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Financial Literacy of the Young Generation: The Influence of Teachers' Technology Adaptation and Teaching Strategies on Students' Financial Literacy Moderated by Gender and Parental Income

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A B S T R A C T

This study aims to examine the effect of teachers' technology adaptation and teaching strategy on students' financial literacy, and to test the moderating roles of gender and parental income. A quantitative approach with a survey method was applied to 224 senior high school students at SMA XYZ Tangerang Selatan. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS 4.0, covering the evaluation of the measurement model, the structural model, and moderation analysis. The results show that teachers' technology adaptation ($\beta = 0.124$; $p = 0.039$) and teachers' teaching strategy ($\beta = 0.746$; $p < 0.001$) have a positive and significant effect on students' financial literacy. In addition, the moderation analysis reveals that gender and parental income significantly moderate this relationship. The findings confirm that improving students' financial literacy requires synergy between the quality of technology-based teaching and students' demographic characteristics.

Keywords: *Financial Literacy, Technology Adaptation, Teaching Strategy, Gender, Parental Income, PLS-SEM*

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INTRODUCTION

The rapid development of digital technology has transformed the world of education, including the way teachers deliver economics instruction and the way students build financial competence Muniarty et al. (2025). Financial literacy has now become an essential competency that determines individuals' future financial well-being, yet empirical data show that the level of financial literacy among Indonesian senior high school students remains relatively low and requires systematic pedagogical intervention. Evidence from school-based financial education research indicates that structured financial education can improve students' financial knowledge and, to a lesser extent, their financial behavior (Kaiser & Menkhoff, 2020). Data from the 2025 National Survey of Financial Literacy and Inclusion (SNLIK), released by the Financial Services Authority (OJK) in collaboration with the Central Statistics Agency (BPS), recorded a national financial literacy index of 66.46%, only a modest increase from 65.43% in 2024, with students and university students still occupying a relatively lower position compared to professional workers; the same survey further shows that literacy levels remain lower among women and rural populations than the national average. At the international level, the OECD's PISA 2022 financial literacy assessment found that, on average, 18% of 15-year-old students across participating OECD countries and economies still lack basic financial literacy proficiency (OECD, 2024).

This persistent gap, evident both globally among adolescents and nationally among Indonesian students, indicates the urgency of research exploring the pedagogical factors that can drive improvements in students' financial literacy. The importance of school-based

intervention is further supported by evidence that students who learn financial concepts at school tend to perform better in financial literacy assessments (OECD, 2024).

Teachers hold a strategic role in determining the quality of classroom learning, particularly through two main dimensions: technology adaptation ability and the teaching strategies applied. Both dimensions are especially important for financial literacy because, in the Indonesian senior high school curriculum, financial literacy is not taught as a stand-alone subject but is embedded within economics instruction; consequently, the depth of students' understanding depends heavily on how effectively individual teachers translate abstract material, such as budgeting, saving, and investment, into tangible and applicable skills. Teachers' technology adaptation supports this translation by enabling digital simulations, interactive media, and real-world financial applications that make abstract concepts concrete, while teachers' teaching strategy ensures that such content is delivered through well-planned, contextual, and evaluable learning sequences rather than one-off exposure. Recent evidence shows that meaningful technology integration is more strongly associated with instructional-quality dimensions such as student support and cognitive activation when technology is integrated through deliberate pedagogical planning (Hebibi et al., 2026). Without adequate teacher competence in these two areas, students risk acquiring financial knowledge that remains rote and disconnected from real financial decision-making. Teachers' technology adaptation encompasses the ability to integrate digital platforms, interactive media, and technology-based learning tools into the learning process. Teacher professional development that strengthens technological pedagogical knowledge has also been shown to support ICT integration and student learning outcomes (Koh et al., 2017).

Teachers' teaching strategies encompass careful planning, the selection of contextual methods, and ongoing evaluation to ensure the achievement of learning objectives. In economics education specifically, teachers' technological pedagogical content knowledge has been identified as increasingly important for improving the effectiveness of learning in response to rapid technological change (Kurniawati et al., 2025). In addition to pedagogical factors, a number of studies have also identified the role of demographic variables in shaping financial literacy. Gender has been shown to influence cognitive and behavioral differences in financial decision-making (Lusardi & Mitchell, 2014). Research among young people further demonstrates that financial literacy is associated with sociodemographic characteristics and family financial sophistication, indicating that students' financial learning is shaped by both individual and family contexts (Lusardi et al., 2010). Meanwhile, parental income reflects the family's socioeconomic condition, which affects children's access to resources and financial experience. Indonesian evidence similarly indicates that parents' socioeconomic status is significantly associated with students' financial literacy (Khusaini et al., 2022). However, research examining the role of these two variables as moderators in the relationship between pedagogical factors and students' financial literacy remains very limited.

Financial literacy is defined by OECD (2023) as a combination of awareness, knowledge, skills, attitudes, and financial behaviors that individuals need to make sound financial decisions and achieve financial well-being. OJK (2025) affirms that financial literacy encompasses the knowledge, skills, and confidence that shape individuals' behavior in managing finances responsibly. (Lusardi & Mitchell, 2014) add that this competency includes the ability to process economic information and make rational decisions related to budget planning, debt management, and investment planning. In the context of formal education, particularly for senior high school students, OJK (2024) operationalizes financial literacy into two main cognitive dimensions: knowledge and skill. The knowledge dimension covers understanding of financial institutions, financial products and services, and their characteristics. The skill dimension focuses on the ability to perform simple financial arithmetic, such as calculating interest, loan installments, and investment returns. These two dimensions were selected based on the consideration that cognitive aspects form the foundation that precedes the formation of financial attitudes and behavior.

Table 1. Dimensions and Indicators of Financial Literacy

Dimension	Indicator
Knowledge	Knowledge of financial institutions, products, services, and their characteristics
Skill	Ability to perform simple financial arithmetic

Source: OJK (2024)

Technology adaptation in the educational context refers to teachers' ability to integrate digital devices and platforms into the learning process effectively and meaningfully. (Haleem et al., 2022) affirm that the development of digital technology has transformed the way teachers conduct instruction and has provided broader access to learning resources. Teachers' ability to optimize technology is a key factor in improving the quality of education, since teachers are required to be more proficient with technology than their students in order to facilitate optimal learning (Dasor et al., 2021). In this study, teachers' technology adaptation is measured through students' perceptions of teachers' ability to use digital media and devices in learning, covering four dimensions: student support, classroom management, differentiation, and cognitive activation. These four dimensions reflect the broad scope of technology implementation, ranging from individual student support and digitally based classroom management to learning differentiation and higher-order cognitive stimulation through technological media.

Teaching strategy is an integrated design encompassing the approaches, methods, and techniques teachers use to plan and implement the learning process in order to achieve educational objectives optimally. Research by (Ruiz-Martín et al., 2026) shows that effective learning strategies can improve academic achievement and help students obtain better learning outcomes. In the context of financial literacy, Budidharmanto (2023) found that digital financial simulation strategies, case studies, and project-based learning significantly improve students' understanding of financial concepts. The teaching strategy variable is operationalized into three dimensions: planning and opening of instruction, implementation of strategy in the classroom, and evaluation and closing. These three dimensions form a comprehensive learning cycle and reflect the professional standard of teachers' pedagogical competence.

Gender has long been identified as a factor influencing cognitive and behavioral differences in financial management. Lusardi & Mitchell (2014) found a consistent gender gap in financial literacy, in which males tend to have higher knowledge scores even though females exhibit more prudent financial behavior. (Tinghög et al., 2021) linked this difference to psychological factors such as stereotype threat, which affects females' confidence in processing financial information. Parental income reflects the family's socioeconomic condition, which directly affects children's access to resources and financial experience. Ndou & Godi (2025) explain that parental income can moderate the relationship between family financial discussions and children's financial literacy, particularly in the knowledge, attitude, and behavior dimensions. (Van-Nguyen et al., 2022) reinforce this finding by showing that family economic conditions are a significant factor shaping financial literacy among students.

Based on the literature review presented above, the research model positions teachers' technology adaptation (X1) and teachers' teaching strategies (X2) as independent variables influencing students' financial literacy (Y), with gender (M1) and parental income (M2) serving as moderating variables. Six hypotheses are formulated as follows:

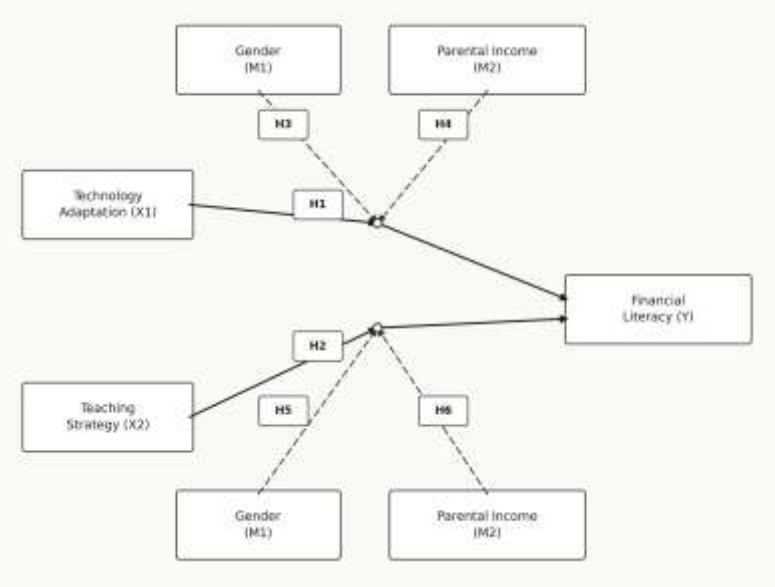

Figure 1. Research model

H1: Teachers' technology adaptation has a positive effect on students' financial literacy.
H2: Teachers' teaching strategy has a positive effect on students' financial literacy.
H3: Gender moderates the effect of technology adaptation on students' financial literacy.
H4: Parental income moderates the effect of technology adaptation on students' financial literacy.
H5: Gender moderates the effect of teaching strategy on students' financial literacy.
H6: Parental income moderates the effect of teaching strategy on students' financial literacy.

METHOD

This study employed a quantitative approach with a cross-sectional survey design. The research population consisted of all students of SMA XYZ Tangerang Selatan. The sample of 224 respondents was obtained through convenience sampling, in which questionnaires were distributed to students who were present in class and willing to participate at the time of data collection. This technique was chosen because the study required efficient access to a sufficiently large number of respondents within the constraints of the school's academic schedule, and because a complete sampling frame stratified by gender and parental income was not available in advance, which made probability-based techniques such as stratified random sampling difficult to implement. To reduce potential bias, data collection was carried out across multiple class levels and sections so that the resulting sample would reasonably reflect the gender and parental-income variation present in the student population. Nonetheless, as a non-probability technique, convenience sampling limits the statistical generalizability of the findings beyond the studied school, a limitation that is acknowledged in the discussion of this study. Data were collected using a questionnaire instrument comprising a 4-point Likert scale for the technology adaptation and teaching strategy variables, as well as a multiple-choice knowledge and skill test for the financial literacy variable.

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0 software. The analysis consisted of: (1) evaluation of the measurement model (outer model), including internal reliability, convergent validity, and discriminant validity; (2) evaluation of the structural model (inner model), including

Goodness of Fit, path coefficients, and the coefficient of determination (R^2); and (3) moderation analysis using the product indicator approach to test the interaction effects between the independent variables and the moderating variables on financial literacy.

FINDINGS AND DISCUSSION

Respondent Characteristics

Table 2. Respondent Characteristics

Characteristic	Category	Percentage (%)
Gender	Male	36.6
	Female	63.4
Parental Income	Low (≤ IDR 5,000,000)	3.6
	Middle (IDR 5–10 million)	8.0
	High (IDR 10–20 million)	28.6
	Very High (> IDR 20 million)	59.8

Source: Processed data (2026)

Measurement Model Evaluation

The outer model evaluation results show that all indicators meet the convergent validity criteria, with outer loading values above 0.70. The Average Variance Extracted (AVE) values were 0.773 for the Technology Adaptation construct and 0.841 for the Teaching Strategy construct, both exceeding the required threshold of 0.50 (Hair et al., 2022). Construct reliability was confirmed through Cronbach's Alpha values (TA = 0.973; TS = 0.987) and Composite Reliability values (TA = 0.976; TS = 0.988), all of which exceeded the critical value of 0.70, indicating that the indicators within each construct have good internal consistency (Hair et al., 2022).

Table 3. Results of Convergent Validity and Reliability Test

Construct	Cronbach's α	CR (rho_c)	AVE	Remarks
Technology Adaptation (TA)	0.973	0.976	0.773	Valid & Reliable
Teaching Strategy (TS)	0.987	0.988	0.841	Valid & Reliable

Source: Processed data (2026)

Discriminant validity was verified using two criteria. First, the Fornell-Larcker criterion shows that the square root of the AVE for each construct is greater than its correlations with other constructs. Second, the Heterotrait-Monotrait Ratio (HTMT) values for all pairs of constructs are below the 0.90 threshold, indicating adequate discriminant validity (Hair et al., 2022). Thus, the measurement model is confirmed to be valid and reliable for use in the structural model analysis.

Table 4. Discriminant Validity Test Results (Fornell-Larcker)

Construct	TA	Gender	Income	FL	TS
Technology Adaptation (TA)	0.879				
Gender	0.009	1.000			
Parental Income	0.016	0.305	1.000		
Financial Literacy (FL)	0.065	0.052	-0.193	1.000	
Teaching Strategy (TS)	0.091	0.201	0.213	0.791	0.917

Source: Processed data (2026)

Structural Model Evaluation

The Goodness of Fit of the model in the PLS-SEM analysis was evaluated using SRMR (Standardized Root Mean Square Residual). The SRMR value was 0.050 for the saturated model and 0.051 for the estimated model, both below the recommended critical value of 0.08, indicating that the model fits the empirical data well. The coefficient of determination (R^2) for financial literacy was 0.797 (Adjusted R^2 = 0.789), indicating that 79.7% of the variance in students' financial literacy can be explained by the combination of the independent variables and their moderation interactions. The Q^2 value of 0.783 confirms that the model has very strong predictive relevance for the endogenous variable (financial literacy).

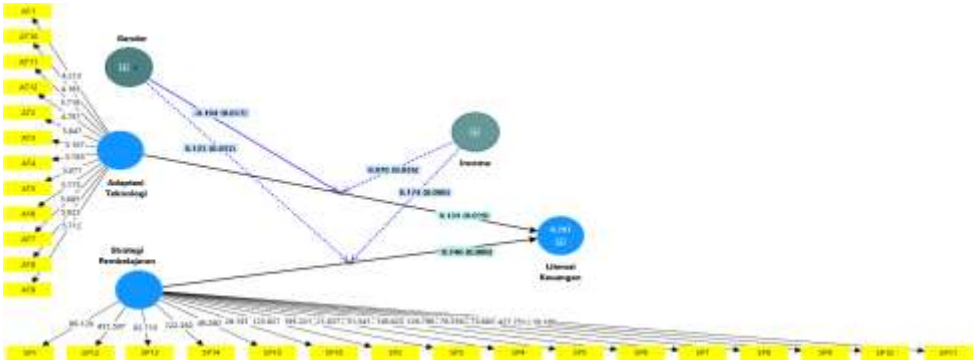

Figure 2. Structural model estimation output (PLS-SEM)

Hypothesis Testing Results

Hypothesis testing produced t-statistic and p-value results. The results of the direct effect and moderation effect tests are presented in Table 5 and Table 6 below.

Table 5. Direct Effect Test Results

Path	β	STDEV	T-stat	P-value	Decision
TA → FL (H1)	0.124	0.070	1.761	0.039	Supported
TS → FL (H2)	0.746	0.056	13.227	0.000	Supported

Source: Processed data (2026)

The direct effect test results show that teachers' technology adaptation has a positive and significant effect on students' financial literacy (β = 0.124; p = 0.039). Teachers' teaching strategy also has a positive and significant effect, with a much larger coefficient (β = 0.746; p < 0.001). These findings indicate that teaching strategy is the most dominant factor in improving students' financial literacy compared to technology adaptation. This substantial gap in effect size suggests that technology functions primarily as a supporting instrument rather than as a substantive driver of financial understanding: a well-designed lesson sequence with clear objectives, contextual cases, and structured evaluation shapes how students process and retain financial concepts, whereas digital tools mainly amplify that process when it is already well designed. In other words, the pedagogical design decisions teachers make, such as what to teach, in what order, and how to check understanding, appear to matter more for building financial competence than the medium through which the material is delivered. This pattern implies that policies aimed solely at expanding technology access in schools, without parallel investment in teachers' capacity to design sound teaching strategies, are unlikely to yield proportionate gains in students' financial literacy.

Table 6. Moderation Effect Test Results

Moderation Path	β	STDEV	T-stat	P-value	Decision
Gender × TA → FL (H3)	-0.194	0.092	2.118	0.017	Supported
Income × TA → FL (H4)	0.076	0.042	1.803	0.036	Supported
Gender × TS → FL (H5)	0.123	0.067	1.834	0.033	Supported
Income × TS → FL (H6)	0.174	0.034	5.099	0.000	Supported

Source: Processed data (2026)

The moderation test results show that gender and parental income significantly moderate the relationship between teachers' pedagogical factors and students' financial literacy. Gender weakens the effect of technology adaptation on financial literacy (β = -0.194) but strengthens the effect of teaching strategy (β = 0.123). Meanwhile, parental income strengthens the effect of both technology adaptation (β = 0.076) and teaching strategy (β = 0.174) on students' financial literacy. Taken together, these two moderators point to different underlying mechanisms rather than a single explanation. Gender's opposite-signed moderation suggests a differential responsiveness to instructional medium versus instructional design between male and female students, rather than a uniform advantage or disadvantage for either group. Parental income's consistently positive moderation, by contrast, suggests that economic resources function as an enabling condition that allows students to better capitalize on whatever pedagogical approach the teacher applies, whether technology-based or strategy-based. This distinction carries different implications for practice: gender differences call for differentiated instructional design, while income differences call for compensatory support that narrows the resource gap so that pedagogical quality translates more evenly into learning outcomes across the student body.

Table 7. Summary of Hypothesis Testing Results

H	Hypothesis	Result
H1	Teachers' technology adaptation → Students' financial literacy (+)	Supported (β=0.124; p=0.039)
H2	Teachers' teaching strategy → Students' financial literacy (+)	Supported (β=0.746; p<0.001)
H3	Gender moderates the effect of TA → FL	Supported (β=-0.194; p=0.017)
H4	Parental income moderates the effect of TA → FL	Supported (β=0.076; p=0.036)
H5	Gender moderates the effect of TS → FL	Supported (β=0.123; p=0.033)
H6	Parental income moderates the effect of TS → FL	Supported (β=0.174; p<0.001)

Source: Processed data (2026)

The summary of hypothesis testing results shows that all research hypotheses are supported by empirical data, with both direct effects and moderation effects proving significant and consistent with the hypothesized directions of the relationships. Thus, the research model is able to explain the role of teachers' pedagogical factors, together with student and family characteristics, in shaping students' financial literacy.

The Effect of Teachers' Technology Adaptation on Students' Financial Literacy

The finding that teachers' technology adaptation has a positive and significant effect on students' financial literacy (β = 0.124; p = 0.039) makes an important contribution to the educational literature, particularly in mapping the role of teachers' digital competence in shaping the financial capability of the younger generation, an area that has rarely been studied. Most previous research has treated technology as a student-side variable, focusing on how much students use digital devices, whereas this study instead examines it from the teacher's side, looking at teachers' ability to adapt technology as a pedagogical instrument for financial

education. The coefficient value of $\beta = 0.124$ offers an interesting perspective: technology is not the primary trigger that directly makes students financially literate. Rather, technology's role is to support learning, enabling teachers to provide financial simulations, enrich media choices in the classroom, and make learning material more tangible for students. In other words, the greatest impact of technology lies not in the transfer of technology itself, but in how technology expands the pedagogical space available to teachers for building students' financial competence. This finding also opens up a policy implication that has previously received little attention: investment in school technology infrastructure without accompanying programs to build teachers' technology-adaptation capacity will yield only suboptimal benefits. The data in this study show that teachers who are able to adapt technology can raise students' financial literacy scores, because they can offer learning methods that are more interactive and relevant to students' current digital lives.

The Effect of Teachers' Teaching Strategy on Students' Financial Literacy

The most striking finding of this study is the dominance of teachers' teaching strategy as a predictor of financial literacy ($\beta = 0.746$; $f^2 = 0.829$), surpassing all other variables, including the demographic factors. Empirically, this confirms that the teaching strategies applied by teachers in the classroom contribute far more to shaping senior high school students' financial literacy than demographic factors such as gender or family economic background. This study shows that teachers' implementation of systematic, student-oriented teaching strategies can improve financial literacy. This finding confirms that teachers' role in applying teaching strategies at school can be a powerful factor in shaping financial literacy. The coefficient of determination of $R^2 = 0.797$ confirms this in the aggregate, meaning that nearly 80% of the variance in students' financial literacy can be explained by the model developed in this study. This finding also carries practical implications for the development of economics teacher training curricula: the competency that needs to be prioritized is not merely mastery of financial content, but pedagogical competence in designing meaningful, contextual financial learning experiences relevant to students' everyday financial lives.

The Moderating Role of Gender

The moderation test results show that the effect of gender varies and is inconsistent across the relationship paths examined. This pattern indicates that gender changes both the strength and the direction of the effects of technology adaptation and teaching strategy on students' financial literacy. On the path from technology adaptation to financial literacy, gender acts as a negative moderator ($\beta = -0.194$; $p = 0.017$), meaning that the effect of teachers' technology adaptation is stronger among male students. However, on the path from teaching strategy to financial literacy, gender instead acts as a positive moderator ($\beta = 0.123$; $p = 0.033$), indicating that female students are more responsive to the quality of teaching strategy. These contrasting results offer new insight that has not been widely discussed in the literature. Most prior research has only compared overall differences in financial literacy levels between male and female students, without examining the specific factors or processes underlying those differences. This study finds that gender does not affect financial literacy directly, but rather through its moderating effect on different learning mechanisms: males are more responsive to the use of technology, while females are more responsive to the quality of teaching strategy. This has concrete implications for instructional design. This finding recommends that teachers adapt their teaching methods to students' gender when delivering material. Teachers can leverage technology to capture male students' attention, while strengthening structured group discussions and case studies for female students. This adaptive approach represents a new breakthrough for education, particularly in creating a classroom environment that is fairer and more effective for both male and female students — an outcome that has rarely been evidenced in Indonesian secondary schools to date.

The Moderating Role of Parental Income

Parental income positively moderates the effects of technology adaptation (β = 0.076; p = 0.036) and teaching strategy (β = 0.174; p = 0.000) on students' financial literacy. The moderating effect of parental income shows a consistent pattern in the same direction across both paths. This finding provides clear evidence that parental income can serve as a key supporting factor enabling students to absorb classroom learning more effectively. Students from higher-income families gain greater benefit from both technology adaptation and teachers' strategies. Students' family environments can provide facilities, access, and information that support learning and make school material easier to understand in everyday life. In other words, family economic conditions and teachers' pedagogical quality are not competing factors but rather mutually reinforcing ones. This finding carries an important policy implication: differences in parental income cause the benefits of teachers' teaching strategies for students' financial literacy to be felt unevenly. Nevertheless, high-quality teaching strategies still produce a positive effect, including for students from lower-income families. Schools therefore need to strengthen inclusive financial literacy programs that involve parents, particularly from lower-income families, and are supported by equitable access to technology. Such interventions are expected to minimize disparities in learning benefits and provide equal opportunities for all students to improve their financial literacy.

CONCLUSIONS

This study contributes to the financial literacy literature by positioning teachers, rather than students or families alone, as a central lever for improving adolescents' financial literacy and by showing that gender and parental income function not as direct determinants but as conditions shaping how effectively pedagogical quality translates into learning outcomes. Theoretically, this reframes financial literacy education as a design problem, emphasizing teachers' pedagogical judgment in purposeful technology use and instructional strategies responsive to differences in students' gender and socioeconomic backgrounds. Practically, the findings highlight the need for teacher professional development that integrates technological competence with instructional design rather than treating them as separate skills. Schools should also combine improvements in teaching quality with targeted support for lower-income students to prevent widening existing resource-based gaps. However, the study is limited by convenience sampling within a single school. Future research should use probability-based sampling across multiple schools, longitudinal designs, and additional moderators such as school type or urban–rural setting to test the robustness of these findings.

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