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Examining Malaysian Schoolchildren's Academic Motivation Before and During COVID-19: A Multivariate Regression Approach

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Abstract

This study examines the effects of gender, household income, and school type on Malaysian schoolchildren's academic motivation before and during the COVID-19 pandemic. Using multivariate regression analysis on survey data from 1,014 students, the research identifies how traditional sociodemographic predictors functioned differently across two contrasting educational contexts: face-to-face learning and emergency remote instruction. Results indicate that gender was a significant predictor before the pandemic, with male students reporting higher motivation. This outcome contradicts the prevailing literature and may reflect contextual classroom dynamics. However, gender lost statistical significance during the pandemic, suggesting that remote learning environments may flatten motivational disparities by removing gendered classroom norms. While household income was not a significant factor pre-pandemic, it gained significance during lockdown, likely due to the increased importance of digital access and conducive home environments in sustaining engagement. School type showed no significant influence in either period, implying that pandemic-related challenges equalized educational experiences across public and private institutions. These findings underscore the limitations of relying solely on structural indicators to predict academic motivation, particularly in times of crisis. Instead, they highlight the need to consider psychosocial, environmental, and technological variables that better capture the multifaceted nature of student engagement. The study concludes by calling for more holistic educational strategies that address resilience, equity, and digital inclusivity in the post-pandemic era.

Keywords: COVID-19, Child Motivation, Malaysia, Educational Equity, Remote Learning, Multivariate Regression.

Introduction

Beginning in late 2019, the COVID-19 epidemic severely disrupted educational systems around the world. Over 3.4 million deaths and more than 165 million illnesses had been reported globally by the beginning of 2021 (Mustafa, 2021). The epidemic impacted the education of almost 1.6 billion students in 190 nations, according to the United Nations (2020). Following the January 25, 2020, report of the first COVID-19 case in Malaysia, a nationwide Movement Control Order (MCO) was put into effect on March 18, 2020. Daily life, family income, child growth, and education were all severely impacted by these limitations.

The quick shift to remote learning around the world exposed and widened already-existing educational disparities. Online involvement was hindered by government schools' greater class numbers, inadequate infrastructure, and less teacher-student interaction, especially for primary

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pupils (Ullah et al., 2022). Despite frequently having greater digital readiness, private institutions faced financial difficulty and decreased enrollment (Morag, 2022). These changes also affected access to academic resources like meals and study materials, mental health, and learning gaps (Easterbrook et al., 2022).

The ways in which these modifications affected student motivation are explained by theoretical frameworks. According to Self-Determination Theory (SDT), autonomy, competence, and relatedness are crucial for maintaining motivation. The impersonal character of online learning significantly disrupted these elements. In a similar vein, Expectancy-Value Theory (EVT) asserts that views about students' abilities and the importance of the task. These aspects are impacted by digital access, family participation, and school assistance during lockdowns, which shape their accomplishment behavior. From a systems perspective, Bronfenbrenner's Ecological Systems Theory emphasizes how individual and family-level influences interact with the larger socioeconomic and policy settings to influence educational results (Sun et al., 2022).

One important aspect of motivational inequality that has surfaced is gender. According to research, although girls tend to be more intrinsically motivated and more engaged in online learning environments (Korlat et al., 2021), the pandemic also made them more susceptible to stress, anxiety, and academic pressure, especially in patriarchal settings where they bear a disproportionate amount of the caregiving responsibilities (Cassaretto et al., 2024). On the other hand, externalizing behaviors, low motivation, and poor adjustment to the unstructured character of home-based learning were more common among boys (Yu, 2021; Ishimoto et al., 2022).

Additionally, children from lower socioeconomic backgrounds were disproportionately affected by the pandemic. Learning motivation and performance were weakened by income-related digital gaps, such as a lack of gadgets, inadequate internet, and a lack of parental assistance (Nazirul et al., 2022). Increased stress, food poverty, and challenges in facilitating children's distance learning were noted by families in Malaysia's B40 income level (Andrade et al., 2022). Similar trends were observed globally, with low-income students exhibiting higher levels of psychological stress and learning loss (Cobb et al., 2024). Furthermore, during lockdowns, children's mental and physical health declined (Shukri et al., 2024). Sedentary behavior and mental health problems rose as a result of decreased outdoor activities, social isolation, and excessive screen time (Dallolio et al., 2022; Gregorio, 2024). Boys exhibited greater externalizing behaviors like restlessness and anger, whereas girls reported internalizing symptoms like worry (Ishimoto et al., 2022).

The purpose of this study is to use multivariate regression analysis to examine the motivated levels of Malaysian school children both before and during the COVID-19 pandemic. It aims to assess how structural and socioemotional elements interacted to affect student motivation during times of crisis by looking at predictors including gender, family income, and school type. This study contextualizes the changing motivational landscape in the face of global educational disruption through the lenses of SDT, EVT, and ecological systems theory.

Measures/instrument

A snowball sampling technique was used in the study to recruit families of students enrolled in public and private schools in Malaysia's Klang Valley. The number of participants was 1,014 in total. Between October 2022 and February 2023, data was gathered using an anonymous online survey that was spread via links and emails. The dependent variable in this study was students' motivational level, as measured by responses to a self-report questionnaire. Motivation was

assessed through a series of items rated on a 5-point Likert scale (1 = Significantly below, 2 = Slightly below, 3 = Very similar, 4 = Better than, and 5 = Much better), designed to capture intrinsic and extrinsic motivational constructs.

Multivariate regression analyses were conducted separately for pre-pandemic and pandemic periods to determine whether sociodemographic variables (gender, annual household income, and school type) significantly predicted children's motivational levels.

The study instrument comprised a structured questionnaire divided into sections covering the following areas:

1. Sociodemographic characteristics: This section gathered information on participants' age, gender, family income, and school type (public or private).
2. Child's motivational levels: Participants assessed their children's motivation levels both before and during the COVID-19 pandemic.

The data analysis focused on testing six hypotheses using multivariate regression analysis. These hypotheses were:

- H1: There is a statistically significant difference between a child's gender and the child's level of motivation before the pandemic.
- H2: There is a statistically significant difference between family income and the child's level of motivation before the pandemic.
- H3: There is a statistically significant difference between school type and the child's level of motivation before the pandemic.
- H4: There is a statistically significant difference between a child's gender and the child's level of motivation during the outbreak.
- H5: There is a statistically significant difference between family income and the child's level of motivation during the outbreak.
- H6: There is a statistically significant difference between school type and the child's level of motivation during the outbreak.

Results and Discussions

Motivational level of school students before Covid-19

The predictive impact of gender, household wealth, and school type on children's academic motivation level before the COVID-19 outbreak was investigated using a multiple linear regression analysis. Together, the three predictors account for a sizable amount of the variance in children's academic motivation prior to the pandemic, according to the statistically significant overall regression model ($F(3, 1010) = 2.853, p = 0.040$). The model accounted for approximately 0.84% of the total variance in motivational level, as indicated by the regression sum of squares (10.721 out of a total of 1275.709). Though modest, this suggests certain demographic factors have meaningful, if limited, explanatory power.

Gender was a statistically significant predictor ($p = 0.043$), indicating that male students reported significantly higher motivational levels compared to female students before the pandemic. This counterintuitive finding may reflect contextual biases, classroom dynamics, or differential maturity rates tied to neurological and developmental differences during adolescence. Studies

show that executive function and brain maturation differ by sex, with females typically maturing earlier, which could affect how motivation is self-perceived or externally influenced (Yáñez et al., 2023).

Household income and school type were not statistically significant predictors ($p > 0.05$), suggesting that these structural factors may have limited influence on motivational outcomes in the pre-pandemic context. This could be attributed to socioeconomic homogeneity in the sample i.e., the government-employed households. Multicollinearity diagnostics showed acceptable tolerance and VIF values ($VIF < 1.02$), confirming that the predictors were not highly correlated.

However, gender emerged as a statistically significant individual predictor. Specifically, the regression coefficient for gender (coded as 0 = male, 1 = female) was $\beta = -0.152$, $p = 0.043$. This negative coefficient indicates that female students reported lower motivational scores than male students, contradicting much of the existing literature, which often reports higher intrinsic motivation among girls (Korlat et al., 2021). This anomaly may be due to contextual classroom dynamics or cultural reporting biases, and warrants further qualitative investigation.

In contrast, household income ($\beta = 0.007$, $p = 0.729$) and school type ($\beta = -0.222$, $p = 0.065$) did not significantly predict motivational levels. The model also showed no signs of problematic multicollinearity, with Tolerance values above 0.7 and VIFs below 2 across all predictors.

ANOVA ^a							
Model		Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	10.721	3	3.574	2.853	0.04 ^b	
	Residual	1264.988	1010	0.000	0.000		
	Total	1275.709	1013	0.000	0.000		

a. Dependent Variable: Child's Motivation Achievement BEFORE Covid-19.
b. Predictors: (Constant), Children's gender, School type, Annual household income

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.810	0.147	0.000	19.137	0.000		
	Annual household income	-0.04	0.017	-0.008	0.243	0.808	0.996	1.004
	Children gender	-0.152	0.075	-0.064	-2.028	0.043	0.989	1.011
	School type	-0.222	0.120	-0.059	-1.850	0.065	0.981	1.020

a. Dependent Variable: Child's Motivation Achievement BEFORE Covid-19.

Based on the above table, the motivational level of school children before pandemic is given by the equation:

$$\text{MotivationPre-COVID} = 2.810 - 0.152 \times \text{Gender} - 0.040 \times \text{Income} - 0.222 \times \text{SchoolType} + c$$

The regression model estimating academic motivation before COVID-19 revealed an intercept

of 2.810, representing the baseline motivation level for a male student attending a government school with zero household income. Gender was a statistically significant predictor ($\beta = -0.152$, $p = 0.043$), indicating that female students were predicted to have lower motivation scores by 0.152 units. Although this contradicts common literature that often finds higher intrinsic motivation among girls, the result may reflect specific contextual factors or reporting differences. Household income ($\beta = -0.040$, $p = 0.808$) had a non-significant and slightly negative effect, potentially due to the relative income uniformity within the sample before the pandemic. School type ($\beta = -0.222$, $p = 0.065$) also had a non-significant effect, with private school students exhibiting marginally lower motivation than their public-school counterparts. The overall model was statistically significant, $F(3, 1010) = 2.853$, $p = 0.040$, suggesting it explained a small but meaningful portion of the variance in academic motivation in the pre-pandemic context. These findings imply that conventional demographic factors had minimal explanatory value in predicting student motivation during this period.

Motivational Level of School Students During Covid-19

A separate multiple regression analysis was conducted to assess whether gender, household income, and school type predicted children's academic motivation during the COVID-19 pandemic. The overall model was statistically significant: $F(3, 1010) = 2.371$, $p = 0.018$, indicating that the combined predictors had a meaningful association with children's motivational outcomes during the pandemic. The model explained a small portion of the variance, with a regression sum of squares of 7.642 out of a total of 1092.935, indicating that structural sociodemographic variables only partially account for differences in motivational levels during the lockdown period.

Household income was a statistically significant predictor ($p = 0.036$), suggesting that students from higher-income households tended to report higher levels of motivation during the pandemic. This is consistent with literature indicating that digital access, learning resources, and parental support often correlated with income played a vital role during remote education periods (Ewaz, 2023; Easterbrook et al., 2022).

Gender and school type were not significant predictors ($p > 0.05$), implying that their effects on motivation diminished during remote learning. This aligns with the hypothesis that pandemic-era learning flattened traditional differences due to shared environmental constraints such as limited peer interaction, lack of structured routines, and digital learning challenges (Gregorio, 2024). Collinearity diagnostics (VIFs < 1.01) confirmed that multicollinearity was not a concern.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.642	3	2.547	2.371	0.018 ^b
	Residual	1085.293	1010	1.075		0.000
	Total	1092.935	1013	0.000		0.000
a. Dependent Variable: Child's motivation achievement during COVID-19						
b. Predictors: (Constant), Children gender, School type, Annual household income						
Coefficients^a						

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.500	0.136		25.731	0.000		
	Annual household income	0.033	0.016	0.066	2.094	0.036	0.996	1.004
	Children gender	-0.106	0.069	-0.048	1.536	0.125	0.998	1.002
	School type	-0.067	0.110	-0.019	0.606	0.544	0.995	1.005
a. Dependent Variable: Child's motivation achievement during COVID-19								

Model 2: Regression Equation During COVID-19

The regression equation during Covid-19 is given by

$$\text{MotivationDuring-COVID} = 3.500 + 0.033 \times \text{Income} - 0.106 \times \text{Gender} - 0.067 \times \text{SchoolType} + \epsilon$$

The intercept value of 3.500 represents the baseline level of academic motivation for a male student enrolled in a public school with zero household income.

- Household Income ($\beta = 0.033$, $p = 0.036$): This variable demonstrated a statistically significant positive effect on academic motivation. Specifically, for each unit increase in household income, there was an associated 0.033 increase in motivation. This finding suggests that socioeconomic disparities may have intensified during remote learning, as students from higher-income households exhibited greater motivation.
- Gender ($\beta = -0.106$, $p = 0.125$): The effect of gender was not statistically significant during the pandemic period. This result indicates a flattening of motivational differences between male and female students, possibly due to the absence of structured, gendered social contexts in online learning environments.
- School Type ($\beta = -0.067$, $p = 0.544$): Consistent with pre-pandemic results, school type remained a non-significant predictor of academic motivation. This suggests that remote learning conditions may have neutralized traditional advantages typically associated with school type, such as resource availability or institutional reputation.

The overall model was statistically significant, $F(3, 1010) = 2.371$, $p = 0.018$, indicating that the predictors explained a small but meaningful portion of the variance in academic motivation during the pandemic. The primary driver of this variance was household income.

Discussions

The results of this study demonstrate the inconsistent significance of conventional predictors on children's academic motivation during pre-pandemic and pandemic periods, including gender, household income, and school type. The study's use of snowball sampling and reliance on online distribution may have biased the sample toward digitally literate, middle-income families, particularly those with stable government employment. This potentially limits the generalizability of findings to the wider Malaysian school population, especially B40 households and rural communities. Moreover, the cross-sectional design prohibits causal inference, and the binary gender categorization does not account for more complex gender identities or roles that

may influence motivation.

Gender Effects

Gender became a statistically significant factor prior to the commencement of COVID-19 ($p = .043$), with male students showing higher levels of motivation. This finding contradicts a great deal of research that repeatedly demonstrates that girls are more likely to exhibit intrinsic motivation and engagement, particularly in digital learning environments (Korlat et al., 2021; Cassaretto et al., 2024). Cultural or contextual variations in classroom dynamics or the likely impact of self-reporting bias could be one reason for this paradox. During remote learning, gender lost its statistical significance ($p = 0.125$), suggesting a flattening of motivational disparities possibly due to the removal of structured social contexts where gendered participation norms prevail (Goudeau et al., 2021).

Neurodevelopmental factors may also offer a complementary explanation. Research by Lunetti et al. (2022) highlights that female typically reach neurocognitive maturity earlier than males, particularly in areas related to executive functioning and self-regulation. These developmental differences, shaped by the timing of puberty and associated brain maturation, could influence learning behaviors, goal-setting, and classroom engagement. Girls in the sample may have already reached a maturity stage that emphasized academic discipline and routine, but may have been less engaged or challenged by conventional learning formats, particularly in physical classrooms that lack personalization. Additionally, girls reported stronger motivation and home-learning engagement during lockdown, while boys faced challenges adapting (Easterbrook et al., 2023).

Household Income Effects

Pre-pandemic, household income was not a statistically significant predictor ($p = 0.808$), likely due to sample homogeneity dominated by government-employed families who faced fewer economic instabilities. During COVID-19, however, income emerged as a significant predictor ($p = 0.036$), suggesting that access to digital infrastructure and conducive home environments factors often tied to income amplified disparities in motivation (Michikyan et al., 2025; Van de Werfhorst et al., 2022; Schulz & Robinson, 2022).

School Type Effects

School type (public vs. private) was not a statistically significant predictor in either period ($p > 0.05$). The shift to remote learning appeared to homogenize educational experiences across school types. Both public and private school students encountered similar challenges, including reduced peer interaction, increased distractions at home, and uneven access to digital infrastructure. These shared challenges likely neutralized previously existing school-type advantages (Kennedy et al., 2022; Müller et al., 2023).

These findings underscore the inadequacy of relying solely on structural predictors such as income and school type to understand academic motivation during crises. More immediate and context-specific factors, such as emotional well-being, mental health stressors, and resilience, appear to have a more substantial influence. As shown by Gregorio (2024) and Abdolrezapour et al. (2023), students' motivational outcomes in online learning environments are increasingly shaped by self-efficacy, resilience, and coping mechanisms developed during adversity.

The gender-based differences observed before the pandemic, in which male students reported higher motivation, might reflect broader societal expectations or instructional styles that

unintentionally favored male participation in traditional classroom settings. At the same time, these differences diminished during remote instruction, reinforcing the hypothesis that contextual variables played a dominant role during the pandemic.

Notably, the overall explanatory power of the multivariate model was limited, indicating that many important variables affecting motivation and achievement such as digital literacy, teacher support, learning self-regulation, and psychological resilience were not captured. While gender and household income reached statistical significance at different time points, the low effect sizes and R^2 values suggest that other, unmeasured factors likely play a much larger role in shaping academic motivation. Emotional resilience, access to meaningful teacher-student interaction, and digital literacy are among the variables future models should consider. In line with Cromley and Kunze (2021), we argue that emotional regulation and adaptive motivation may outweigh structural predictors in disruptive educational environments.

Lastly, although not directly measured in this study, emerging research suggests that children demonstrated adaptability and resilience during remote learning, often mediated by social support, emotional self-efficacy, and parental involvement (Yang & Wang, 2022; Uygur et al., 2023). Future investigations should explore these mediating variables more explicitly to understand how different demographic groups navigated the educational challenges of the pandemic.

Conclusions

This study provides a nuanced understanding of how traditional predictors i.e. gender, household income, and school type interact with children's academic motivation during pre-pandemic and pandemic contexts in Malaysia. The findings suggest that these structural variables do not offer consistent predictive power across different educational environments. Before the COVID-19 pandemic, gender emerged as a significant predictor, with male students reporting higher motivation. This contrasts with much of the international literature but may reflect gendered classroom dynamics and self-report biases within Malaysia's traditionally structured learning environments. During the pandemic, gender lost statistical significance, indicating that remote learning conditions may have neutralized prior social and pedagogical gender disparities.

Household income was not a significant factor before the pandemic, likely due to the financial stability of government-employed households in the sample. However, it became a significant predictor during remote learning, highlighting how income-related disparities in digital access and home learning conditions exacerbated motivational gaps. This finding underscores the increasing salience of digital equity in sustaining educational engagement under crisis conditions. School type (public vs. private) did not significantly influence motivation in either period, suggesting a convergence in educational experience during remote learning. Both school sectors were equally impacted by infrastructural challenges, limited peer interaction, and instructional constraints.

Taken together, these results suggest that structural variables alone are insufficient to explain variations in student motivation, especially during disruptive events. More immediate, context-sensitive variables such as emotional well-being, digital engagement quality, psychological resilience, and parental involvement appear to be more relevant indicators of academic motivation. This points to the need for future research and policy to incorporate holistic, student-centered models that reflect the complex interplay of personal, familial, and systemic influences in times of educational upheaval.

Educational planners and policymakers in Malaysia must consider targeted interventions that address not only access to technology but also the socio-emotional and psychological support required to maintain student engagement. Moreover, as digital learning environments become more embedded in the future of education, narrowing the digital divide and enhancing motivational resilience will be essential to ensuring equity in learning outcomes across diverse student populations.

Recommendations to Improve the Study

The study has several limitations, including a sample predominantly comprising government staff families, which may not reflect the broader population's financial challenges during the pandemic. The reliance on self-reported data introduces potential biases, and the focus on limited variables like gender, income, and school type overlooks other influential factors such as parental involvement and quality of digital learning environments. Additionally, the cross-sectional design limits causal inferences, and the income distribution categories may not adequately capture financial impacts across different groups. Furthermore, the study's geographical scope is restricted to Klang Valley, Malaysia, potentially limiting the generalizability of findings to other regions or contexts.

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