Vol. 15, No. 03, pp. 1670-1687, 2025 DOI: 10.23960/jpp.v15i3.pp1670-1687

Jurnal Pendidikan Progresif

e-ISSN: 2550-1313 | p-ISSN: 2087-9849

http://jpp.fkip.unila.ac.id/index.php/jpp/

How School Culture and Climate Mediated Student's Mathematics Achievement: A Path Analysis of PISA 2022 Indonesia Data

Ayustina Intan Latifah & Kismiantini*

Statistics Study Program, Universitas Negeri Yogyakarta, Indonesia

*Corresponding email: kismi@.uny.ac.id

Received: 08 June 2025 *Accepted: 18 July 2025* *Published: 28 August 2025*

Abstract: How School Culture and Climate Mediated Student's Mathematics Achievement: a Path Analysis of PISA 2022 Indonesia Data. Indonesia's declining mathematics performance in PISA 2022 highlights the need to examine key educational factors affecting student achievement. In the post-pandemic context, school culture and climate have become increasingly important in shaping learning outcomes. This study investigates how these factors mediate the effects of teacher support, gender, and socioeconomic and cultural status (ESCS) on students' mathematics achievement. **Objectives:** This study aims to: (1) examine the effects of teacher support, gender, and socioeconomic and cultural status on school climate and culture indicators (bullying victimization, sense of belonging, feeling safe, and school safety risks); (2) assess the influence of these indicators on students' mathematics achievement; (3) analyze the direct effects of the independent variables on mathematics achievement; and (4) evaluate the mediating role of school climate and culture in these relationships. **Methods:** This quantitative study used cross-sectional data from the PISA 2022 Indonesia dataset, comprising 12,491 students from 410 schools. Data were analyzed using a parallel multiple mediation model with path analysis, employing Maximum Likelihood estimation and nonparametric bootstraping with 1,000 replications. **Findings:** The results showed that all independent variables significantly affected all four indicators of school culture and climate. Bullying victimization, lack of feeling safe, and school safety risks had significant negative effects on math achievement, while a sense of school belonging had a significant positive effect. Teacher support and gender had significant negative effects on mathematics achievement, while socioeconomic and cultural status had significant positive effects. All mediating variables significantly mediated the relationships between the independent variables and math achievement. **Conclusion:** Interventions to improve math achievement should not rely solely on direct teacher support, but also prioritize building a positive school climate by strengthening students' sense of belonging and reducing bullying as these are critical pathways influencing academic success.

Keywords: PISA 2022, mathematics achievement, path analysis, mediation model.

To cite this article:

Latifah, A. I., & Kismiantini. (2025). How School Culture and Climate Mediated Student's Mathematics Achievement: A Path Analysis of PISA 2022 Indonesia Data. *Jurnal Pendidikan Progresif*, *15*(3), 1670-1687. doi: 10.23960/jpp.v15i3.pp1670-1687.

INTRODUCTION

Undang-undang Republik Indonesia Nomor 20 Tahun 2003 (Law of the Republic of Indonesia Number 20 of 2003) states that education is a conscious and planned effort to create a learning atmosphere and learning process in which students actively develop their potential. Education plays a key role in shaping quality human resources and is a determining factor in a country's competitiveness. Schultz (1959), through his theory of human capital, demonstrated that investment in education correlates with

increased productivity and economic growth. In line with this, Vasilescu et al. (2010) emphasize that quality education is a form of institutional social responsibility and a strategic investment in building the innovative skills needed to address the challenges of an ever-evolving global society.

There are various parameters used by international institutions in evaluating the condition of education in a country (Paramesti et al., 2024). One of the parameters used as the main reference is the Program for International Student Assessment (PISA). PISA is a global survey organized by the Organization for Economic Co-operation and Development (OECD) and aims to measure the ability of 15-year-old students to apply knowledge and skills in real life (OECD, 2023b). The PISA survey is conducted every three years, with the main focus of assessment in three areas, namely mathematics, reading, and science. Based on the PISA 2022 results, Indonesia ranked 70th in mathematics achievement with an average score of 366. This score is still far below the OECD average of 472 (OECD, 2023b). Compared to the 2018 PISA results, Indonesia experienced a decrease in average mathematics achievement, scoring 379 (OECD, 2023b). The decrease in the average mathematics achievement score, which is also below the OECD average, indicates that there are serious challenges in improving the math achievement of Indonesian students, which has direct implications for the quality of education and national competitiveness.

Various studies have shown that students' mathematics achievement is influenced by internal and external factors, including learning motivation, school environmental conditions, and teaching methods (Oktaviani et al., 2020; Salsabila & Puspitasari, 2020). One external aspect that has received increasing attention in the education literature is school culture and climate. School culture and climate refer to the overall atmosphere of the school environment, including shared norms, quality of relationships, safety, and students' psychological sense of belonging (OECD, 2023a). These aspects define the character of school life and influence both student motivation and learning outcomes (Kutsyuruba et al., 2015). In this study, school culture and climate are operationalized through four indicators from the 2022 PISA framework: bullying victimization, sense of school belonging, feeling of safety, and school safety risks. A positive school culture and climate have been shown to correlate with improved student academic achievement (Berkowitz et al., 2017; Dulay & Karadag, 2017; Yang et al., 2021).

In the Indonesian context, school climate poses unique challenges. A recent national study found that 19.9% of adolescents in Indonesia reported being victims of bullying at school, with risk factors including loneliness, substance use, and gender (Yusuf et al., 2022). Socioeconomic disparities also impact learning outcomes, as students from lower ESCS backgrounds tend to have reduced access to learning facilities and supportive environments, contributing to a lower achievement (Setiawan et al., 2024).

Prior studies have demonstrated that teacher support and school safety are significant predictors of student well-being and academic success (Yang et al., 2021; Winnaar, 2020). However, evidence across different cultural contexts remains mixed. For example, while a strong sense of belonging generally correlates positively with achievement, some studies suggest that in certain collectivist societies, an excessive emphasis on group cohesion may diminish academic motivation or onscure underperformance (Gutiérrez & Tomás, 2019). Similarly, while teacher support is broadly beneficial, it may have varying effects depending on how students perceive that support whether as encouragement or as a signal of low expectations (Nurmi, 2012). These complexities highlight the need for mediation analysis, which

allows researchers to investigate the indirect pathways through which contextual factors like teacher support influence academic outcomes (Hayes, 2022; MacKinnon, 2015). This approach has been used extensively in various educational contexts, such as research by Tosto et al. (2016) and Maxwell et al. (2017) which identified indirect effects and clarified the psychosocial processes that contribute to students' academic achievement.

Against this backdrop, the present study examines how teacher support, gender, and economic, social, and cultural status (ESCS) influence Indonesian students' mathematics achievement in the PISA 2022 assessment, through the mediating role of school culture and climate. The model incorporates four key mediating variables: sense of belonging, bullying victimization, feeling of safety, and school safety risk. By employing a parallel multiple mediation model using path analysis, this study aims to identify both the direct and indirect pathways through which these factors shape students' academic outcomes. The findings of this study are expected to contribute to efforts to improve the quality of national education through a more comprehensive understanding of the role of the school environment in supporting students' academic success, particularly in mathematics.

METHOD

Participants

This study used data from the PISA 2022 survey, which involved Indonesian students aged 15 years. The population consisted of 13,439 students from 410 schools. After applying listwise deletion, 12,491 students (approximately 93%) with complete responses were included in the analysis. The sampling framework of PISA employs a stratified sampling design to ensure the representativeness of the Indonesian student population (OECD, 2024).

Research Design and Procedures

This research is a quantitative study utilizing secondary data from the PISA 2022 assessment, accessed via the OECD database (https://www.oecd.org/en/data/datasets/pisa-2022-database/). PISA is an international triennial survey that assesses the abilities of 15-year-old students in applying knowledge and skills in real-world contexts, with a primary focus on mathematical literacy in 2022. Data cleaning was performed using a listwise deletion approach, excluding approximately 7% of students with incomplete responses. Data imputation was not conducted due to the complexity of plausible values estimation and composite indices employed in the PISA dataset.

Instrument

The first independent variable in this study is teacher support, which refers to students' perceptions of the extent to which they receive academic assistance from their mathematics teachers. This variable is represented by the TEACHSUP index in the 2022 PISA data. The scaling method used in the teacher support index variable is Item Response Theory (IRT) (OECD, 2024). The items in the teacher support index (e.g., "The teacher shows an interest in every student's learning.", "The teacher gives extra help when students need it.") are found in question ST270. A higher index score indicates a stronger perception of academic support from teachers.

The second independent variable is gender, which includes two response categories: category 1 for female students and category 2 for male students. In this study, the gender variable was recoded with 0 for female and 1 for male. In PISA 2022, the gender variable is found in questionnaire item ST004Q01TA.

The third independent variable is economic, social, and cultural status (ESCS), which is a composite index developed by the OECD using

IRT modeling based on three main components: parents' highest level of education (PARED), parents' highest employment status (HISEI), and ownership of educational items at home (HOMEPOS). This ESCS index has been internationally standardized with a mean of 0 and a standard deviation of 1.

The mediating variable in this study is school climate and culture, which consists of four separate variables: bullying (BULLIED), sense of belonging (BELONG), feeling of safety (FEELSAFE), and school safety risk (SCHRISK). All these variables are formed as composite indices using IRT and have been standardized by the OECD. Students' ratings of how often they had a range of experiences at school that are indicative of being bullied during the past 12 months (e.g., "Other students left me out of things on purpose.", "Other students made fun of me.") are included in question ST038. The sense of school belonging variable measures the extent to which students feel they are part of the school (e.g., "I feel like I belong at school.", "I feel lonely at school.") as found in question ST034. The feeling safe variable measures students' ratings of their agreement with four statements about their perceived safety (e.g., "I feel safe on my way to school.", "I feel safe in my classrooms at school.") in question ST265. Meanwhile, the school safety risk variable contains students' response indicating whether a range of events indicative of safety risks at school occurred during the past four weeks (e.g., "Our school was vandalised.", "I witnessed a fight on school property in which someone got hurt.") in question ST266.

The dependent variable in this study is students' mathematics achievement, measured using ten plausible values (PVs) from the PISA 2022 dataset. These values are the result of multiple imputation developed using the IRT approach to estimate students' mathematics ability (OECD, 2024). The relationship between the research variables can be seen in Figure 1 and further details regarding the research variables are explained in Table 1.

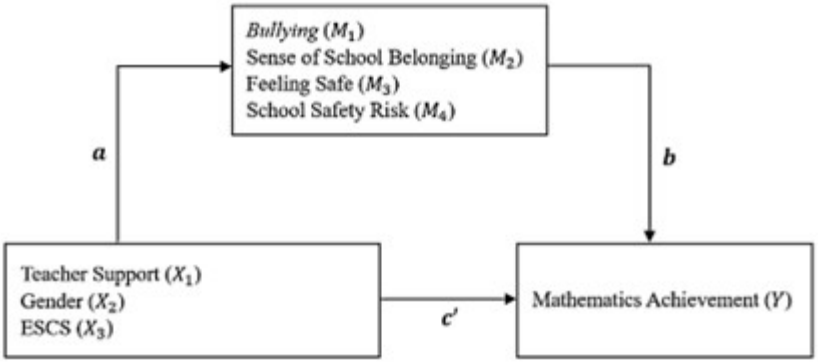

Figure 1. Path diagram of research variables

Table 1. Variables used in this study

Role	Variable	Explanation	Code
Dependent	Mathematics Achievement (Y)	The arithmetic mean of the ten plausible values in math.	PV1MATH-PV10MATH
Independent	Teacher Support (X_1)	An index represents how students perceive their teacher to support them in learning.	TEACHSUP

Independent	Gender (X_2)	A (re-coded) dummy for students' gender: 0 = female; 1 = male.	ST004D01T
Independent	ESCS (X_3)	A standardized index representing students' background that consists of parents' higher education (HISEI), parents' occupation (PARED), and house possession (HOMEPOS).	ESCS
Mediation	Bullying Victimization (M_1)	An index represents how often students experienced various indications of bullying in the school environment.	BULLIED
Mediation	Sense of School Belonging (M_2)	An index represents the extent to which students feel part of the school.	BELONG
Mediation	Feeling Safe (M_3)	An index that describes students' perception of safety in the school environment.	FEELSAFE
Mediation	School Safety Risk (M_4)	An index that measures events that reflect safety risks at school in the last four weeks.	SCHRISK

Data Analysis

Path analysis is a statistical method used to examine direct and indirect relationships between variables in a model (Mackinnon, 2015). In this study, path analysis was used to test how teacher support, gender, and socioeconomic status affect students' mathematics achievement, both directly and through the mediating effects of school culture and climate. In addition, path analysis was used to determine the extent to which each factor influences students' mathematics achievement. Parameter estimation in this study was conducted using the Maximum Likelihood (ML) method. Given the violations of normality and homoskedasticity assumptions, non-parametric bootstrapping with 1,000 replications was employed to obtain robust standard errors and confidence intervals. The analysis was conducted using R software (R Core Team, 2023) with RStudio interface, and utilizing various packages such as lavaan (Rosseel, 2012), car (Fox & Weisberg, 2018), MASS (Venables & Ripley, 2002), plyr (Wickham, 2011), dplyr (Wickham et al., 2023), and ggplot2 (Wickham, 2016).

Data analysis was conducted in several stages. The process began with descriptive statistics to understand the distribution and central tendency of each variable. Before estimating the main mediation model, classical linear regression assumptions such as normality, linearity, homoscedasticity, multicollinearity, and independence of errors, were tested through residual plots, VIF values, and normality tests. As some assumptions, particularly normality and homogeneity of variance, were violated, a robust estimation approach was adopted to ensure the reliability of the results.

Subsequently, a parallel multiple mediation model was specified and estimated using the sem() function from the lavaan package in R (Rosseel, 2012). The model simultaneously tested 12 indirect paths and three direct paths to mathematics achievement simultaneously. Parameter estimation used the Maximum Likelihood method with nonparametric bootstrapping (1,000 replications) to compute standard errors and confidence intervals. Model fit was evaluated using R^2, CFI, TLI, RMSEA, and SRMR indices.

Figure 2 illustrates the correlation among the research variables, where colors and numbers represent the strength and direction of the relationship. Overall, the correlation between variables range from weak to moderate.

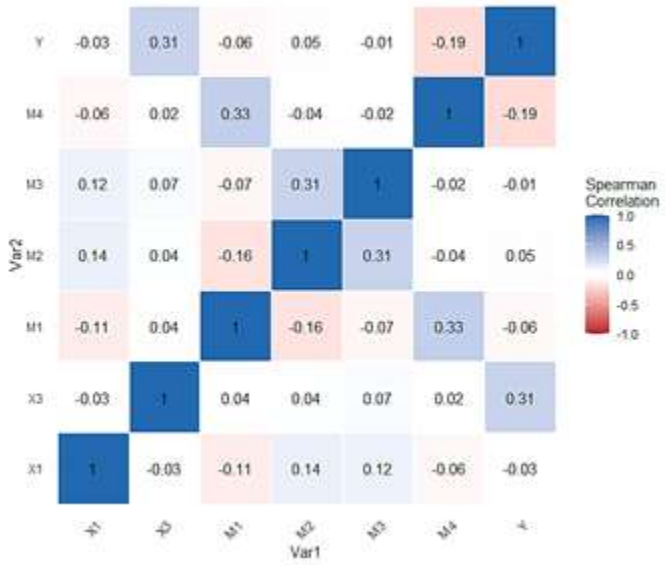

Figure 2. Spearman correlation matrix between research variables

■ RESULT AND DISCUSSION

This section presents the results of the analysis and discusses the findings in relation to the research objectives. The analysis begins with descriptive statistics to provide an overview of the variables used, then proceeds with path analysis to test the direct effect, indirect effect, and total effect between variables through the mediating role of school culture and climate.

Descriptive Statistics

To provide an overview of the data characteristics, descriptive statistics were calculated for all variables included in the analysis, namely teacher support, gender, ESCS, bullying victimization, sense of school belonging, feeling of safety, school safety risk, and mathematics achievement. The mathematics achievement is calculated by averaging the ten plausible values in mathematics.

Table 2. Descriptive statistics

Variable	Minimum	Maximum	Mean	SD
Teacher Support (X_1)	-2.910	1.556	0.093	1.025
Gender (X_2)	1.000	2.000	1.488	0.500
ESCS (X_3)	-6.346	3.475	-1.436	1.049
Bullying Victimization (M_1)	-1.228	4.694	-0.317	1.043
Sense of School Belonging (M_2)	-3.258	2.756	-0.112	0.762
Feeling Safe (M_3)	-2.789	1.125	-0.275	0.857
School Safety Risk (M_4)	-0.639	3.649	-0.328	0.689
Mathematics Achievement (Y)	200.400	644.800	381.500	60.600

Table 2 shows the descriptive statistics of the variables used in the study. The mean perceived teacher support of students was 0.093 with a standard deviation of 1.025, indicating a rather neutral perception. Gender proportions were almost equal with a mean value of 1.488. ESCS had a mean value of -1.436, indicating that the majority of students were below the mean ESCS index. Bullying victimization, sense of school belonging, feeling of safety, and school

safety risk were each negative on average, indicating students' negative perceptions of school culture and climate. Students' mathematics achievement scores were at an average of 381.500, with a range of scores between 200.400 and 644.800, reflecting a fairly wide variation in achievement among respondents.

Formulation of Mediation Model

We developed the mediation model presented as a path diagram in Figure 3. Following Figure 3, the mediation models can be stated in the five equations below.

$$\eta_1 = \gamma_{11}\xi_1 + \gamma_{12}\xi_2 + \gamma_{13}\xi_3 + \zeta_1$$
$$\eta_2 = \gamma_{21}\xi_1 + \gamma_{22}\xi_2 + \gamma_{23}\xi_3 + \zeta_2$$

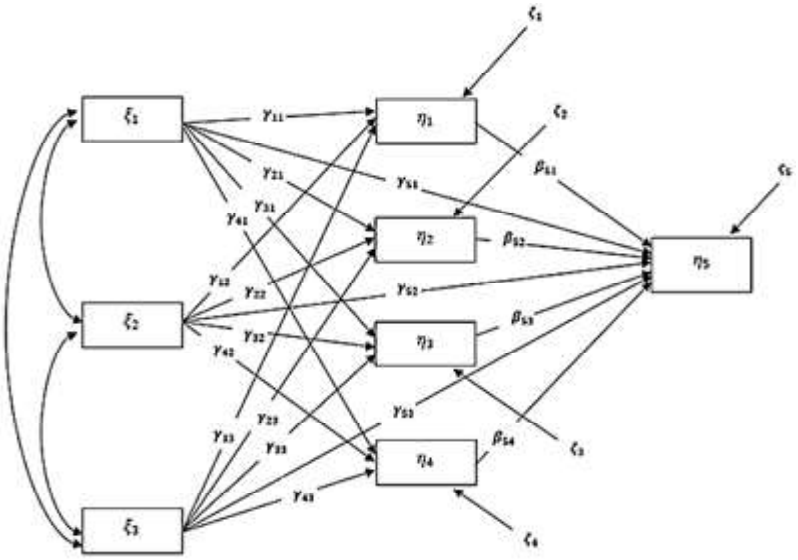

Figure 3. Path diagram of mediation model in greek notation

$$\eta_3 = \gamma_{31}\xi_1 + \gamma_{32}\xi_2 + \gamma_{33}\xi_3 + \zeta_3$$
$$\eta_4 = \gamma_{41}\xi_1 + \gamma_{42}\xi_2 + \gamma_{43}\xi_3 + \zeta_4$$
$$\eta_5 = \beta_{51}\eta_1 + \beta_{52}\eta_2 + \beta_{53}\eta_3 + \beta_{54}\eta_4 + \gamma_{51}\xi_1 + \gamma_{52}\xi_2 + \gamma_{53}\xi_3 + \zeta_5$$

or, in matrix notation,

$$\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\end{bmatrix} = \begin{bmatrix}0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & 0 & 0\end{bmatrix}\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\end{bmatrix} + \begin{bmatrix}\gamma_{11} & \gamma_{12} & \gamma_{13}\\ \gamma_{21} & \gamma_{22} & \gamma_{23}\\ \gamma_{31} & \gamma_{32} & \gamma_{33}\\ \gamma_{41} & \gamma_{42} & \gamma_{43}\\ \gamma_{51} & \gamma_{52} & \gamma_{53}\end{bmatrix}\begin{bmatrix}\xi_1\\ \xi_2\\ \xi_3\end{bmatrix} + \begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\\ \zeta_5\end{bmatrix}$$

where ξ_1, ξ_2, ξ_3 are independent variables, $\eta_1, \eta_2, \eta_3, \eta_4$ are mediation variables, and $\zeta_1, \zeta_2, \zeta_3, \zeta_4, \zeta_5$ are errors.

Model Identification and Estimation

The model identification process can be done by comparing the number of parameters that need to be estimated in the model with the variance-covariance of the measured variables. The number of estimated parameters is determined by the elements in the variance-covariance matrix and the model coefficient matrix. The number of estimated parameters and the number of unique elements is stated in Table 3.

Based on Table 3, the total number of parameters estimated is 36. Meanwhile, the

Table 3. Element of parameters in the model

Matrix	Elements	Number of Parameters
Ψ	$\psi_{11}, \psi_{21}, \psi_{22}, \psi_{31}, \psi_{32}, \psi_{33}, \psi_{41}, \psi_{42}, \psi_{43}, \psi_{44}, \psi_{55}$	11
Φ	$\Phi_{11}, \Phi_{12}, \Phi_{13}, \Phi_{22}, \Phi_{23}, \Phi_{33}$	6
Γ	$\gamma_{11}, \gamma_{12}, \gamma_{13}, \gamma_{21}, \gamma_{22}, \gamma_{23}, \gamma_{31}, \gamma_{32}, \gamma_{33}, \gamma_{41}, \gamma_{42}, \gamma_{43}, \gamma_{51}, \gamma_{52}, \gamma_{53}$	15
B	$\beta_{51}, \beta_{52}, \beta_{53}, \beta_{54}$	4
Total		36

number of unique elements in the covariance matrix for the eight observed variables p is $\frac{p(p+1)}{2} = \frac{8(8+1)}{2} = 36$. For a model to be estimated, it must be just-identified or over-identified (Wang & Wang, 2020). Thus, the number of parameters estimated is equal to the number of unique elements, which is 36, indicating that the model is identified as a just-identified model. Therefore, the model has no degrees of freedom ($df = 0$) and the χ^2 fit measure of the model is equal to zero.

Before estimating, it is necessary to check some classical assumptions. It was found that the linearity and multicollinearity assumptions were met for all five models. However, the normality assumption is only met in the fifth model, while the first, second, third, and fourth models do not meet the assumption. The homogeneity asumption was also not met in the first, fourth, and fifth model. Thus, parametric inference cannot be conducted.

In this study, parameter estimation was conducted using the Maximum Likelihood method, which was then followed by bootstrapping to estimate the standard errors. A total of 1,000 bootstrap samples were used. The entire procedure was implemented using the lavaan package in R, and the results are presented in Table 4. It is important to note that there are four models analyzed, corresponding to equations (1), (2), (3), (4), and (5) above.

Table 4. Results of the estimated parameters

Regression	Coefficient Estimation	SE	Confidence Interval	
			2.5%	97.5%
Model 1				
Intercept	-0.563	0.032	-0.625	-0.504
Teacher Support → Bullying	-0.110	0.009	-0.128	-0.090
Gender → Bullying	0.199	0.019	0.162	0.237
ESCS → Bullying	0.027	0.009	0.010	0.046
Model 2				
Intercept	-0.179	0.023	-0.229	-0.134
Teacher Support → Sense of School Belonging	0.100	0.007	0.087	0.114
Gender → Sense of School Belonging	0.078	0.013	0.052	0.105
ESCS → Sense of School Belonging	0.040	0.007	0.027	0.053
Model 3				
Intercept	-0.505	0.026	-0.557	-0.458
Teacher Support → Feeling Safe	0.098	0.008	0.083	0.112
Gender → Feeling Safe	0.198	0.015	0.171	0.228
ESCS → Feeling Safe	0.052	0.007	0.037	0.066

Model 4				
Intercept	-0.556	0.018	-0.590	-0.517
Teacher Support → School Safety Risk	-0.045	0.007	-0.058	-0.031
Gender → School Safety Risk	0.170	0.012	0.145	0.194
ESCS → School Safety Risk	0.014	0.005	0.004	0.026
Model 5				
Intercept	413.509	1.849	409.929	417.041
Bullying → Math Achievement	-1.158	0.539	-2.272	-0.087
Sense of School Belonging → Math	1.757	0.714	0.330	3.186
Achievement	-2.304	0.626	-3.615	-1.090
Feeling Safe → Math Achievement	-16.559	0.756	-18.037	-15.110
School Safety Risk → Math Achievement	-1.191	0.502	-2.207	-0.202
Teacher Support → Math Achievement	-6.313	0.986	-8.224	-4.313
Gender → Math Achievement	20.034	0.521	19.000	21.021
ESCS → Math Achievement				

Effect of Teacher Support, Gender, and ESCS on School Culture and Climate

Based on the Table 4, the results indicate that for the first model, teacher support ($\hat{\gamma}_{11} = -0.110; [-0.128, -0.090]$), gender ($\hat{\gamma}_{12} = 0.199; [0.162, 0.237]$), and ESCS ($\hat{\gamma}_{13} = 0.027; [0.010, 0.046]$) have a significant effect on bullying. Teacher support is associated with a reduction in bullying victimization scores, while ESCS is positively associated with increased bullying victimization.

In the second model, teacher support ($\hat{\gamma}_{21} = 0.100; [0.087, 0.114]$), gender ($\hat{\gamma}_{22} = 0.078; [0.052, 0.105]$), and ESCS ($\hat{\gamma}_{23} = 0.040; [0.027, 0.053]$) significantly affect on students' sense of school belonging. Both teacher support and ESCS contribute positively to the sense of school belonging.

For the third model, teacher support ($\hat{\gamma}_{31} = 0.098; [0.083, 0.112]$), gender ($\hat{\gamma}_{32} = 0.198; [0.171, 0.228]$), and ESCS ($\hat{\gamma}_{33} = 0.052; [0.037, 0.066]$) have a significant effect on students' feeling of safety. Both teacher support and ESCS are associated with an increase in students' perceived safety.

The fourth model is used to predict students' school safety risks. Based on Table 4, teacher support ($\hat{\gamma}_{41} = -0.045; [-0.058, -0.031]$), gender ($\hat{\gamma}_{42} = 0.170; [0.145, 0.194]$), and ESCS ($\hat{\gamma}_{43} = 0.014; [0.004, 0.026]$) have a significant effect on school safety risk. Teacher support is associated with a decrease in school safety risk, whereas ESCS is positively associated with increased school safety risk.

Teacher support serves as a significant protective factor in shaping school climate and culture. Prior research has shown that teacher support can reduce bullying behavior, enhancing students' sense of belonging to the school, and strengthen students' feelings of security. Estell & Perdue (2013) stated that support from teachers and peers foster a more positive school climate, especially for students who experience bullying. Furthermore, teacher support contributes to students' attachment to school, which may help mitigate safety risks within the school environment (Lenzi et al., 2017; Osher et al., 2012).

Gender has a significant influence on students' experiences in the context of school culture and climate. This study found that male students are more likely to engage in bullying than female students, in line with the findings of Li et al. (2020) and Afriani & Denisa (2021).

However, a study by Pontes et al. (2018) shows that in the United States, female students experience are more frequently subjected to bullying, both at school and electronically. In terms of school belonging, Galliher et al. (2004) and Mcneely et al. (2002) reported that male students exhibit a stronger sense of belonging than female students, although these findings contrast with the those of Kuang et al. (2019) who found the opposite in some Asian countries. Interestingly, male students in Indonesia say they face bullying more, yet they feel belonging more—a pattern studies on hegemonic masculinity note within school peer groups. For example, r Horton's ethnographic research in Vietnam illustrates the way boys may express aggression as as a means of asserting status, while this same peer culture cultivates a strong sense of identity and belonging (Horton, 2019). Regarding feelings of safety, Mcknight & Schubotz (2024) found that male students report feeling safer in public spaces more often than females, but Prusinski et al. (2019) reported that more female students felt very safe at school. In addition, Kim et al. (2020) stated that female students are more likely to express concern about school safety than their male counterparts.

The socio-economic and cultural status of students' families significantly influences their perceptions of school culture and climate. This study shows that students from families with higher ESCS tend to report a stronger sense of school belonging, consistent with the findings of Bakchich et al. (2024). Interestingly, students from higher ESCS backgrounds report higher levels of bullying victimization and perceived school risk, which may reflect increased sensitivity to social tensions in competitive educational settings. The findings align with a Chinese study showing that competitive school climates are associated with increased bullying behaviors (Penghui & Mengfan, 2024). Regarding feelings of safety, Mijanovich & Weitzman (2003) reported that adolescents from families with higher socioeconomic status tend to feel safer in school environment, although Shumow & Lomax (2001) found that higher socioeconomic status does not necessarily predict greater perceived school safety from the perspectives of students and parents.

Last, for the fifth model, all mediating variables (bullying victimization, sense of school belonging, feeling of safety, and school safety risk), as well as independent variables (teacher support, gender, and ESCS) have a significant effect on students' math achievement. Previous studies found that a sense of belonging to the school positively affects mathematics achievement, in line with the findings of Antonelli-Ponti et al. (2021) and Chang & Bangsri (2020). In contrast, bullying negatively impacts the mathematics achievement, consistent with the research of Winnaar (2020), Ortega-Rodriguez (2025), and Gimenez et al. (2024). Interestingly, students' feelings of safety at school are negatively correlated with math achievement, as reported by Wingard et al. (2020) and Katschnig & Hastedt (2017). Putwain & Daly (2013) found that students with low to moderate levels of test anxiety and high levels of academic confidence performed best. If feelings of security are associated with low anxiety or pressure, then students who feel too secure may lack the internal pressure to achieve, resulting in suboptimal performance. In this context, a little academic pressure can be functional, while excessive feelings of safety can weaken the drive to learn. In addition, school safety risks are also negatively associated with math achievement, supporting the findings of Wardat et al. (2022) and Lopez (2019) who emphasize the importance of creating a safe school environment that supports students' freedom to learn.

Table 5. Direct effects

Effects	Estimation	SE	Confidence Interval	
			2.5%	97.5%
Teacher Support → Mathematics Achievement	-1.191	0.502	-2.207	-0.202
Gender → Mathematics Achievement	-6.313	0.986	-8.224	-4.313
ESCS → Mathematics Achievement	20.034	0.521	19.000	21.021

Table 6. Indirect effects of independent variables

Effects	Estimation	SE	Confidence Interval	
			2.5%	97.5%
Teacher Support → M_i → Mathematics Achievement				
Bullying (M_1)	0.127	0.060	0.009	0.248
Sense of School Belonging (M_2)	0.176	0.073	0.034	0.318
Feeling Safe (M_3)	-0.227	0.064	-0.357	-0.104
School Safety Risk (M_4)	0.738	0.115	0.525	0.968
Total Indirect Effect of Teacher Support	0.814	0.148	0.541	1.121
Gender → M_i → Mathematics Achievement				
Bullying (M_1)	-0.230	0.109	-0.453	-0.019
Sense of School Belonging (M_2)	0.137	0.062	0.027	0.265
Feeling Safe (M_3)	-0.457	0.132	-0.722	-0.207
School Safety Risk (M_4)	-2.815	0.238	-3.277	-2.358
Total Indirect Effect of Gender	-3.366	0.281	-3.949	-2.823
ESCS → M_i → Mathematics Achievement				
Bullying (M_1)	-0.032	0.019	-0.078	-0.002
Sense of School Belonging (M_2)	0.071	0.031	0.013	0.138
Feeling Safe (M_3)	-0.120	0.038	-0.199	-0.050
School Safety Risk (M_4)	-0.240	0.095	-0.434	-0.071
Total Indirect Effect of ESCS	-0.320	0.108	-0.545	-0.123

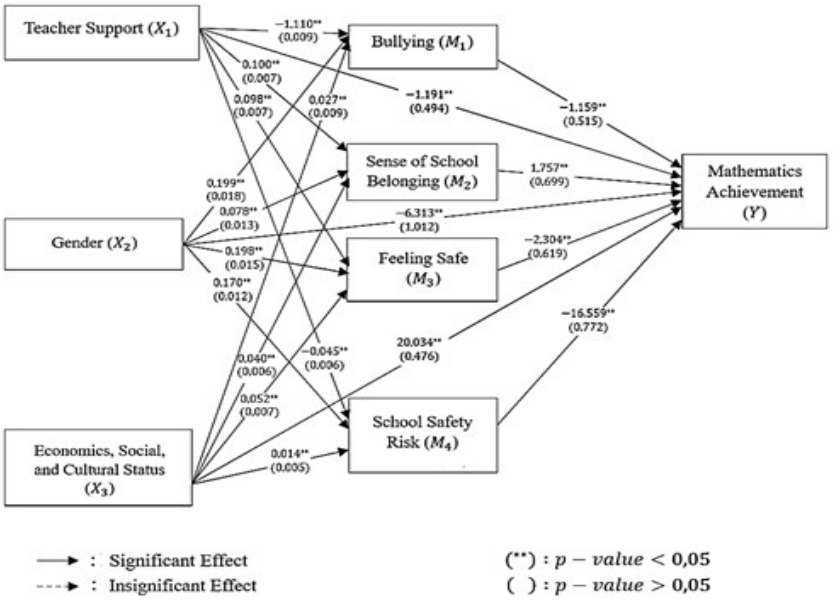

Figure 4. Path diagram of parameter estimates for the mediation model

Table 7. Total effect

Effects	Estimation	Confidence Interval	
		2.5%	97.5%
Teacher Support → Mathematics Achievement	-0.376	-1.365	0.660
Gender → Mathematics Achievement	-9.679	-11.616	-7.721
ESCS → Mathematics Achievement	19.714	18.658	20.745

Direct, Indirect, and Total Effects of Teacher Support on Mathematics Achievement

Based on Table 5, it can be seen that the direct effect of teacher support on student math achievement has a confidence interval of [-2.207, -0.202]. Therefore, at the 5% significance level, it can be concluded that teacher support directly influence students' mathematics achievement. For every one-unit increase in teacher support, students' mathematics achievement decreases by 1.191 units with gender and ESCS fixed with school culture and climate being statistical controls.

Based on Table 6, the total indirect effect of teacher support is 0.814, which means that students who receive teacher support had an average math achievement of 0.814 units higher than those who did not. The confidence interval [0.541, 1.121] (not containing zero), indicating significance at the 5% level. This effect was significantly mediated by bullying victimization, sense of school belonging, feeling of safety, and school safety risk.

Based on Table 7, the estimated total effect between the teacher support variable and students' mathematics achievement is -0.376 with a confidence interval from -1.365 to 0.660, which contains zero. Therefore, at the 5% significance level, it can be concluded that the total effect of teacher support does not significantly affect students' mathematics achievement.

This study found that teacher support was directly negatively correlated with math achievement, in line with the findings of Kogar (2015) and Wong et al. (2018) suggesting that higher teacher support may be provided to students who experience difficulties in mathematics. However, indirectly, teacher support had a positive effect on math achievement through an increased sense of belonging and a positive school climate, as reported by Chang & Bangsri (2020) and Chen (2005). As stated by Roorda et al. (2011), the quality of teacher-student relationships has a significant influence on academic achievement, especially if such relationships enhance student engagement and comfort at school.

Direct, Indirect, and Total Effects of Gender on Mathematics Achievement

The direct effect of gender on student mathematics achievement has a confidence interval of [-8.224, -4.313]. It can be concluded that at 5% significance level, gender directly affects mathematics achievement. The negative estimated value means that female students have high mathematics achievement than male students.

The total indirect effect of gender is -3.366, which means that female students have an average mathematics achievement of 3.366 units lower than male students due to the influence of school culture and climate. The confidence interval [-3.949, -2.823], is significant at the 5% level. All mediators were significant in this relationship.

The estimated total effect between the gender variable and students' mathematics achievement is -9.679 with a confidence interval from -11.616 to -7.721, which does not contain zero. So at the 5% significance level, it can be concluded that the total effect of the gender variable significantly affects students' mathematics achievement.

Gender affects students' mathematics achievement both directly and through the mediation of school climate and culture. This study shows that female students have higher average math scores than male students, supporting the findings of OECD (2023b). In addition, Sari & Setiawan (2023) and Kogar (2021) reported that gender significantly affects students' academic abilities, including in mathematics.

Direct, Indirect, and Total Effects of ESCS on Mathematics Achievement

The direct effect of ESCS on student mathematics achievement has a confidence interval of [19.000, 21.021]. Therefore, at the 5% significance level, it can be concluded that ESCS directly influence students' mathematics achievement. For every one-unit increase in ESCS, students' math achievement increases by 20.034 units with teacher support and gender held constant and school culture and climate treated as statistical controls.

The total indirect effect of ESCS is -0.320, indicating that students with higher ESCS had 0.320 units lower average mathematics achievement. Confidence intervals [-0.545, -0.123], are also significant. All four mediating variables played a role in this effect.

The estimated total effect of the ESCS on students' mathematics achievement is 19.714, with a confidence interval from 18.658 to 20.745, where the interval does not contain zero. Thus, ESCS significantly influences students' mathematics achievement.

Students' socio-economic and cultural status significantly affect mathematics achievement, both directly and through the mediation of school culture and climate. This study found that students with higher ESCS tend to achieve better mathematics achievement, consistent with the findings of Ortega-Rodriguez (2025) and Setiawan et al. (2024) who emphasized the role of adequate learning facilities in supporting mathematics learning. In addition, Berkowitz et al. (2017) showed that the quality of school climate is a determining factor in the relationship between students' backgrounds and their academic achievement.

Model Evaluation

In this study, model evaluation was conducted by examining the coefficient of determination (R^2), CFI, TLI, RMSEA, and SRMR. Based on the output of R software, the value for this mediation model is 0.378, indicating that about 37.8% of the variation in students' mathematics achievement can be explained by this mediation model, while the remaining 74.3% is explained by variables outside the model. According to Cohen et al. (2003), this coefficient of determination falls into the strong effect category, as it exceeds 0.26.

Practical Implications and Limitations

This study recommends that efforts to improve students' mathematics achievement should not rely solely on teacher pedagogical training, but should also invest in programs that foster students' sense of belonging, such as inclusive extracurricular activities or structured peer mentoring (Allen et al., 2018). The negative direct effect of teacher support suggests the importance of targeted and differentiated assistance, where teachers are trained to support struggling students without creating stigma, while also providing appropriate challenges for high-achieving students. These findings highlight the complexity of the relationship between student characteristics, teacher support, and academic outcomes and emphasize the need to address both instructional and social factors within schools.

This study has several limitations. First, the use of cross-sectional data limits the ability to analyze causal relationships over time. Second, many variables in PISA 2022 that may influence mathematics achievement were not included in

the analysis. Third, although the instruments used in PISA are internationally standardized, cultural validity in the Indonesian context may influence how students interpret and respond to questionnaire items.

■ CONCLUSION

This study reveals that teacher support, gender, and socioeconomic status significantly influence aspects of school culture and climate namely, bullying victimization, sense of belonging, feeling safety, and perceived school safety risk which in turn influence students' mathematics achievement. These findings highlight the importance of not only focusing on instructional practices but also addressing the broader psychosocial environment of schools to enhance mathematics outcomes in Indonesia. The results highlight the mediating role of school culture and climate in shaping students' academic performance, emphasizing the need for comprehensive learning support systems.

The findings practically suggest educational interventions should prioritize fostering students' sense of belonging along with reducing bullying, rather than solely relying on teachers' direct academic support. For both struggling and high-achieving students, differentiated support strategies should be integrated into teacher training programs. However, this study has certain limitations. The use of cross-sectional data restricts causal inferences, and the potential for cultural bias in internationally standardized instruments such as PISA may affect the interpretation of responses in the Indonesian context. Future research should consider longitudinal designs and explore variables that are contextually relevant to Indonesia.

■ REFERENCES

Afriani, & Denisa. (2021). Bullying victimization among junior high school students in Aceh, Indonesia: Prevalence and its differences in gender, grade, and friendship quality. *Jurnal Ilmiah Peuradeun*, *9*(2), 251–274. https://doi.org/10.26811/peuradeun.v9i2.518

Allen, K., Kern, M. L., Vella-Brodrick, D., Hattie, J., & Waters, L. (2018). What schools need to know about fostering school belonging: A meta-analysis. *Educational Psychology Review*, *30*, 1-34. https://doi.org/10.1007/s10648-016-9389-8

Antonelli-Ponti, M., Monticelli, P. F., Versuti, F. M., Campos, J. R., & Elias, L. C. D. S. (2021). Academic achievement and the effects of the student's learning context: a study on PISA data. *Psico-USF*, *26*(1), 13–25. https://doi.org/10.1590/1413-82712021260102

Bakchich, J., Claes, N., Carré, A., & Smeding, A. (2024). Examining the effects of socioeconomic status indicators on the association between growth mindset and sense of belonging to school. *Social Psychology of Education*. https://doi.org/10.1007/s11218-024-09900-8

Berkowitz, R., Moore, H., Astor, R. A., & Benbenishty, R. (2017). A research synthesis of the associations between socioeconomic background, inequality, school climate, and academic achievement. *Review of Educational Research*, *87*(2), 425–469. https://doi.org/10.3102/0034654316669821

Chang, Y. C., & Bangsri, A. (2020). Thai students' perceived teacher Support on their reading ability: Mediating effects of self-efficacy and sense of school belonging. *International Journal of Educational Methodology*, *6*(2), 435–446. https://doi.org/10.12973/ijem.6.2.435

Chen, J. J. L. (2005). Relation of academic support from parents, teachers, and peers to Hong Kong adolescents' academic achievement: The mediating role of academic engagement. *Genetic, Social,*

and General Psychology Monographs, *131*(2), 77–127. https://doi.org/10.3200/MONO.131.2.77-127

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behaviorial sciences* (3rd ed.). Lawrence Erlbaum Associates, Inc.

Dulay, S., & Karadag, E. (2017). The effect of school climate on student achievement. In *The Factors Effecting Student Achievement* (Issue May 2017, pp. 199–213). Springer International Publishing. https://doi.org/10.1007/978-3-319-56083-0_12

Estell, D. B., & Perdue, N. H. (2013). Social support and behaviorial and affective school engagement: The effect of peers, parents, and teachers. *Psychology in the Schools*, *50*(4), 325–339. https://doi.org/10.1002/pits.21681

Fox, J., & Weisberg, S. (2018). *An R companion to applied regression*. Sage publications.

Galliher, R. V., Rostosky, S. S., & Hughes, H. K. (2004). School belonging, self-esteem, and depressive symptoms in adolescents: An examination of sex, sexual attraction status, and urbanicity. *Journal of Youth and Adolescene*, *33*(3), 235–245. https://doi.org/10.1023/B:JOYO.0000025322.11510.9d

Gimenez, G., Mediavilla, M., Giuliodori, D., & Rusteholz, G. C. (2024). Bullying at school and students' learning outcomes: International perspective and gender analysis. *Journal of Interpersonal Violence*, *39*(11), 2733–2760. https://doi.org/10.1177/08862605231222457

Gutiérrez, M., & Tomás, J. M. (2019). The role of perceived autonomy support in predicting university students' academic success mediated by academic self-efficacy and school engagement. *Educational Psychology, 39*(6), 729-748. https://doi.org/10.1080/01443410.2019.1566519

Hayes, A. F. (2022). *Introduction to Mediation, Moderation, and Conditional Proccess Analysis: A Regression-Based Approach* (3rd ed.). The Guilford Press.

Horton, P. (2019). The bullied boy: masculinity, embodiment, and the gendered social-ecology of Vietnamese school bullying. *Gender and Education*, *31*(3), 394-407. https://doi.org/10.1080/09540253.2018.1458076

Katschnig, T., & Hastedt, D. (2017). Too scared to learn? Understanding the importance of school safety for immigrant students. *International Association for the Evaluation of Educational Achievement*, *15*, 1–7. https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED588370&site=ehost-live&authtype=ip,uid

Kim, Y. K., Sanders, J. E., Makubuya, T., & Yu, M. (2020). Risk factors of academic performance: Experiences of school violence, school safety concerns, and depression by gender. *Child and Youth Care Forum*, *49*(5), 725–742. https://doi.org/10.1007/s10566-020-09552-7

Kogar, E. Y. (2021). An investigation of the mediating role of various variables in the effect of both gender and economic, social and cultural status on reading literacy. *International Journal of Progressive Education*, *17*(1), 376–391. https://doi.org/10.29329/ijpe.2021.329.24

Kogar, H. (2015). Examination of factors affecting PISA 2012 mathematical literacy through mediation model. *Ted Egitim Ve Bilim*, *40*(179). https://doi.org/10.15390/EB.2015.4445

Kuang, X., Mok, M. M. C., Chiu, M. M., & Zhu, J. (2019). Sense of school belonging:

Psychometric properties and differences across gender, grades, and East Asian societies. *PsyCh Journal*, *8*(4), 449–464. https://doi.org/10.1002/pchj.275

Lenzi, M., Sharkey, J., Furlong, M. J., Mayworm, A., Hunnicutt, K., & Vieno, A. (2017). School sense of community, teacher support, and students' school safety perceptions. *American Journal of Community Psychology*, *60*(3–4), 527–537. https://doi.org/10.1002/ajcp.12174

Li, L., Chen, X., & Li, H. (2020). Bullying victimization, school belonging, academic engagement and achievement in adolescents in rural China: A serial mediation model. *Children and Youth Services Review*, *113*(March), 104946. https://doi.org/10.1016/j.childyouth.2020.104946

López, F. (2019). How educational settings inform Latino student identity and achievement. *Policy Insights from the Behavioral and Brain Sciences*, *6*(2), 170–177. https://doi.org/10.1177/2372732219860859

MacKinnon, D. P. (2015). Mediating variable. In *International Encyclopedia of the Social & Behavioral Sciences: Second Edition* (Second Edi, Vol. 15). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.44037-7

Maxwell, S., Reynolds, K. J., Lee, E., Subasic, E., & Bromhead, D. (2017). The impact of school climate and school identification on academic achievement: Multilevel modeling with student and teacher data. *Frontiers in Psychology*, *8*(DEC), 1–21. https://doi.org/10.3389/fpsyg.2017.02069

Mcknight, M., & Schubotz, D. (2024). *Feeling safe/ ? Gender-based violence experiences of 16-year-olds*. *158*, 1–6.

Mcneely, C. A., Nonnemaker, J. M., & Blum, R. W. (2002). Promoting school connectedness: Evidence from the national longitudinal study of adolescent health. *Journal of School Health*, *72*(4), 138–146.

Mijanovich, T., & Weitzman, B. C. (2003). Which "broken windows" matter? School, neighborhood, and family characteristics associated with youths' feelings of unsafety. *Journal of Urban Health*, *80*(3), 400–415. https://doi.org/10.1093/jurban/jtg045

Nurmi, J. E. (2012). Students' characteristics and teacher–child relationships in instruction: A meta-analysis. *Educational Research Review, 7*(3), 177-197. https://doi.org/10.1016/j.edurev.2012.03.001

OECD. (2023a). PISA 2022 assessment and analytical framework. OECD Publishing. https://doi.org/https://doi.org/10.1787/dfe0bf9c-en

OECD. (2023b). PISA 2022 results (Volume II). OECD Publishing. https://doi.org/10.1787/a97db61c-en

Oktaviani, U., Kumawati, S., Apriliyani, M. N., Nugroho, H., & Susanti, E. (2020). *Identifikasi faktor penyebab rendahnya hasil belajar matematika peserta didik di SMK Negeri 1 Tonjong* [Identification of factors causing low mathematics learning outcomes of students at SMK Negeri 1 Tonjong]. *MATH LOCUS: Jurnal Riset Dan Inovasi Pendidikan Matematika*, *1*(1), 1–6. https://doi.org/10.31002/mathlocus.v1i1.892

Ortega-Rodríguez, P. J. (2025). PISA 2022: The impact of school-environment predictors on the performance of spanish students. *Revista Espanola de Pedagogia*, *83*(290), 223–240. https://doi.org/10.22550/2174-0909.4100

Osher, D., Dwyer, K. P., Jimerson, S. R., & Brown, J. A. (2012). Developing safe, supportive, and effective schools: Facilitating student success to reduce school violence. In S. Jimerson, A. Nickerson, M. J. Mayer, & M. J. Furlong

(Eds.), *Handbook of School Violence and School Safety* (2nd ed., pp. 27–44). Routledge/Taylor & Francis Group.

Paramesti, A. L., Zefanya, J. N., Berliani, B., & Ramadhani, D. N. (2024). *Nilai PISA rendah, ekonomi susah: Hubungan kualitas pendidikan terhadap pertumbuhan ekonomi* [Low PISA scores, poor economy: The relationship of education quality to economic growth]. HIMIESPA FEB UGM. https://himiespa.feb.ugm.ac.id/nilai-pisa-rendah-ekonomi-susah-hubungan-kualitas-pendidikan-terhadap-pertumbuhan-ekonomi/

Penghui, H., & Mengfan, X. (2024). Does competitive school climate really harm to students' anti-bullying attitude: empirical evidence from China. *BMC Public Health*, *24*(1), 2927. https://doi.org/10.1186/s12889-024-20444-6

Pontes, N. M. H., Ayres, C. G., Lewandowski, C., & Pontes, M. C. F. (2018). Trends in bullying victimization by gender among U.S. high school students. *Research in Nursing and Health*, 1–9. https://doi.org/10.1002/nur.21868

Prusinski, E., Hastedt, D., & Dohr, S. (2019). Do both boys and girls feel safe at school – and does it matter? *Compass: Briefs in Education*, *5*.

Putwain, D. W., & Daly, A. L. (2013). Do clusters of test anxiety and academic buoyancy differentially predict academic performance?. *Learning and Individual Differences*, *27*, 157-162. https://doi.org/10.1016/j.lindif.2013.07.010

Roorda, D. L., Koomen, H. M., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher–student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research*, *81*(4), 493-529. https://doi.org/10.3102/00346543 11421793

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, *48*(2), 1–36. https://doi.org/10.18637/jss.v048.i02

Salsabila, A., & Puspitasari. (2020). *Faktor-faktor yang mempengaruhi prestasi belajar siswa sekolah dasar* [Factors that influence learning achievement of elementary school students]. *JMKSP (Jurnal Manajemen, Kepemimpinan, Dan Supervisi Pendidikan)*, *2*(2), 278–288.

Sari, D. A. K., & Setiawan, E. P. (2023). *Literasi baca siswa Indonesia menurut jenis kelamin, growth mindset, dan jenjang pendidikan: Survei PISA* [Reading literacy of Indonesian students by gender, growth mindset, and level of education: PISA survey]. *Jurnal Pendidikan Dan Kebudayaan*, *8*(1), 1–16. https://doi.org/10.24832/jpnk.v8i1.3873

Schultz, T. W. (1961). Investment in human capital. *The American Economic Review, 51*(1), 1-17.

Setiawan, E. P., Kismiantini, & Montesinos-lópez, O. A. (2024). How economics-socio-cultural status affect Indonesian students' performance in mathematics/ ? an insight from PISA 2012-2022. *Jurnal Pendidikan Progresif*, *14*(03), 1800–1816. https://doi.org/10.23960/jpp.v14.i3.2024122

Shumow, L., & Lomax, R. G. (2001). Predicting perceptions of school safety. *The School Community Journal*, *11*(2), 93–112.

Tosto, M. G., Asbury, K., Mazzocco, M. M. M., Petrill, S. A., & Kovas, Y. (2016). From classroom environment to mathematics achievement: The mediating role of self-perceived ability and subject interest. *Learning and Individual Differences*, *50*, 260–269. https://doi.org/10.1016/j.lindif.2016.07.009

Vasilescu, R., Barna, C., Epure, M., & Baicu, C. (2010). Developing university social responsibility: A model for the challenges of the new civil society. *Procedia-Social and Behavioral Sciences*, *2*(2), 4177-4182. https://doi.org/10.1016/j.sbspro.2010.03.660

Venables, W. N., & Ripley, B. D. (2002). *Modern applied statistics with S* (4th ed.). Springer. https://www.stats.ox.ac.uk/pub/MASS4/

Wang, J., & Wang, X. (2020). *Structural equation modeling: application using mplus* (2nd ed.). John Wiley & Sons, Inc.

Wardat, Y., Belbase, S., Tairab, H., Takriti, R. A., Efstratopoulou, M., & Dodeen, H. (2022). The influence of student factors on students' achievement in the Trends in International Mathematics and Science Study in Abu Dhabi Emirate Schools. *Frontiers in Psychology*, *14*. https://doi.org/10.3389/fpsyg.2023.1168032

Wickham, H. (2011). The split-apply-combine strategy for data analysis. *Journal of Statistical Software*, *40*(1), 1–29. https://doi.org/10.18637/jss.v040.i01

Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org

Wickham, François, R., Henry, L., Müller, K., & Vaughan, D. (2023). *dplyr: A Grammar of Data Manipulation*. https://dplyr.tidyverse.org

Wingard, A. K., Hermawan, H. D., & Dewi, V. R. (2020). The effects of students' perception of the school environment and students' enjoyment in reading towards reading achievement of 4th grades students in Hong Kong. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, *2*(2), 68–74. https://doi.org/10.23917/ijolae.v2i2.9350

Winnaar, L. (2020). *The effect of school climate: How feelings of safety and belonging support learners' achievement*. *19*(2), 20–22.

Wong, T. K. Y., Tao, X., & Konishi, C. (2018). Teacher support in learning: Instrumental and appraisal support in relation to math achievement. *Issues in Educational Research*, *28*(1), 202–219.

Yang, Y., Li, G., Su, Z., & Yuan, Y. (2021). Teacher's emotional support and math performance: The chain mediating effect of academic self-efficacy and math behavioral engagement. *Frontiers in Psychology*, *12*(September), 1–10. https://doi.org/10.3389/fpsyg.2021.651608

Yusuf, A., Habibie, A. N., Efendi, F., Kurnia, I. D., & Kurniati, A. (2019). Prevalence and correlates of being bullied among adolescents in Indonesia: Results from the 2015 Global School-based Student Health Survey. *International Journal of Adolescent Medicine and Health, 34*(1), 1-7. https://doi.org/10.1515/ijamh-2019-0064