in environments with minimal technology such as Islamic boarding schools. Follow-up research can explore other variables such as emotion regulation or math anxiety to strengthen models of mathematical reasoning enhancement in vocational education.

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REFERENCES

Akmal, R. A., Sarjana, K., Wulandari, N. P., & Soeprianto, H. (2022). Pengaruh Disposisi Matematis Terhadap Kemampuan Penalaran Matematis Pada Materi Statistika Siswa Kelas VIII MTsN 3 Mataram Tahun Ajaran 2022/2023. *Jurnal Ilmiah Profesi Pendidikan*, *7*(4b). https://doi.org/10.29303/jipp.v7i4b.904

Alawiyah, Z., Somatanaya, G., Mulyani, E., & Matematika, P. (2022). Gaya Belajar, Self efficacy dan Pengaruhnya Terhadap Kemampuan Penalaran Matematis. *Jurnal Kongruen*, *1*(1), 30–31.

Alhadabi, A., & Karpinski, A. C. (2019). Grit, Self-Efficacy, Achievement Orientation Goals, and Academic Performance in University Students. *International Journal of Adolescence and Youth*, *25*(1), 519–535. https://doi.org/10.1080/02673843.2019.1679202

ARUMSARI, D. M. (2023). Analisis Gaya Belajar Siswa Terhadap Hasil Belajar Pada Mata Pelajaran Ipas. *Learning Jurnal Inovasi Penelitian Pendidikan Dan Pembelajaran*, *3*(1), 111–119. https://doi.org/10.51878/learning.v3i1.2118

Attami, D., Budiyono, & Indriati, D. (2020). Mathematical resilience and mathematical problem-solving ability in Junior High School. *Journal of Physics: Conference Series*, *1613*(1), 012028. https://doi.org/10.1088/1742-6596/1613/1/012028

Audina, S., Nahdi, D. S., Jatisunda, M. G., & Cahyaningsih, U. (2023). Connected

Corresponding author: M. Iqbal Maulana Halisna (22302072018@unisma.ac.id)

Mathematics Project in Vocational School: A Teaching Quality that Improves student's Mathematical Reasoning and Resilience. *Journal of Education For Sustainable Innovation*, *1*(1), 20–30. https://doi.org/10.56916/jesi.v1i1.485

Azizah, R. N., & Abadi, A. P. (2022). Kajian Pustaka: Resiliensi Dalam Pembelajaran Matematika. *Didactical Mathematics*, *4*(1), 104–110. https://doi.org/10.31949/dm.v4i1.2061

Bacatan, R. J. (2024). Mediating Effect of School Climate on the Relationship between Mathematical Resilience and Disposition of Senior High School Students. *Twist*, *April*, 16–31.

Baehaqi, M. R., Parta, I. N., & Chandra, T. D. (2023). Kemampuan Komunikasi Matematis Tulis Siswa Bergaya Belajar Visual Dalam Menyelesaikan Masalah Ditinjau Dari Perbedaan Gender. *Jurnal Cendekia Jurnal Pendidikan Matematika*, *7*(1), 550–561. https://doi.org/10.31004/cendekia.v7i1.1978

Bandura, A. (2006). Guide to the construction of self-efficacy scales. *Self-Efficacy Beliefs of Adolescents*, 307–337.

Baştan, A., & Dülek, A. (2023). Learned violence: bandura's social learning theory in edward bond's the children öğrenilmiş şiddet: edward bond'un the children adli oyunununda ba ndura'nin sosyal öğrenme kurami. *Sosyal Bilimler Enstitüsü Dergisi*, *13*(1), 106–118.

Cheng, J., Zheng, X., & Zhu, Y. (2021). *Chinese Eighth Graders' Competencies in Mathematical Reasoning* (pp. 187–207). https://doi.org/10.1007/978-3-030-68157-9_11

Connor, K., & Davidson, J. (2003). *Connor-Davidson resilience scale (CD-RISC) © manual*. *2*(18), 76–82. https://doi.org/10.1002/da.10113

Constantinescu, M. (2024). Resilience and Student Integration in Higher Education. *Revista Romaneasca Pentru Educatie Multidimensionala*, *16*(4), 497–508. https://doi.org/10.18662/rrem/16.4/926

Creswell, J. W., & Creswell, J. D. (2018). Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). *SAGE Publications*.

Du, Z. (2023). The Application of Constructivist Educational Theory in Classroom Practice in Higher Vocational Colleges. *International Journal of Education and Humanities*, *11*(2), 161–163. https://doi.org/10.54097/ijeh.v11i2.13752

Dutta, T., & Mandal, M. K. (2018). *Neuromarketing in India*. Routledge. https://doi.org/10.4324/9781351269360

Dwiguningtyas, A. A., Agustito, D., Kusumaningrum, B., & Kuncoro, K. S. (2025). *Persepsi Siswa terhadap Pembelajaran Matematika dan Kaitannya dengan Minat Serta Sikap Belajar Siswa*. *9*, 83–90.

Edeh, E., Lo, W.-J., & Khojasteh, J. (2023). Review of Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook. In *Structural Equation Modeling: A Multidisciplinary Journal* (Vol. 30, Issue 1). https://doi.org/10.1080/10705511.2022.2108813

G. David Garson. (2018). Partial Least Squares. In *Multi-Label Dimensionality Reduction*. https://doi.org/10.1201/b16017-6

Ghasemy, M., Rosa-Díaz, I. M., & Gaskin, J. E. (2021). The Roles of Supervisory Support and Involvement in Influencing Scientists' Job Satisfaction to Ensure

Corresponding author: M. Iqbal Maulana Halisna (22302072018@unisma.ac.id)

the Achievement of SDGs in Academic Organizations. *SAGE Open*, *11*(3). https://doi.org/10.1177/21582440211030611

Ghifari, S. S. A., Juandi, D., & Usdiyana, D. (2022). Systematic Literature Review: Pengaruh Resiliensi Matematis Terhadap Kemampuan Berpikir Matematis Tingkat Tinggi. *Jurnal Cendekia Jurnal Pendidikan Matematika*, *6*(2), 2025–2039. https://doi.org/10.31004/cendekia.v6i2.1271

Hadiat, H. L., & Karyati, K. (2019). Hubungan Kemampuan Koneksi Matematika, Rasa Ingin Tahu Dan Self-Efficacy Dengan Kemampuan Penalaran Matematika. *Jurnal Riset Pendidikan Matematika*, *6*(2), 200–210. https://doi.org/10.21831/jrpm.v6i2.26552

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Haratua, C. S., Indriasari, R. N., Yuana, Y., Maksudi, M., Gabun, L., & Amanda, N. (2024). The Effect of Self-Efficacy and Learning Independence on Students Mathematical Reasoning Ability. *Jurnal Indonesia Sosial Sains*, *5*(05), 1085–1091. https://doi.org/10.59141/jiss.v5i05.1115

Henseler, J., & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. *Computational Statistics*, *28*(2), 565–580.

Hidayah, S. (2024). Penerapan Model Pembelajaran Problem Based Learning (PBL) Dalam Upaya Meningkatkan Kemampuan Penalaran Matematis Siswa. *Math-Edu Jurnal Ilmu Pendidikan Matematika*, *9*(2), 536–545. https://doi.org/10.32938/jipm.v9i2.7658

Hilman, I., Akmal, R., & Nugraha, F. (2023). Analisis Gaya Belajar Peserta Didik Melalui Assessment Diagnostik Non Kognitif Pada Pembelajaran Diferensiasi Di Sekolah Dasar. *Naturalistic Jurnal Kajian Penelitian Pendidikan Dan Pembelajaran*, *8*(1), 161–167. https://doi.org/10.35568/naturalistic.v8i1.3911

Huda, A. A. S., & Nurhuda, A. (2023). Asesmen Diagnostik Non-Kognitif Gaya Belajar Siswa SMP Kelas 7 Di Lembang, Indonesia. *Nusant. J. Behav. And. Soc. Sci*, *2*(3), 55–60. https://doi.org/10.47679/202331

Inayah, F., & Agoestanto, A. (2023). Kemampuan Pemecahan Masalah Ditinjau Dari Resiliensi Matematis: Tinjauan Pustaka Sistematis. *Jumlahku Jurnal Matematika Ilmiah Stkip Muhammadiyah Kuningan*, *9*(1), 74–86. https://doi.org/10.33222/jumlahku.v9i1.2798

Itasari, K., Pramudya, I., & Slamet, İ. (2021). *Mathematical Connection Analysis of High School Students With Accommodator and Diverger Learning Style*. https://doi.org/10.2991/assehr.k.211122.021

Jehabun, S., Gunur, B., & Kurniawan, Y. (2020). Emotional Intelligence and Mathematics Learning Interest in Students' Mathematical Reasoning Ability. *Math Didactic Jurnal Pendidikan Matematika*, *6*(1), 25–38. https://doi.org/10.33654/math.v6i1.801

Joseph F. Hair Jr.;G. Tomas M. Hult; Christian M. Ringle; Marko Sarstedt; Nicholas P Danks; Soumya Ray. (2023). Review of Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook. In *Structural Equation*

Corresponding author: M. Iqbal Maulana Halisna (22302072018@unisma.ac.id)

Modeling: A Multidisciplinary Journal (Vol. 30, Issue 1). https://doi.org/10.1080/10705511.2022.2108813

Jumiarsih, D. I., Kusmayadi, T. A., & Fitriana, L. (2020). Students' mathematical reasoning ability viewed from self-efficacy. *Journal of Physics: Conference Series*, *1538*(1). https://doi.org/10.1088/1742-6596/1538/1/012101

Konaszewski, K., Kolemba, M., & Niesiobędzka, M. (2019). Resilience, Sense of Coherence and Self-Efficacy as Predictors of Stress Coping Style Among University Students. *Current Psychology*, *40*(8), 4052–4062. https://doi.org/10.1007/s12144-019-00363-1

Kusumaningtyas, E. R. (2024). The Effect of the Problem Based Learning on Mathematical Reasoning and Proofing Ability in Terms of Learning Style. *Prima Jurnal Pendidikan Matematika*, *8*(1), 159. https://doi.org/10.31000/prima.v8i1.9457

Lestari, G. P., Zamzaili, & Haji, S. (2022). Pengaruh Self Efficacy, Disposisi Matematis, Dan Koneksi Matematis Terhadap Kemampuan Penalaran Matematis Peserta Didik. *Didactical Mathematics*, *4*(2), 399–412. https://doi.org/10.31949/dm.v4i2.3538

Lohri-Posey, B. (2021). Determining learning style preferences of students. *Nurse Educator*, *28*(2), 54. https://doi.org/10.1097/00006223-200303000-00002

Lubis, S. N., Siregar, R., & Syahlan, S. (2022). Pengembangan Media Pembelajaran Audio Visualberbasis Realistic Mathematics Education Untuk Meningkatkan Kemampuan Penalaran Matematis Dan Self-Efficacy Siswa. *Jurnal Pembelajaran Dan Matematika Sigma (Jpms)*, *8*(2), 184–192. https://doi.org/10.36987/jpms.v8i2.3274

Masruroh, H., Susanto, S., & Lestari, N. D. S. (2023). Pengembangan Paket Tes Geometri Bangun Datar Untuk Mengukur Kemampuan Penalaran Matematis Siswa SMP. *Aksioma Jurnal Program Studi Pendidikan Matematika*, *12*(1), 1128. https://doi.org/10.24127/ajpm.v12i1.6729

Maulana, M. I., Sunismi, S., & Fuady, A. (2024). *Mathematical resilience and learning climate in view of learning style : The impact of improving mathematical reasoning in vocational schools*. *7*(1), 32–52.

Mukuka, A., Mutarutinya, V., & Balimuttajjo, S. (2021). MEDIATING EFFECT OF SELF-EFFICACY ON THE RELATIONSHIP BETWEEN INSTRUCTION AND STUDENTS' MATHEMATICAL REASONING. *Journal on Mathematics Education*, *12*(1), 73–92. https://doi.org/10.22342/jme.12.1.12508.73-92

Mustikasari, R. (2021). Pengaruh Gaya Belajar Dan Regulasi Emosi Terhadap Kemampuan Berpikir Reflektif Matematis. *Jurnal Pendidikan Sains Dan Komputer*, *1*(01), 36–41. https://doi.org/10.47709/jpsk.v1i01.1270

Nurjanah, A. S., Nurcahyono, N. A., & Imswatama, A. (2022). Penerapan Model Problem Based Learning Terhadap Kemampuan Pemecahan Masalah Matematis Ditinjau Dari Gaya Belajar Siswa SMP. *Prisma*, *11*(2), 406. https://doi.org/10.35194/jp.v11i2.2420

Nurma, N. M. A., & Rahaju, E. B. (2021). Penalaran Analogi Siswa SMA Dalam Menyelesaikan Soal Persamaan Logaritma Ditinjau Dari Kemampuan Matematika. *Mathedunesa*, *10*(2), 339–349.

Corresponding author: M. Iqbal Maulana Halisna (22302072018@unisma.ac.id)

https://doi.org/10.26740/mathedunesa.v10n3.p339-349

Ogbeibu, S., Senadjki, A., & Gaskin, J. (2020). The impact of transformational leadership on employee creativity in the workplace: A structural equation modelling approach. *Journal of Business Research*, *119*, 95–109.

Olo, E., Son, A. L., & Klau, K. Y. (2023). Pengaruh Resiliensi Matematis Terhadap Kemampuan Pemecahan Masalah Siswa Kelas VIII Sekolah Menengah Pertama. *Math-Edu Jurnal Ilmu Pendidikan Matematika*, *8*(2), 119–126. https://doi.org/10.32938/jipm.8.2.2023.119-126

Pajares, F., & Kranzler, J. (1995). Self-Efficacy Beliefs and General Mental Ability in Mathematical Problem-Solving. *Contemporary Educational Psychology*, *20*(4), 426–443. https://doi.org/10.1006/ceps.1995.1029

Pizon, M. G., & Ytoc, S. T. (2022). A Path Model to Infer Mathematics Performance: The Interrelated Impact of Motivation, Attitude, Learning Style and Teaching Strategies Variables. *East Asian Journal of Multidisciplinary Research*, *1*(3), 315–330. https://doi.org/10.55927/eajmr.v1i3.104

Pratiwi, L., & Nawangsari, H. (2022). Penyuluhan Gaya Hidup Sehat Remaja. *J.Abdimedika*, *2*(2), 45–52. https://doi.org/10.35874/jam.v2i2.1122

Purbaningrum, M., & Mahmudi, A. (2024). The Effect of GeoGebra-Assisted Problem-Based Learning on Students' Mathematical Literacy Skills and Learning Motivation. *AL-ISHLAH: Jurnal Pendidikan*, *16*(2), 1337–1350. https://doi.org/10.35445/alishlah.v16i2.4620

Putri, D., Ekawati, R., & Fiangga, S. (2022). Kemampuan Penalaran Matematika Siswa Dalam Pemecahan Masalah Matematika Ditinjau Dari Gaya Belajar. *Jurnal Pendidikan Matematika Undiksha*, *13*(1), 1–12. https://doi.org/10.23887/jjpm.v13i1.35865

Rafiska, R., & Susanti, R. (2023). Analisis Profil Gaya Belajar Peserta Didik Sebagai Data Pembelajaran Berdiferensiasi Di Kelas Xii Sma Negeri 1 Palembang. *Research and Development Journal of Education*, *9*(1), 474. https://doi.org/10.30998/rdje.v9i1.17043

Ragusa, A., González-Bernal, J. J., Trigueros, R., Caggiano, V., Gómez, N. N., Mínguez-Mínguez, L. A., Obregón, A. I., & Fernandez-Ortega, C. (2023). Effects of Academic Self-Regulation on Procrastination, Academic Stress and Anxiety, Resilience and Academic Performance in a Sample of Spanish Secondary School Students. *Frontiers in Psychology*, *14*. https://doi.org/10.3389/fpsyg.2023.1073529

Rambe, M. S., & Yarni, N. (2019). Pengaruh Gaya Belajar Visual, Auditorial, Dan Kinestetik Terhadap Prestasi Belajar Siswa Sma Dian Andalas Padang. *Jurnal Review Pendidikan Dan Pengajaran*, *2*(2), 291–296. https://doi.org/10.31004/jrpp.v2i2.486

Roche, A. I., Adamowicz, J. L., Stegall, M. S., Toovey, C. R., Sirotiak, Z., & Thomas, E. B. (2022). College Student Resilience During COVID-19: Examining the Roles of Mindfulness, Compassion, and Prosocial Behavior. *Adversity and Resilience Science*, *3*(4), 309–320. https://doi.org/10.1007/s42844-022-00083-9

Rohmah, S., Kusmayadi, T. A., & Fitriana, L. (2020). Problem Solving Ability of Junior High School Students Viewed by Mathematical Resilience. *Universal*

Corresponding author: M. Iqbal Maulana Halisna (22302072018@unisma.ac.id)

Journal of Educational Research, *8*(7), 3026–3033. https://doi.org/10.13189/ujer.2020.080731

Roshanti, D., Laili, R. N., Nashir, M., & Oktaviana, S. (2023). Pengenalan Jenis Kecerdasan Dan Gaya Belajar Untuk Efektivitas Belajar Anak Di Panti Asuhan Budi Mulya Banyuwangi. *Jurnal Pengabdian Masyarakat Sains Dan Teknologi*, *2*(1), 1–12. https://doi.org/10.58169/jpmsaintek.v2i1.90

Sahwari, S., & Dassucik, D. (2022). Pengaruh Kemampuan Berpikir Kreatif Terhadap Hasil Belajar Siswa Pada Mata Pelajaran Matematika SMP Negeri 5 Panji Kabupaten Situbondo. *Jurnal Ika PGSD (Ikatan Alumni Pgsd) Unars*, *10*(2), 75. https://doi.org/10.36841/pgsdunars.v10i2.1404

Saija, L. M. (2021). Analysis on Students' Mathematics Achievement Based on Learning Styles. *Jurnal Magister Pendidikan Matematika (Jumadika)*, *3*(2), 59–64. https://doi.org/10.30598/jumadikavol3iss2year2021page59-64

Santosa, F. H., & Bahri, S. (2022). Pengaruh self-efficacy matematis terhadap kemampuan penalaran matematis siswa dalam situasi online learning. *Journal of Didactic Mathematics*, *3*(2), 61–68. https://doi.org/10.34007/jdm.v3i2.1465

Shafira, Z. N., Adetia, E., Julaeha, N. S., Pertiwi, Y. A., Devi, D., & Zikri, M. F. A. (2023). Tren Penelitian Kemampuan Penalaran Matematis Di Indonesia. *Intellectual Mathematics Education*, *1*(1), 10–22. https://doi.org/10.59108/ime.v1i1.12

Shaojie, T., Abd Samad, A., & Ismail, L. (2024). The Influence of Meta-Cognitive Listening Strategies on Listening Performance in the MALL: The Mediation Effect of Learning Style and Self-Efficacy. *SAGE Open*, *14*(2), 1–16. https://doi.org/10.1177/21582440241249354

Singh, T., Athavale, V. A., & Athavale, V. (2008). Constructivist Perspective on Technical and Vocational Education Constructivist Perspective on Technical and Vocational Education Constructivist Perspective on Technical and Vocational Education. *Article in The Journal of Educational Research*, *November*.

Suanto, E., Armis, A., & Siregar, S. N. (2022). Pengembangan E-Modul Matakuliah Masalah Nilai Awal Syarat Batas Berbasis Experiential Learning Untuk Meningkatkan Kemampuan Penalaran Matematis Mahasiswa. *Jurnal Cendekia Jurnal Pendidikan Matematika*, *6*(1), 164–180. https://doi.org/10.31004/cendekia.v6i1.1060

Supriadi, N., Jamaluddin Z, W., & Suherman, S. (2024). The role of learning anxiety and mathematical reasoning as predictor of promoting learning motivation: The mediating role of mathematical problem solving. *Thinking Skills and Creativity*, *52*(December 2023), 101497. https://doi.org/10.1016/j.tsc.2024.101497

Svartdal, F., Sæle, R. G., Dahl, T. I., Nemtcan, E., & Gamst-Klaussen, T. (2021). Study Habits and Procrastination: The Role of Academic Self-Efficacy. *Scandinavian Journal of Educational Research*, *66*(7), 1141–1160. https://doi.org/10.1080/00313831.2021.1959393

Upu, H., Nasrullah, N., & Amir, A. A. (2020). Pengaruh Tipe Kepribadian, Berpikir

Corresponding author: M. Iqbal Maulana Halisna (22302072018@unisma.ac.id)

Divergen, Iklim Keluarga, Dan Motivasi Terhadap Prestasi Belajar Matematika Siswa Kelas XI MIPA SMA. *Issues in Mathematics Education (Imed)*, *4*(2), 169. https://doi.org/10.35580/imed15328

Utami, H. S., & Puspitasari, N. (2022). Kemampuan Pemecahan Masalah Siswa SMP Dalam Menyelesaikan Soal Cerita Pada Materi Persamaan Kuadrat. *Jurnal Inovasi Pembelajaran Matematika Powermathedu*, *1*(1), 57–68. https://doi.org/10.31980/powermathedu.v1i1.1916

Zulfah, N. A. A., Kusumaningsih, W., & Endahwuri, D. (2021). Profil Kemampuan Penalaran Matematis Dalam Menyelesaikan Soal Cerita Ditinjau Dari Gaya Belajar Siswa. *Jipmat*, *6*(2), 277–284. https://doi.org/10.26877/jipmat.v6i2.9495

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