Psychological and Social Determinants of SPM Mathematics Achievement Among Malaysian Secondary Students: A Comparative Analysis Between Sekolah Menengah Kebangsaan And Sekolah Menengah Agama

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ABSTRACT

Persistent underachievement in Sijil Pelajaran Malaysia (SPM) Mathematics continues to raise concern within Malaysia's education system, with a significant proportion of students failing to meet expected proficiency levels. This study examines the psychological and social determinants influencing SPM Mathematics achievement among secondary school students in Masjid Tanah, Melaka. Data were collected using a structured questionnaire from 591 respondents (444 SMK and 147 SMA students) and analyzed quantitatively through descriptive and Pearson correlation analyses using SPSS version 27. Four key variables: student interest, mathematics anxiety, motivation, and peer influence were measured to assess their relationships with mathematics proficiency. The results revealed that student interest ($r = 0.428$–0.642) and motivation ($r = 0.321$–0.412) showed moderate to strong positive correlations with mathematics achievement, whereas anxiety demonstrated a weak negative correlation ($r = -0.10$ to -0.14) and peer influence exhibited a weak but significant positive correlation ($r = 0.22$–0.25). Comparative findings indicated that SMA students displayed stronger positive relationships between interest and motivation with mathematics proficiency than SMK students, reflecting higher academic discipline and consistent study habits. These findings highlight that mathematics achievement at the SPM level is shaped not only by cognitive ability but also by affective and social dimensions of learning. Practically, the study suggests that student-centered, anxiety-reducing instructional strategies should be prioritized in classrooms to enhance motivation and mathematics engagement in line with Malaysia's education reform and SDG 4 (Quality Education).

Keywords: SPM Mathematics, student motivation, mathematics interest, mathematics anxiety, peer influence

INTRODUCTION

The performance of students in Mathematics, particularly among Sijil Pelajaran Malaysia (SPM) candidates, has long been a matter of concern in Malaysia's education system. Despite numerous educational reforms and pedagogical improvements, the subject continues to record a high rate of failure, signalling a systemic challenge that persists across schools nationwide. This phenomenon poses a serious threat to the country's long-term goal of producing a mathematically literate and scientifically skilled generation capable of meeting the demands of Industry 4.0 and Malaysia MADANI's vision for human capital excellence.

According to the Laporan Analisis Keputusan Peperiksaan SPM 2022 (Malaysian Examination Board, 2023), 24.3% of the 373,974 candidates failed Mathematics, while 29% obtained grades D and E. This indicates that more than half (54%) of all SPM candidates scored only between grades D to G in Mathematics. Although the overall performance showed a minor improvement of 1.2% from 2021 (where 25.5% of candidates failed), this marginal increase highlights that the underlying problem remains unresolved. The Mathematics subject recorded the second-highest failure rate, trailing only behind Additional Mathematics (26.2%).

The implications of this persistent low achievement extend beyond examination statistics. Poor performance in Mathematics not only limits access to tertiary education but also restricts employability, particularly in sectors that demand numerical reasoning, problem-solving, and analytical skills. Many professional fields including finance, accounting, data analysis, engineering, health sciences, and business require at least a pass or credit in Mathematics as a basic entry qualification. For instance, in Universiti Islam Melaka (UNIMEL), at least 15 academic programmes at the foundation, diploma, and bachelor's degree levels require students to achieve a pass or distinction in Mathematics as a prerequisite for admission. Consequently, students who fail Mathematics face restricted opportunities in both education and employment, particularly in a digital economy where computational literacy is increasingly critical (OECD, 2024).

From an employment perspective, the situation is equally worrying. Employers in Malaysia have reported growing concern regarding graduates' numeracy and problem-solving capabilities (TalentCorp, 2024). The World Economic Forum's Future of Jobs Report (2023) also highlights analytical thinking, reasoning, and quantitative analysis as top employability skills demanded in the 21st century workforce. Thus, persistent failure in Mathematics may produce a generation ill-prepared for data-driven industries, reducing Malaysia's competitiveness in global and regional markets.

While numerous studies have examined instructional or cognitive aspects of mathematics achievement, there remains a significant research gap in understanding how psychological (interest, motivation, anxiety) and social (peer influence) determinants collectively shape students' performance particularly at the SPM level. Previous research has often addressed these variables in isolation or focused on tertiary students (e.g., Shamsuddin et al., 2024; Rahim et al., 2024; Abd Karim et al., 2023; Woo et al., 2022), leaving a lack of comparative evidence between different school environments in Malaysia. This study addresses that gap by simultaneously examining these determinants among secondary students in two distinct school types: Sekolah Menengah Kebangsaan (SMK) and Sekolah Menengah Agama (SMA).

To bridge this gap, a mixed-method approach involving both questionnaires and interviews was employed. The quantitative survey identifies patterns and relationships among interest, motivation, anxiety, and peer influence, while qualitative interviews provide contextual understanding of students' learning behaviors and emotional experiences. This methodological integration enables a more holistic exploration of how psychological and social dynamics contribute to mathematics achievement.

Accordingly, the purpose of this study is to examine the relationships between student interest, mathematics anxiety, motivation, and peer influence with SPM Mathematics achievement, and to compare these relationships between SMK and SMA students in Masjid Tanah, Melaka. The comparative design allows for an understanding of how school environment, discipline culture, and peer dynamics may moderate the strength of these relationships.

The study aligns with Sustainable Development Goal (SDG) 4, which seeks to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (United Nations, 2024). It also supports Malaysia's Dasar Pendidikan Digital (DPD), aimed at developing a digitally literate, competitive generation by enhancing knowledge, skills, and values among students, educators, and education leaders. By integrating psychological and social determinants within an empirical comparative framework, this research contributes to existing literature on motivation (Ryan & Deci, 2020; Rahim et al., 2024), mathematics anxiety (Abd Karim et al., 2023; Khoo et al., 2024), student interest (Shamsuddin et al., 2024), and peer influence (Woo et al., 2022; Rahmawati & Suhartono, 2024), while offering practical implications for classroom practices and educational policy reform.

LITERATURE REVIEW

Mathematics achievement at the Sijil Pelajaran Malaysia (SPM) level has long been influenced by a complex interaction of psychological and social factors such as interest, motivation, anxiety, and peer influence. Understanding these variables is essential in addressing Malaysia's persistent mathematics underachievement and meeting the aspirations of Sustainable Development Goal 4 (Quality Education) and the Dasar Pendidikan Digital.

Students' Interest in Mathematics

Student interest represents enjoyment and engagement in mathematical learning, often shaped by teaching quality, relevance, and learning environment (Shamsuddin et al., 2024). Prior research shows that students with high interest demonstrate stronger persistence and cognitive engagement, leading to higher achievement (Razali et al., 2015; Wong & Wong, 2019). Innovative methods such as inquiry-based and technology-supported learning are found to sustain interest and improve performance (Mantihal & Maat, 2020). However, existing studies rarely explore how student interest varies between different school environments, such as Sekolah Menengah Kebangsaan (SMK) and Sekolah Menengah Agama (SMA), where learning culture and discipline differ significantly.

Mathematics Anxiety

Mathematics anxiety, feelings of fear or tension toward mathematical tasks negatively affects confidence and performance (Richardson & Suinn, 1972; Roslan et al., 2023). Studies confirm that high anxiety levels correlate with weaker achievement (Zakaria & Nordin, 2020; Abd Karim et al., 2023). Gender and cultural factors further influence anxiety responses (Saad et al., 2021). While various strategies such as gamification and cooperative learning reduce anxiety (Kurniawati et al., 2022), limited research compares anxiety's intensity and impact between school types with distinct academic climates like SMK and SMA.

Motivation in Learning Mathematics

Motivation drives persistence and achievement, both intrinsically and extrinsically (Ryan & Deci, 2020). In Malaysia, declining motivation among secondary students has been identified as a major concern (Halim et al., 2023). Research highlights that contextualized and student-centered pedagogies can enhance mathematical motivation (Rahim et al., 2024). However, it remains unclear whether motivational patterns differ between SMK and SMA students whose educational ethos and disciplinary expectations may influence their engagement levels.

Peer Influence

Peer influence is a critical social determinant that shapes students' attitudes and engagement (Abu & Eu, 2017). Positive peer learning environments enhance understanding, collaboration, and confidence (Gan & Hong, 2022; Woo et al., 2022). Cooperative and peer-assisted methods improve both cognitive and affective outcomes (Rahmawati & Suhartono, 2024). Nevertheless, empirical evidence comparing peer influence on mathematics learning between SMK and SMA students remains limited, despite differing peer group norms and support systems in both school settings.

Mathematics Achievement and Research Gap

Mathematics achievement reflects not only cognitive ability but also emotional and social readiness. Prior studies (e.g., Mantihal & Maat, 2020; Rahim et al., 2024) emphasize that motivation, interest, and anxiety collectively influence achievement. However, few have simultaneously examined these psychological and social determinants across different school types within the same region. Although prior studies explored these factors individually, few have compared their combined effects on mathematics achievement across SMK and SMA students in Masjid Tanah, Melaka.Therefore, this study fills that gap by conducting a comparative analysis of SMK and SMA students to determine how interest, motivation, anxiety, and peer influence interact to affect SPM Mathematics performance. The findings are expected to inform differentiated teaching strategies and school-based interventions that enhance mathematics engagement across diverse educational settings.

METHODOLOGY

Research Design

This study employed a quantitative correlational research design, which was deemed appropriate for examining the relationships between psychological and social determinants, student interest, mathematics anxiety,

motivation, peer influence and mathematics achievement without manipulating variables. Unlike experimental designs, which require controlled conditions, the correlational approach allows for natural observation of relationships in real classroom contexts. A mixed-method design was considered but not adopted, as the focus was on identifying statistical associations rather than exploring in-depth perceptions. This design is consistent with previous educational studies that investigated similar constructs using correlational frameworks (Creswell & Creswell, 2023).

Population and Sampling

The study population consisted of Form 4 and Form 5 students from six secondary schools in Masjid Tanah, Melaka, including both Sekolah Menengah Kebangsaan (SMK) and Sekolah Menengah Agama (SMA). A total of 591 students participated (444 from SMK and 147 from SMA), representing both genders. The inclusion criteria required that participants were current Form 4 or Form 5 students who had taken at least one internal mathematics examination during the 2024 academic year. Students with incomplete responses or without parental consent were excluded.

Table 1: Demographic Distribution of Respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
School Type	SMK	444	75.1
	SMA	147	24.9
Form Level	Form 4	247	41.8
	Form 5	344	58.2
Gender	Male	276	46.7
	Female	315	53.3

The convenience sampling method was employed due to accessibility and administrative approval from participating schools. Although non-probabilistic, this approach was suitable for educational research contexts with time and logistical constraints (Etikan & Bala, 2017).

Research Instrument

A structured questionnaire was used, comprising five main constructs:

Table 2: Cronbach Alpha for main constructs

Constructs	No. of item, n	Cronbach Alpha,
Students' Interest in Mathematics	11	0.886
Mathematics Anxiety	6	0.658
Motivation	6	0.865
Peer Influence	5	0.821
Mathematics Achievement	10	0.891

Each construct was measured using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The questionnaire was adapted from validated scales used in Shamsuddin et al. (2024), Rahim et al. (2024), and Abd Karim et al. (2023). Content validity was confirmed through expert review by three educational psychologists, ensuring that items aligned with the theoretical constructs. Cronbach's alpha values for four constructs exceeded 0.70, indicating satisfactory internal consistency (Nunnally & Bernstein, 1994). For Mathematics Anxiety

construct, Hair et al. (2019) state that Cronbach's alpha values between 0.60 and 0.70 indicate acceptable reliability for exploratory research, while values ≥0.70 are considered good for established scales.

Data Collection Procedure

Data collection was conducted over three weeks in October 2024, after receiving approval from the Alor Gajah District Education Office and formal permission from the participating schools. Questionnaires were distributed and collected by the school teachers during class sessions. All participants and their teachers were informed about the study's objectives, confidentiality, and voluntary participation. No personal identifiers were collected to maintain anonymity and ethical compliance.

Data Analysis

All data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics (mean, standard deviation, and frequency) were first computed to summarize respondents' demographic profiles and overall responses for each construct.

Inferential analyses were conducted in two stages to address the study objectives. In the first stage, Pearson's correlation analysis was employed to examine the direction and strength of the relationships between the four independent variables student interest, mathematics anxiety, motivation, and peer influence and Mathematics achievement. This analysis provided an overview of how each psychological and social determinant is associated with performance outcomes among students from both school types.

In the second stage, multiple linear regression analysis was applied to determine the combined and unique contributions of these predictors to Mathematics achievement. This approach allowed for identifying the most influential factors after controlling for overlaps among variables. Separate regression models were tested for Sekolah Menengah Kebangsaan (SMK) and Sekolah Menengah Agama (SMA) to compare the determinants across different school contexts.

Prior to analysis, assumptions of normality, linearity, multicollinearity, and homoscedasticity were examined through skewness-kurtosis statistics, scatterplots, and variance inflation factor (VIF) values. All assumptions were satisfied within acceptable thresholds. Significance levels were interpreted at $p < 0.05$ (significant) and $p < 0.01$ (highly significant).

The integration of both correlation and regression analyses enhanced the robustness of this study. Correlation results identified general trends and relationships among variables, while regression analysis provided deeper insights into which factors most strongly predict Mathematics achievement. Together, these techniques offered a comprehensive understanding of how psychological and social determinants interact to influence student performance.

Results And Findings

Comparison between SMK and SMA

Table 3. Summary Table for the Comparison of the Students' Interest in Mathematics between SMK and SMA.

School Type	Mean (M)	Standard Deviation	Interpretation	Remarks
SMK	3.5536	0.5747	Moderate level of interest	SMK students show a fair level of interest but slightly lower than SMA students.
SMA	3.7774	0.6280	High level of interest	SMA students demonstrate a higher interest in Mathematics compared to SMK students.

The findings indicate that SMA students (M = 3.7774) exhibit a higher level of interest in Mathematics compared to SMK students (M = 3.5536). Although both groups fall within the moderate-to-high range, the higher mean score for SMA suggests that students in SMA schools tend to be more engaged and motivated to learn Mathematics. The standard deviations (0.5747 for SMK and 0.6280 for SMA) show relatively consistent responses within both groups, implying that most students share similar attitudes toward the subject. This difference in mean values may be influenced by factors such as school environment, teaching strategies, or students' academic focus.

Table 4. Summary Table for the Comparison of the Mathematics Anxiety between SMK and SMA.

School Type	Mean (M)	Standard Deviation	Interpretation	Remarks
SMK	3.5364	0.6180	Moderate level of anxiety	SMK students show a slightly higher level of mathematics anxiety than SMA students.
SMA	3.4875	0.6258	Moderate level of anxiety	SMA students display slightly lower anxiety levels compared to SMK students.

The results show that both SMK (M = 3.5364) and SMA (M = 3.4875) students experience a moderate level of mathematics anxiety, with SMK students reporting a slightly higher mean score. This suggests that feelings of tension, worry, or nervousness related to Mathematics are relatively common among both groups but somewhat more pronounced in SMK students. The standard deviations (0.6180 for SMK and 0.6258 for SMA) indicate a similar level of variation in responses, meaning the anxiety levels are relatively consistent within each group. The slight difference in means may be due to differences in school curriculum difficulty, teaching methods, or students' confidence levels in handling mathematical tasks. Despite the small gap, both groups show that anxiety in Mathematics remains a moderate concern that may impact learning motivation and performance.

Table 5. Summary Table for the Comparison of the Motivation between SMK and SMA.

School Type	Mean (M)	Standard Deviation	Interpretation	Remarks
SMK	4.1363	0.6449	High level of motivation	SMK students show a strong motivation to learn Mathematics but slightly lower than SMA students.
SMA	4.4274	0.5856	High level of motivation	SMA students demonstrate a higher level of motivation in Mathematics compared to SMK students.

The data reveal that both SMK and SMA students possess a high level of motivation toward learning Mathematics. SMA students recorded a higher mean score (M = 4.4274) than SMK students (M = 4.1363), indicating stronger enthusiasm, effort, and persistence among SMA students in engaging with mathematical activities. The standard deviations (0.6449 for SMK and 0.5856 for SMA) suggest that responses are relatively consistent within each group, with SMA showing slightly less variability. The difference in motivation may stem from factors such as students' academic orientation, exposure to enrichment programs, or support from teachers and peers.

Table 6. Summary Table for the Comparison of the Peer Influence between SMK and SMA.

School Type	Mean (M)	Standard Deviation	Interpretation	Remarks
SMK	4.0802	0.6573	High level of peer influence	SMK students experience strong peer influence in relation to learning Mathematics.
SMA	4.3293	0.5870	High level of peer influence	SMA students show slightly higher peer influence compared to SMK students.

The results indicate that both SMK (M = 4.0802) and SMA (M = 4.3293) students experience a high level of peer influence toward learning Mathematics. However, SMA students recorded a slightly higher mean score, suggesting that peer relationships and encouragement play a more significant role in motivating SMA students' learning behavior. The standard deviations (0.6573 for SMK and 0.5870 for SMA) are relatively low, showing consistent responses within both groups. This implies that most students share similar perceptions regarding how their peers affect their interest and performance in Mathematics. The findings highlight the importance of peer dynamics in shaping students' attitudes toward Mathematics. Peers may provide emotional support, create competitive learning environments, or share academic resources that influence motivation and engagement.

Correlation Analysis

Table 7: Strength of Variable Relationships (Davis, 1971)

Correlation Coefficient, r	Description of strength
0.70 and above	Very strong
0.50 to 0.69	Strong
0.30 to 0.49	Moderate
0.10 to 0.29	Weak
0.01 to 0.09	Negligible

Sekolah Menengah Kebangsaan

Table 8: Strength of Variable Relationships with Mathematics Proficiency Level (Sekolah Menengah Kebangsaan)

Variables	Correlation Coefficient, r	Description of strength
Student interest	0.428	Moderate
Anxiety	- 0.100	Weak
Motivation	0.321	Moderate
Peer Influence	0.217	Weak

The table above illustrates the relationships between variables such as student interest, anxiety, motivation, peer influence, and mathematics proficiency. The findings show that all independent variables have moderate or weak relationships, as categorized by Davis' (1971) strength scale.

The results indicate a significant positive correlation between student interest and mathematics proficiency ($r = 0.428$, $p<0.01$). According to Davis (1971), this correlation is moderate, suggesting that higher student interest is associated with higher mathematics proficiency. This supports the first hypothesis that student interest has a significant positive relationship with mathematics proficiency.

A significant negative correlation was observed between anxiety and mathematics proficiency ($r = -0.100$, $p<0.05$). Based on Davis' scale, this is a weak relationship, indicating that higher anxiety levels are linked to lower mathematics proficiency. This finding supports the second hypothesis that anxiety negatively correlates with mathematics proficiency.

There is also a significant relationship between motivation and mathematics proficiency ($r=0.321$, $p<0.01$). The correlation, classified as moderate, indicates that higher motivation is associated with better mathematics proficiency. This finding supports the third hypothesis that motivation positively impacts mathematics proficiency.

Finally, the analysis shows a significant positive correlation between peer influence and mathematics proficiency ($r=0.217$, $p<0.01$). Although weak, this correlation suggests that higher peer influence is positively associated with improved mathematics proficiency. This supports the fourth hypothesis that peer influence significantly affects mathematics proficiency.

Sekolah Menengah Agama

Table 9: Strength of Variable Relationships with Mathematics Proficiency Level (Sekolah Menengah Agama)

Variables	Correlation Coefficient, r	Description of strength
Student interest	0.642	Strong
Anxiety	-0.143	Weak
Motivation	0.412	Moderate
Peer Influence	0.248	Weak

The findings show a significant positive correlation between student interest and mathematics proficiency ($r=0.642$, $p<0.01$). According to Davis' scale, this is a strong correlation, indicating that higher student interest results in better mathematics proficiency. This supports the first hypothesis that student interest positively impacts mathematics proficiency. A weak negative correlation between anxiety and mathematics proficiency was found ($r=-0.143$, $p=0.085>0.05$). This result does not support the second hypothesis, as the relationship is not statistically significant.

A significant positive correlation exists between motivation and mathematics proficiency ($r=0.412$, $p<0.01$). The correlation is moderate, suggesting that higher motivation is associated with better mathematics performance. This finding supports the third hypothesis that motivation positively impacts mathematics proficiency.Lastly, peer influence has a significant positive correlation with mathematics proficiency ($r=0.248$, $p<0.01$). Although weak, the correlation indicates that stronger peer influence is linked to improved mathematics performance. This finding supports the fourth hypothesis regarding peer influence.

Regression Analysis

Sekolah Menengah Kebangsaan

Table 10: Results from Regression Analysis (Sekolah Menengah Kebangsaan)

Dependent Variable	Independent Variables	β	BETA	t	Sig.
	Constants	1.883		7.888	<0.001

Mathematics Achievement (Y)	Student interest (X^1)	0.355	0.340	6.361	<0.001
	Anxiety (X^2)	-0.086	-0.089	-1.975	0.049
	Motivation (X^3)	0.106	0.114	1.892	0.059
	Peer Influence (X^4)	0.034	0.037	0.673	0.501
R^2	0.199				
F	27.294				
Sig F	<0.001				

Table 10 presents the regression results examining the combined influence of psychological and social determinants—student interest, mathematics anxiety, motivation, and peer influence—on Mathematics achievement among SMK students. The model produced an R^2 value of 0.199, indicating that approximately 19.9% of the variance in Mathematics achievement is explained by these four predictors. Although the overall model was significant (F = 27.294, p < 0.001), the relatively lower R^2 compared to SMA suggests that the psychological and social factors examined exert a weaker overall influence among SMK students.

Among the predictors, student interest (β = 0.355, t = 6.361, p < 0.001) emerged as the strongest and most significant positive predictor of Mathematics achievement, confirming that higher levels of interest are associated with improved performance. In contrast, mathematics anxiety (β = –0.086, t = –1.975, p = 0.049) demonstrated a significant negative effect, indicating that higher anxiety levels slightly reduce achievement outcomes. Motivation (β = 0.106, p = 0.059) and peer influence (β = 0.034, p = 0.501) were not statistically significant, suggesting their effects are minimal once interest and anxiety are considered.

These findings highlight that for SMK students, interest and anxiety represent the primary psychological determinants influencing Mathematics performance, whereas motivation and peer dynamics play secondary or indirect roles. The negative effect of anxiety supports previous research (Abd Karim et al., 2023; Zakaria & Nordin, 2020), which found that students with higher anxiety levels tend to underperform in Mathematics due to fear and avoidance behaviors. Meanwhile, the strong influence of interest aligns with Shamsuddin et al. (2024) and Rahim et al. (2024), who identified engagement and curiosity as key drivers of academic success.

Overall, the regression results for SMK suggest that interventions aimed at reducing anxiety and fostering interest may yield the greatest improvement in Mathematics performance. Teachers in SMK should incorporate student-centered and anxiety-reducing strategies—such as cooperative learning, gamified exercises, and real-life problem contexts—to enhance engagement and confidence, thereby mitigating the emotional barriers that limit achievement.

Sekolah Menengah Agama

Table 11: Results from Regression Analysis (Sekolah Menengah Agama)

Dependent Variable	Independent Variables	β	BETA	t	Sig.
Mathematics Achievement (Y)	Constants	1.313		3.249	0.001
	Student interest (X^1)	0.609	0.616	7.227	<0.001
	Anxiety (X^2)	-0.062	-0.062	-0.934	0.352

	Motivation (X^3)	0.040	0.038	0.428	0.669
	Peer Influence (X^4)	-0.015	-0.014	-0.186	0.852
R^2	0.416				
F	25.3040				
Sig F	<0.001				

Table 11 presents the regression results examining the combined influence of psychological and social determinants in student interest, mathematics anxiety, motivation, and peer influence on Mathematics achievement among SMK students. The model yielded an R² value of 0.416, indicating that approximately 41.6% of the variance in Mathematics achievement can be explained by these four predictors. The overall model was significant (F = 25.304, p < 0.001), suggesting that the set of independent variables collectively contributes meaningfully to the prediction of Mathematics performance.

Among the predictors, student interest (β = 0.616, t = 7.227, p < 0.001) emerged as the only significant positive predictor, demonstrating a strong influence on Mathematics achievement. This finding implies that as students' interest in Mathematics increases, their achievement levels also rise substantially. In contrast, anxiety (β = –0.062, p = 0.352), motivation (β = 0.038, p = 0.669), and peer influence (β = –0.014, p = 0.852) were not significant predictors within the SMA context, suggesting that these variables do not uniquely contribute to the model once student interest is considered.

These results highlight that, for SMA students, interest plays a dominant role in determining Mathematics achievement, while other psychological and social factors exert weaker or non-significant effects. The weaker influence of motivation and peer factors may reflect inconsistencies in classroom engagement and peer learning culture within SMA settings. The non-significant effect of anxiety, though negative in direction, suggests that while students may experience mild worry, it does not critically undermine performance compared to lack of interest.

This pattern aligns with findings from Shamsuddin et al. (2024) and Rahim et al. (2024), which emphasize that student interest is a fundamental driver of persistence and cognitive engagement in Mathematics. It also supports the interpretation from Mantihal and Maat (2020) that effective instructional strategies fostering curiosity and relevance can significantly enhance performance. Overall, the regression results reinforce the need for SMA schools to prioritize instructional approaches that spark and sustain interest in Mathematics through contextualized learning, digital tools, and engaging classroom practices rather than focusing solely on rote or exam-driven preparation.

Comparative Analysis of Correlation and Regression Results between Sekolah Menengah Kebangsaan (SMK) and Sekolah Menengah Agama (SMA)

The comparative results from both correlation and regression analyses provide a deeper understanding of how psychological and social determinants student interest, mathematics anxiety, motivation, and peer influence affect Mathematics achievement across two school types.

Correlation Analysis

The correlational findings revealed distinct patterns between SMK and SMA students. Among SMA students, student interest (r = 0.642) and motivation (r = 0.412) demonstrated strong and moderate positive relationships with Mathematics achievement, while anxiety (r = –0.143) showed a weak and non-significant negative correlation, and peer influence (r = 0.248) had a weak but positive association. In contrast, SMK students showed weaker relationships overall: interest (r = 0.428) and motivation (r = 0.321) were moderate, anxiety (r = –0.100) was weak but significant, and peer influence (r = 0.217) was weak and positive. These findings indicate that

while interest and motivation positively influence Mathematics achievement across both groups, the strength of these associations is notably higher among SMA students. Conversely, anxiety exerts a stronger negative effect among SMK students, reflecting differing emotional and learning environments.

Regression Analysis

Regression results further clarify which factors most significantly predict Mathematics achievement when all variables are considered simultaneously. For SMA students, the model accounted for 41.6% of the variance (R^2 = 0.416, F = 25.304, p < 0.001), indicating strong explanatory power. Within this model, student interest (β = 0.616, p < 0.001) emerged as the sole significant predictor, while anxiety, motivation, and peer influence were not significant. This highlights that SMA students' Mathematics performance is predominantly driven by intrinsic factors such as engagement and enjoyment of the subject, consistent with Mantihal and Maat (2020) and Shamsuddin et al. (2024), who found that high-interest learners exhibit greater persistence and comprehension in Mathematics.

For SMK students, the model explained a smaller proportion of variance 19.9% (R^2 = 0.199, F = 27.294, p < 0.001) suggesting that psychological and social determinants play a comparatively weaker role. Nonetheless, student interest (β = 0.355, p < 0.001) remained the strongest positive predictor, while mathematics anxiety (β = –0.086, p = 0.049) emerged as a significant negative predictor. Motivation and peer influence did not contribute significantly once interest and anxiety were controlled. This indicates that SMK students' achievement is shaped mainly by their enthusiasm for Mathematics and their ability to manage anxiety levels. High anxiety may lead to avoidance behaviors and reduced confidence, as reported by Abd Karim et al. (2023) and Zakaria & Nordin (2020).

When both school types are compared, clear contrasts emerge. SMA students display stronger positive correlations and greater explained variance in regression analysis, suggesting that interest and motivation are more deeply internalized and reinforced within SMA learning environments possibly due to structured discipline, smaller class sizes, and consistent teacher engagement. In contrast, SMK students exhibit weaker motivational and interest-driven relationships, alongside the presence of anxiety as a significant negative factor, implying that emotional barriers are more pronounced in mainstream public-school settings.

Overall, the integrated analysis underscores that student interest consistently emerges as the most powerful determinant of Mathematics achievement in both contexts, while anxiety serves as a critical inhibitory factor among SMK students. Motivation and peer influence play secondary roles that may become more effective when mediated through interest-driven engagement. These findings emphasize the need for differentiated pedagogical interventions SMA schools may continue leveraging interest-based approaches to sustain high engagement, whereas SMK schools should prioritize strategies that reduce anxiety and foster intrinsic interest to close the performance gap between school types.

CONCLUSIONS AND RECOMMENDATIONS

This study aimed to examine the psychological and social determinants student interest, mathematics anxiety, motivation, and peer influence affecting Mathematics achievement among secondary school students in Masjid Tanah, Melaka, and to compare these effects between Sekolah Menengah Kebangsaan (SMK) and Sekolah Menengah Agama (SMA). The findings revealed that student interest consistently emerged as the most significant determinant of Mathematics achievement across both school types, while mathematics anxiety exerted a negative influence, particularly among SMK students. Motivation and peer influence were found to have weaker and statistically insignificant effects when controlling for other variables.

Overall, the results underscore the critical importance of interest as a motivational driver and the detrimental impact of anxiety on academic performance. The comparative findings between SMK and SMA provide new insights into how contextual factors such as school culture, instructional practices, and emotional climate shape students' cognitive and affective engagement with Mathematics. Theoretically, the study contributes to the growing body of literature linking affective-motivational constructs with academic achievement, extending prior research by demonstrating how these relationships differ across distinct school settings.

From a practical and policy standpoint, the results suggest that Mathematics instruction should go beyond content mastery to address emotional and motivational dimensions. Teachers are encouraged to integrate interest-based and anxiety reduction strategies, such as active learning, gamified assessments, and real-world problem applications. Schools, particularly SMK, should cultivate a supportive and low stress learning environment that encourages persistence and confidence. At the policy level, the Ministry of Education may consider incorporating psychological skills development modules such as stress management and learning motivation into the national Mathematics curriculum to improve overall engagement and achievement.

Despite its valuable findings, the study acknowledges several limitations. The use of convenience sampling and a regionally limited sample from Masjid Tanah may constrain generalizability to broader populations. Additionally, the reliance on self-reported data may introduce bias due to students' perceptions rather than objective performance indicators. Future research should involve larger, more diverse samples across different states and adopt mixed method or longitudinal designs to explore causal relationships and contextual variations more comprehensively.

In conclusion, this study contributes to both educational theory and practice by highlighting that Mathematics achievement is not solely determined by cognitive ability but also by students' emotional and motivational readiness. By fostering interest and reducing anxiety, schools can create more equitable and engaging learning experiences that ultimately enhance students' confidence and performance in Mathematics.

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Conflict Of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

Data Availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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