

The Influence of School Travel Conditions on Academic Achievement and Well-Being of Schoolchildren: A Multi-Method Approach

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Abstract: This study examines the impact of school travel conditions on academic performance and psychosocial well-being among public school students in Region I, Philippines. A multi-method quantitative methodology was utilized to gather data from 1,110 students in Grade 6 and Grade 10 using structured, face-to-face surveys that assessed sociodemographic profiles, school travel characteristics, transportation satisfaction, psychosocial well-being, and academic achievement. The analyses encompassed exploratory data analysis, multiple linear regression, and structural equation modelling (SEM). Findings revealed that sociodemographic factors, transportation duration, distance, road accessibility, and transportation satisfaction substantially influenced students' well-being and academic achievement. Psychosocial well-being significantly served as a mediator connecting transportation satisfaction to academic achievement. The SEM indicated that enhancing school transportation satisfaction positively affects well-being, which in turn improves academic achievement. These findings highlight the significance of including transportation service quality and infrastructure improvements into educational policy, particularly regarding psychosocial effects for students in marginalized and remote communities.

Keywords: School Transportation Satisfaction, Psychosocial Well-Being, Academic Achievement, Travel Characteristics, Structural Equation Modeling

1. INTRODUCTION

1.1. Research Background

School transportation profoundly influences children's well-being and academic achievement. Prolonged travel durations have an adverse impact on psychological well-being and academic performance, particularly affecting students in both urban and rural settings (Ding & Feng, 2022). Access to better-quality schools can be made possible by school bus service, notwithstanding its inconsistent performance (Hopson et al., 2022). Active travel modalities, such as walking and cycling, can enhance well-being, particularly in metropolitan areas (Ding & Feng, 2022; Waygood et al., 2017). According to Ikeda et al. (2018), the physical environment is very important, and active school travel is favorably correlated with elements including safety, walkability, and neighborhood social interactions. In contrast, extended travel distances and vehicle ownership negatively impact active transportation.

According to Hopson et al. (2022), school transportation has a major effect on academic performance, especially for children from rural and low-income communities. Furthermore, extended trip durations and transportation difficulties correlate with negative academic outcomes, unless they facilitate access to superior educational institutions. In Brazil, children from rural areas frequently endure long commutes as a result of school centralization initiatives, which may threaten their social inclusion (Carvalho et al., 2016). A mobility justice

paradigm indicates that school transportation challenges mirror wider socioeconomic disparities, requiring fair resource allocation and stakeholder involvement in policy formulation (Lenhoff et al., 2022). In the Philippines, enhanced transport connections via the Roll-on/Roll-off policy resulted in higher school attendance across all educational levels and a decline in child employment, especially among males (Francisco & Tanaka, 2019). These findings highlight the essential importance of transportation in facilitating educational access and outcomes, particularly for marginalized populations.

International studies have consistently highlighted the impact of school travel variables, including travel duration, safety perceptions, and travel satisfaction, on students' health and academic achievement. The test results of American children who are dropped off by private vehicles, and to a lesser degree, walk to school, outperform those of children who take the bus (Yeung & Nguyen-Hoang, 2017). In Spain, physical commuting to school correlates with reduced stress levels and enhanced health outcomes among schoolchildren (Chillón et al., 2017). Furthermore, travel-related well-being is positively correlated with life satisfaction across multiple domains for young adolescents in rural Japan, with mode-specific attitudes and perceived independent mobility affecting trip experiences (Khaleghi & Kato, 2023). In the Philippines, one investigation conducted in Pasig City revealed that areas with lower socioeconomic status generally exhibit poorer walkability and public transport accessibility (Nogueira & Diaz, 2023).

1.2. Research Problem

Recent transportation studies in the Philippines have started to investigate advanced methodology, moving beyond descriptive approaches. Guillermo et al. (2022) proposed a strategic recommendation method for transit routes utilizing logit models and optimal travel time analysis, taking into account various trip characteristics. Moreover, Vergel et al. (2024) assessed pollutant and CO₂ emissions from road and rail transportation via a bottom-up methodology, yielding significant data for policy formulation. However, there are still limitations with transportation studies. Not enough emphasis has been placed on how these travel-related events influence students' academic and psychological well-being.

To address these gaps, the current study used a multi-method approach to examine how school travel conditions affect the academic performance and general well-being of students in Region I, Philippines. In particular, exploratory data analysis (EDA) was used in the study to characterize the distribution and correlations of important variables. To identify the significant factors of academic achievement and subjective well-being, multiple linear regression (MLR) was used. Furthermore, the intricate connections among travel conditions, well-being, and academic achievement were investigated using Structural Equation Modelling (SEM).

1.3. Research Objectives

The primary objective of this study was to investigate the influence of school travel conditions on the academic achievement and well-being of schoolchildren in Region I, Philippines. Specifically, the study aimed to:

- Describe the travel characteristics, well-being, and academic achievement of schoolchildren in Region I, Philippines.
- To determine the influence of school transportation satisfaction and travel-related factors on academic achievement and well-being.
- Examine the complex interconnections among school transportation conditions, student well-being, and academic achievement.

1.4. Significance of the Study

This study attempted to fill numerous critical research gaps. Numerous international and local studies have focused solely on specific travel criteria such as travel time, distance, or safety, overlooking a full assessment of travel satisfaction that encompasses elements such as comfort, punctuality, affordability, and accessibility. Second, the use of integrated multi-method analytical frameworks has been limited; no documented study in the Philippines has simultaneously used Exploratory Data Analysis (EDA), Multiple Linear Regression (MLR), and Structural Equation Modeling (SEM) to investigate the collective impact of school travel conditions on academic achievement and well-being outcomes. Third, while some foreign studies have looked into the impact of school travel on student well-being, few have analyzed both academic and psychosocial outcomes in a unified framework, and none have performed a complete examination in the Philippine context. Local research overlooks the mediating or moderating role of travel satisfaction in the relationship between objective travel circumstances and student outcomes such as stress, academic achievement, and school involvement. Finally, there is a notable shortage of context-specific evidence in Region I of the Philippines, which is characterized by a variety of rural and urban mobility difficulties, making this study an important contribution to national transportation and education research.

This study aims to provide multifaceted, context-specific evidence on how school travel experiences affect Filipino schoolchildren's academic and psychosocial well-being by addressing existing gaps using a multi-method approach, informing child-friendly transportation and education policy interventions. The results were anticipated to guide transport infrastructure planning, school travel interventions, and child-focused mobility programs designed to improve educational outcomes and well-being among Filipino schoolchildren.

2. REVIEW OF RELATED LITERATURE

2.1. School Travel Conditions and Educational Outcomes

Travel conditions to school substantially affect educational outcomes, as demonstrated by several research studies investigating the correlation between modes of transportation, travel duration, and academic achievement. Longer trip durations adversely impact academic achievement, especially in developing regions. Research in Ghana revealed that children commuting over 30 minutes to school exhibited inferior reading outcomes attributed to missing learning time and health issues (Afoakwah & Koomson, 2021). In Morocco, prolonged commuting durations are associated with greater tardiness and absenteeism, which negatively impacts academic achievement (Bammou et al., 2024). Active transportation, including walking and cycling, is associated with enhanced learning outcomes. A study indicated that children who cycled to school demonstrated superior exam performance, influenced by diminished emotional challenges. In contrast, being driven to school correlated with increased self-esteem, which favorably affected exam performance, especially in high-income homes (Walker & Gamble, 2023). Moreover, transportation challenges disproportionately impact children from low-income families and rural regions, emphasizing the necessity for targeted efforts to enhance access to quality education (Bammou et al., 2024; Hopson et al., 2022). Learning outcomes for low-income and rural children can be enhanced by cutting down on travel time (Afoakwah & Koomson, 2021; Bammou et al., 2024).

2.2. School Travel and Student Well-Being

School travel significantly impacts student well-being, impacting both psychological and academic outcomes. The mode and duration of travelling to school can affect students differently, depending on their geographical location and socio-economic conditions. In China, extended travel durations adversely impact children's psychological well-being and academic achievement, with children from urban fringe exhibiting greater resilience to longer commutes than their counterparts in city centers and rural areas (Ding & Feng, 2022). This shows the significance of accounting for local settings when assessing the impact of school travel on well-being. Sustainable mobility methods, including active and public transportation, correlate with enhanced mental health and well-being. Variables such as trip distance and destination substantially affect the selection of sustainable travel modes, hence improving student well-being (Apriandy et al., 2024). Travel and recreational activities can alleviate stress and improve happiness and life satisfaction among students, indicating that travel experiences significantly impact general well-being (Baroi, 2024).

Educational travel experiences foster lifelong learning and enhance academic motivation and well-being, suggesting a wider influence on students' attitudes towards learning (Chau et al., 2024). In the study of Ding & Feng (2022), walking to school correlates positively with psychological well-being in urban environments, although bicycles and public transport exhibit a comparable influence in rural regions.

2.3. Philippines and Local Context

Within the Philippine context, research on school travel and its educational and psychosocial implications remains relatively limited. In the study of Rivera & Castro (2022), enhancing the quality of public transport vehicles may be the most effective intervention in promoting mobility behavior towards public transport, especially in the case of children. The enhancement of public transport vehicles should aim to offer a more comfortable and convenient travel experience, thereby reducing the disparity in experiences between utilizing private cars and public transportation. However, this study focused primarily on modal shift without exploring academic or well-being outcomes. Similarly, Cabrera et al. (2025) investigated the determinants of absenteeism among senior high school students in Pampanga, Philippines. The findings indicated that absenteeism was affected by financial limitations, health concerns, familial troubles, insufficient sleep, excessive academic demands, and adverse school conditions. Yet, the study employed descriptive and thematic analyses without considering a more complex, multi-method model such as structural equation modeling (SEM) or a decision tree model (DT) to explain the interrelationships among travel conditions, academic outcomes, and well-being. Another study by Kamid et al. (2024), offered an extensive examination of the training, behaviors, and safety protocols of motorcycle riders in the Philippines, with a specific emphasis on motorcycle enthusiasts. The findings indicated a substantial awareness of essential traffic regulations, including mandatory helmet usage and a zero-tolerance policy for alcohol consumption while driving. Although safety protocols were evaluated, psychological well-being was not analyzed.

3. METHODOLOGY

3.1. Empirical Approach

This study used a multi-method empirical strategy informed by Bronfenbrenner's (2013) Ecological Systems Theory of Human Development and De Vos et al.'s (2013) Travel

Behavior Satisfaction Framework to investigate the impact of school travel conditions on the academic achievement and well-being of schoolchildren in Region I, Philippines. According to Bronfenbrenner's theory, human development is impacted by a number of interconnected environmental systems, ranging from immediate surroundings such as family and school (microsystem) to larger socioeconomic issues (macrosystem). The school travel environment operates inside the microsystem and mesosystem, having a direct impact on children's daily routines, safety perceptions, stress levels, and involvement in the school setting. The study defined school travel satisfaction and characteristics as immediate contextual factors that potentially influence developmental outcomes such as academic achievement and psychosocial well-being.

De Vos et al. (2013) used the Travel Behavior Satisfaction Framework to describe the processes by which travel-related experiences influence subjective well-being and educational engagement. According to this theory, personal travel pleasure, which is influenced by factors such as perceived safety, comfort, accessibility, punctuality, cost, and route duration, has an impact on emotional and cognitive assessments, influencing overall well-being and everyday functioning. Satisfaction on safety, comfort, punctuality, travel time, travel cost, and accessibility are all important components of perceived travel satisfaction in the context of school travel. Concurrently, travel characteristics such as travel distance, travel time, and weekly fare act as environmental constraints or facilitators within the exosystem, potentially influencing students' psychological stress, life satisfaction, academic achievement (grade average), and perceived health.

The study's conceptual framework as presented in Figure 1, put these theoretical ideas into practice by suggesting direct and mediated pathways from school transportation satisfaction measures and trip characteristics to academic and well-being outcomes. According to the paradigm, more satisfaction with travel conditions correlates with lower stress and higher well-being indicators such as life satisfaction, average well-being, school life satisfaction, and health. These are expected to predict academic achievement (average grade). Furthermore, demographic parameters such as age were employed as control variables. Studies indicate that age significantly influences individuals' responses to stress and ethical dilemmas. Older adults typically utilize more emotion-focused coping mechanisms than their younger counterparts (Flannery et al., 2018; Whitty, 2003). The proposed relationships suggest that variables such as travel distance and travel time may have both direct impacts on academic performance (via punctuality or fatigue) and indirect effects through stress and travel satisfaction, aligning with the findings of Bammou et al. (2024) and Hopson et al. (2022).

This study, based on developmental systems theory and mobility satisfaction theory, allowed for a thorough evaluation of the link between travel contexts and child development outcomes. It also identified substantial gaps in local literature, particularly the insufficient integration of multidimensional travel satisfaction with scholastic and well-being outcomes within a consistent analytical framework. The use of a multi-method analytical framework—including Exploratory Data Analysis (EDA), Multiple Linear Regression (MLR), and Structural Equation Modeling (SEM) enabled a thorough analysis of both direct and mediated pathways. This comprehensive paradigm provides critical evidence for policymakers and education planners in designing mobility systems to improve the educational outcomes and psychosocial well-being of Filipino children.

3.2. Research Design

This research utilized a multi-method quantitative approach incorporating exploratory data analysis (EDA), multiple linear regression, and structural equation modeling (SEM). The

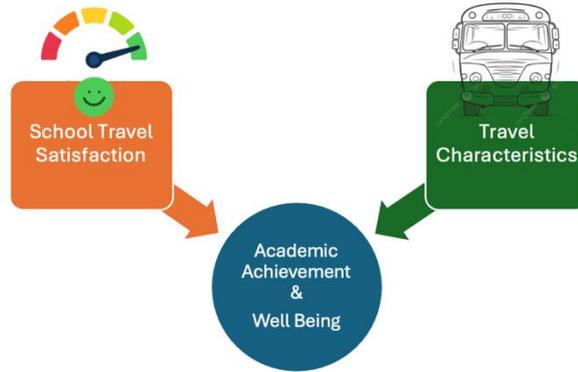


Figure 1 Conceptual Framework of the Study.

objective was to examine the impact of school travel conditions on the academic achievement and well-being of students in urban and rural environments within Region 1, Philippines.

3.2.1. Data Collection Procedure

This study employed stratified random sampling to survey 1,110 Grade 6 and Grade 10 students from public schools in Region I, Philippines. Data were collected using a structured, self-administered questionnaire with Likert-scale items measuring demographics, travel conditions, travel satisfaction, well-being, and academic achievement. Surveys were conducted face-to-face in classrooms from November 2024 to February 2025, supervised by trained research staff and teachers, with ethical clearance and informed consent obtained from parents and school authorities. The sample included students from both urban and rural areas across Ilocos Norte, Ilocos Sur, La Union, and Pangasinan. Despite logistical challenges such as school event conflicts and varying participation policies, ethical protocols were maintained, ensuring voluntary, confidential participation. While logistical limitations affected full representativeness, the study successfully gathered valuable empirical data illustrating the relationship between school transportation experiences, well-being, and academic achievement among schoolchildren in the Northern Philippines. Figure 2 depicts the study area and the test schools where survey questionnaires were distributed.

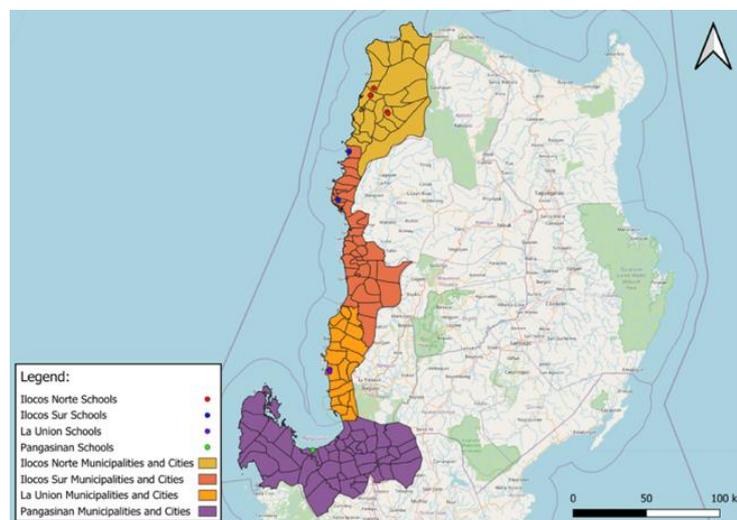


Figure 2 Location of Schools

3.2.2 Research Instrument

The survey instrument for this study was adapted from established instruments and tailored to the Philippine setting to thoroughly capture schoolchildren's travel experiences, well-being, and academic achievement. The study encompassed student demographics, satisfaction with school travel (including safety, comfort, punctuality, travel cost, travel time, and accessibility), well-being indicators (stress, life satisfaction, health), and travel characteristics such as distance, duration, and fare. The majority of factors were assessed utilizing Likert scales, whilst academic grades and travel information were derived from institutional records and student self-reports.

Reliability tests demonstrated satisfactory internal consistency, as evidenced by Cronbach's α of 0.687 and McDonald's ω of 0.738, thereby endorsing the scale's application in an exploratory study. The results demonstrate that the instrument consistently measures the desired dimensions related to the interrelated impacts of travel circumstances, well-being, and academic achievement among schoolchildren in Region I, Philippines. The average score of the scale was 2.79, with a standard deviation of 0.394. A Cronbach's α value of 0.70 or higher is generally advised for established scales (Kılıç, 2016), while values nearing this threshold are deemed acceptable in studies utilizing newly adapted instruments or varied constructs, as demonstrated in this multi-dimensional survey (Gliem & Gliem, 2003). The McDonald's ω coefficient, frequently considered a more precise measure of reliability for scales with multidimensional or uneven item loadings (Hayes & Coutts, 2020; Ravinder & Saraswathi, 2020), further corroborates the scale's internal consistency. The findings validate that the measure shows satisfactory reliability in assessing school travel satisfaction, well-being, and academic achievement among schoolchildren in Region I, Philippines.

3.3 Data Analysis

3.3.1. Exploratory Data Analysis (EDA)

Exploratory Data Analysis (EDA) was used to identify the sociodemographic profile, travel characteristics, satisfaction levels, and well-being indicators of the participants. Descriptive statistics (frequency, percentage) and correlation coefficients (Pearson's r) were calculated to examine the correlations among continuous variables.

3.3.2. Multiple Linear Regression

Separate multiple linear regression models were constructed to assess the predictive effect of school travel conditions on academic achievement and student well-being. The independent variables included travel satisfaction indicators, travel time and distance, as well as individual aspects such as age, stress level, and health.

A multiple linear regression (MLR) model consists of one continuous response variable and two or more independent variables. The independent variables might be either continuous (scaled) or categorical. The dataset has n observations of a dependent variable Y and k explanatory variables $x_1, x_2, x_3, \dots, x_k$. Tharu (2024) stated that the relationship between Y and $x_1, x_2, x_3, \dots, x_k$ is formulated by the MLR model as:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots + \beta_k x_k + \varepsilon \quad (1)$$

In standardized form, a multiple regression equation is expressed as:

$$Z_y = \beta_1 Z_{x_1} + \beta_2 Z_{x_2} + \dots + \beta_k Z_{x_k} + \varepsilon \quad (2)$$

where:

- Z_y is the standardized dependent variable (standardized Grade Average)
- β_k is the standardized coefficient for predictor x_k
- Z_{x_k} is the standardized score for predictor x_k
- ε is the residual (error term)

In this study, let Z_y denote standardized academic achievement/well-being and x_i 's represent the various academic achievement/well-being factors. $\beta_1, \beta_2, \beta_3, \dots, \beta_k$ represents constants that function as the standard regression coefficients of explanatory variables, while ε denotes a stochastic disturbance or error.

3.3.3. Structural Equation Modeling (SEM)

A structural equation model was developed to simultaneously assess the direct and indirect influences of travel satisfaction, travel characteristics, and individual factors on student well-being and academic achievement. The measurement and structural models were evaluated by Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), followed by path analysis. The model fit was assessed using conventional indices: CFI, TLI, RMSEA.

According to Stephan & Friston (2009), Structural Equation Modeling (SEM) is a multivariate, hypothesis-driven approach that uses a structural model to represent a hypothesis about the causal links between several variables. The structural equation model consists of two parts: (a) the structural component, which uses simultaneous equations to relate latent variables, and (b) the measurement component, which uses a restricted (confirmatory) factor model to associate observed variables (Joreskog, 1973).

The Measurement Model describes how observed variables (indicators) interact with latent variables (factors). It is commonly depicted as:

$$Y = \Lambda_y \varepsilon + \epsilon \quad (3)$$

where:

- Y is a vector of observed variables,
- Λ_y is a matrix of factor loadings,
- ε is a vector of latent variables,
- ϵ is a vector of measurement errors.

The Structural Model describes the relationships between the latent variables. This can be expressed as:

$$\varepsilon = B\varepsilon + \eta \quad (4)$$

where:

- ε is a vector of latent variables (endogenous),
- B is a matrix that defines the relationships between the latent variables,
- η is a vector of exogenous latent variables or noise.

Table 1 Demographic Profile of Respondents

Predictor	Count	%	Predictor	Count	%	Predictor	Counts	%	Predictor	Counts	%
Gender			Income (Php)			Locality			Travel Time (minutes)		
Male	435	39.20	0 - 4999	184	16.60	Rural	655	59	More than 60	10	0.90
Female	675	60.80	5000 - 9999	194	17.50	Urban	455	41	51 - 60	12	1.10
Grade			10000 - 14999	136	12.30	Distance to School (kilometers)			41 - 50	14	1.30
			15000 - 19999	111	10.00				31 - 40	46	4.10
Grade 6	560	50.50	20000 - 24999	56	5.00	More than 5	231	20.80	16 - 30	159	14.30
Grade 10	550	49.50	25000 - 29999	74	6.70	4.1 - 5	86	7.70	11 -15	320	28.80
Age Range			30000 - 34999	64	5.80	3 .1 - 4	132	11.90	less than 10	549	49.50
9 - 10	11	1.00	35000 - 39999	48	4.30	2.1 - 3	175	15.80	Weekly Fare (Php)		
11 - 12	546	49.20	40000 - 44999	41	3.70	1.1 - 2	265	23.90	More than 400	82	7.40
13 - 14	2	0.20	45000 - 49999	2	0.20	Less than 1	221	19.90	351 - 400	43	3.90
15 - 16	543	48.90	more than 50000	38	3.40	Road type			301 - 350	49	4.40
19	8	0.70	Confidential	162	14.60	Earth	69	6.20	251 -300	47	4.20
School in Barangay			Road Access			Gravel	41	3.70	201 - 250	104	9.40
No	651	58.60	No	418	37.70	Asphalt	204	18.40	Less than 200	547	49.30
Yes	459	41.40	Yes	692	62.30	Concrete	796	71.7	None	238	21.40

4. PRESENTATION AND ANALYSIS OF RESULTS

4.1 Respondent's Profile

An analysis of 1,110 students in Region I, Philippines, revealed significant socioeconomic, demographic, and travel-related inequalities that affect students' daily commutes, as shown in Table 1. The sample was consistently assigned by grade level and was predominantly composed of females, with the majority of respondents residing in rural areas. A sizable proportion of students came from low-income households, with more than one-third earning less than PHP 10,000 per month, highlighting financial weaknesses that may impact trip affordability. Students' commuting conditions varied greatly; about 50% traveled less than one kilometer, roughly 21% commuted over five kilometers, and a small but significant minority traveled for more than an hour. Weekly transportation expenses vary greatly, with nearly half of the students allocating less than PHP 200 and others incurring costs above PHP 400. Disparities in road infrastructure were evident, with rural children more likely to encounter gravel roads and limited direct access to schools. These patterns reveal considerable inequalities in mobility and accessibility, which, according to the study's conceptual framework, are likely to influence school transportation satisfaction, academic achievement, and well-being outcomes.

4.2 Correlation Matrix

Many statistically significant relationships were found between the study's demographic, transportation-related, and well-being variables, verifying the key pathways proposed in the conceptual framework. The connections provide strong empirical support for the travel-well-being-academic achievement pathway. Academic achievement is moderately affected by demographic factors (age, income, gender) and characteristics of school transport (road type, travel duration, school location). Well-being outcomes (life satisfaction, stress, health) are

influenced by demographic and travel characteristics, notably travel distance, weekly fare, and road type.

4.2.1 Correlation of Academic Achievement (Grade Average)

The strongest correlation with academic achievement was age ($r = 0.490, p < .001$), indicating that older children in the sample generally achieved higher academic averages, possibly due to being in higher grade levels or possessing greater intellectual maturity. Income ($r = 0.154, p < .001$) exhibited a positive correlation with academic achievement. The type of road ($r = 0.116, p < .001$) showed a slight positive connection with academic achievement, suggesting that students accessing better road infrastructure may encounter smoother, less stressful commutes, hence enhancing their school performance. In contrast, travel time ($r = -0.074, p < .05$) and enrollment in schools beyond one's barangay ($r = -0.144, p < .001$) had a negative correlation with academic achievement, indicating that longer, inconvenient, or more difficult commutes may marginally hinder learning outcomes.

4.2.2 Correlation of Well-being and Stress

Life satisfaction exhibited a positive correlation with health ($r = 0.317, p < .001$) and Average Well-Being ($r = 0.177, p < .001$), while demonstrating a negative association with age ($r = -0.203, p < .001$) and stress ($r = 0.211, p < .001$). This suggests that younger, healthier, and less stressed students exhibited greater life satisfaction. Stress was identified as a significant variable, exhibiting robust negative correlations with age ($r = -0.485, p < .001$) and academic performance ($r = -0.370, p < .001$), while demonstrating positive correlations with travel distance ($r = 0.160, p < .001$), travel time ($r = 0.147, p < .001$), and weekly fare ($r = 0.171, p < .001$).

4.2.3 Correlation of School Travel Conditions and Accessibility

Significant positive correlations were seen between travel distance and traveling time ($r = 0.430, p < .001$), as well as between road access and travel distance ($r = 0.209, p < .001$), hence confirming anticipated geographic travel trends. Longer distances and durations adversely connected with academic achievement and positively correlated with stress, highlighting the mobility inequities encountered by students in remote regions. Weekly fare had a positive correlation with trip distance, travel time, and stress, while demonstrating a negative correlation with income and academic achievement, highlighting the financial responsibilities associated with school commuting that may impede learning possibilities, particularly for lower-income families.

4.3 Multiple Linear Regression

4.3.1. Model 1: Academic Achievement

Model Fit Measures

A multiple linear regression model was created to forecast students' grade averages using 14 demographic, psychological, and travel-related variables. Several model fit indices were used to assess the adequacy and explanatory ability of the regression model until the optimal model with eight associated predictors was identified.

Table 2 shows that the multiple linear regression analysis for Model 1 (academic achievement) produced a multiple correlation coefficient (R) of 0.547, indicating a moderate positive relationship between the observed and expected grade averages of pupils. The model's

Table 2 Model 1 Fit Measures

Model 1	R	R ²	Adjusted R ²	AIC	BIC	RMSE	Overall Model Test			
							F	df1	df2	p
Grade Average	0.547	0.299	0.294	2775	2825	0.837	58.6	8	1101	<.001

Table 3 Model 1 Standardized Coefficients

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	-2.0071	0.25531	-7.86	<.001	
Age	0.3889	0.02897	13.43	<.001	0.3987
Income	0.0155	0.00675	2.29	0.022	0.0589
Locality	-0.0977	0.0518	-1.89	0.059	-0.0481
Stress	-0.1436	0.02565	-5.6	<.001	-0.1643
Travel Distance	0.0329	0.0144	2.28	0.023	0.0594
Road Type	0.0843	0.0306	2.76	0.006	0.0703
Gender	0.1962	0.05236	3.75	<.001	0.0958
Average WB	0.2524	0.05379	4.69	<.001	0.1201

coefficient of determination (R²) was 0.299, suggesting that the eight predictors studied could explain approximately 29.9% of the variance in students' academic achievement.

Cohen's (1988) effect size interpretation criteria state that a R² of 0.13 indicates medium influence, while a R² of 0.26 or above is considered large. The resulting value of 0.299 indicates a strong practical effect, emphasizing these variables' important influence on academic achievement in the context of school travel and well-being. The adjusted R² of 0.294, which accounts for the number of predictors to sample size, closely resembles the R², indicating that the model's explanatory power is not due to overfitting, but rather significant correlations between the predictors and the outcome variable (Günel, 2003). The comprehensive F-test revealed statistical significance (F(8, 1101) = 58.60, p <.001), indicating that aggregate predictors significantly improve grade average prediction beyond random occurrence (Dhurandhar, 2011).

Model precision and complexity were measured using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), which were 2775 and 2825, respectively. Although their absolute values are most important in comparative model evaluation, these indices represent the balance between model fit and simplicity, with lower values frequently preferred when comparing alternative models (Harbecke et al., 2024). The root mean square error (RMSE) was 0.837, which represents the average size of prediction errors in the dependent variable's original units (grade average).

Fitted Model

Table 3 presents a summary of the fitted model for academic achievement, incorporating selected relevant independent factors. Utilizing Equation (2) in standardized form, substituting values from Table 5, is expressed as:

$$Z_{GradeAve} = 0.3987Z_{age} + 0.0589Z_{income} - 0.1643Z_{stress} + 0.0594Z_{Tdistance} + 0.0703Z_{rdtype} + 0.0958Z_{gender} + 0.1201Z_{AveWB} + \varepsilon \quad (5)$$

Note: Intercept is omitted in standardized regression equations because it equals zero (mean-centered).

The standardized regression results from Model 1 reveal how various factors affect students' academic achievement (grade average) as presented in Table 5. Age was the strongest positive predictor ($\beta = 0.3987$), meaning older students generally achieved higher academic achievement, likely due to maturity and cognitive development. Average WB also showed a

positive effect ($\beta = 0.1201$), indicating that students with better overall well-being tended to perform better in school. Gender had a positive association ($\beta = 0.0958$), suggesting that female

Table 4 Model 2 Fit Measures

Model 2	R	R ²	Adjusted R ²	AIC	BIC	RMSE	Overall Model Test			
							F	df1	df2	p
Well-being	0.316	0.1	0.0943	1401	1446	0.451	17.5	7	1102	<.001

Note. Models estimated using sample size of N=1110

Table 5 Model 2 Standardized Coefficients

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	1.6779	0.116	14.46	<.001	
Stress	0.0231	0.0133	1.73	0.084	0.0555
Road Type	0.0336	0.0165	2.04	0.042	0.0588
Life Satisfaction	0.0595	0.0157	3.8	<.001	0.1162
Health	0.0792	0.0152	5.22	<.001	0.1598
Travel Time	0.0289	0.0122	2.36	0.018	0.0692
Road Access	0.0773	0.0284	2.72	0.007	0.0787
Average grade	0.0809	0.0147	5.51	<.001	0.17

students typically earned higher grades — a trend seen in both local and international studies. The type of road near students' homes and schools ($\beta = 0.0703$) and travel distance ($\beta = 0.0594$) both positively influenced academic achievement, possibly reflecting better school access for those traveling farther. Family income showed a modest positive effect ($\beta = 0.0589$), while stress had a significant negative impact ($\beta = -0.1643$), confirming that higher stress levels reduce academic achievement.

4.3.2. Model 2: Well Being

A multiple linear regression model was developed to predict students' grade averages based on 14 demographic, psychological, and travel-related characteristics. Several model fit indicators were employed to evaluate the adequacy and explanatory power of the regression model until the ideal model with seven corresponding predictors was determined.

Table 4 summarizes the multiple linear regression model fit for Model 2, which sought to forecast students' well-being utilizing seven factors. The model yielded a multiple correlation coefficient (R) of 0.316, signifying a moderate positive association between the observed and predicted well-being ratings. The coefficient of determination (R²) was 0.100, indicating that around 10% of the variance in well-being was elucidated by the predictors in the model. The adjusted R² was marginally reduced to 0.0943, indicating a minor decrease after considering the number of predictors and sample size, suggesting the model maintained its explanatory power with little inflation from additional variables.

The comprehensive F-test demonstrated statistical significance, $F(7, 1102) = 17.5$, $p < .001$, indicating that the predictors effectively explained variance in well-being scores beyond random fluctuations. The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) were 1401 and 1446, respectively, serving as foundational metrics for assessing model fit and parsimony in subsequent comparisons. Finally, the Root Mean Square Error (RMSE) was 0.451, signifying the average size of prediction errors in the units of the well-being score, with lower values denoting enhanced predictive accuracy.

Table 5 summarizes the fitted model for academic achievement, which includes selected significant independent factors. Using Equation 2 in standardized form, incorporating values from Table 5, is represented as:

$$Z_{\text{wellbeing}} = 0.0588Z_{\text{roadtype}} + 0.1162Z_{\text{Lsatisfaction}} + 0.1598Z_{\text{health}} + 0.0692Z_{\text{Ttime}} + 0.0787Z_{\text{rdaccess}} + 0.17Z_{\text{gradeAve}} + \varepsilon \quad (6)$$

Note: Intercept is omitted in standardized regression equations because it equals zero (mean-centered).

The final regression model determined six significant indicators of student well-being: grade average, health, life satisfaction, road access, travel time, and road type, as illustrated in Equation 6. The comparative value of these variables, indicated by standardized regression coefficients (β), demonstrated that grade average ($\beta = 0.170$) was the most significant positive factor, suggesting that academic achievement substantially improves students' well-being. Health ($\beta = 0.1598$) was tightly correlated, underscoring the critical importance of physical and mental well-being in fostering a favorable emotional condition.

Life satisfaction ($\beta = 0.1162$) demonstrated a significant beneficial impact, underscoring the significance of students' comprehensive evaluation of their personal and social life. Environmental and travel-related factors exhibited more moderate, albeit still substantial, effects. Road access ($\beta = 0.0787$) and travel time ($\beta = 0.0692$) exhibited a positive correlation with well-being, indicating that enhanced mobility and possibly favored school placements facilitate improved psychosocial outcomes. The type of road ($\beta = 0.0588$), suggests that safer and higher-quality commuting surroundings slightly improve students' everyday experiences and overall well-being. Stress ($\beta = 0.0555$) was initially included but did not achieve statistical significance ($p = 0.084$) and was therefore omitted from the final model. This indicates that, when more robust variables are accounted for, stress levels do not independently account for increased variance in well-being.

4.4 Structural Equation Modeling

4.4.1. Exploratory Factor Analysis

The Exploratory Factor Analysis (EFA) revealed a distinct four-factor structure from the sample, employing maximum likelihood extraction with varimax rotation. Factor loadings exceeding 0.40 were deemed significant, and uniqueness values were analyzed to evaluate the fraction of variance not accounted for by the factors.

Table 6 revealed four different latent factors within the dataset. The initial element, Transportation Satisfaction (TS), was characterized by six indicators: safety satisfaction (0.641), comfort satisfaction (0.531), timeliness satisfaction (0.510), travel time satisfaction (0.485), travel cost satisfaction (0.403), and accessibility satisfaction (0.450). These variables had a significant positive loading on the factor, signifying a common dimension of perceptions regarding transport service quality. The uniqueness values varied between 0.55 and 0.75, indicating that this factor explains a moderate to substantial fraction of the variance in these transport-related questions.

The second factor, Academic-Stress Profile (ASP), consisted of three variables: age (0.734), average academic grade (0.683), and stress (-0.579). Age and grade exhibited a strong positive correlation, whereas stress demonstrated a negative correlation, indicating an unfavorable association between academic achievement and stress levels. This factor encapsulated a dimension of school performance-related stress, with uniqueness values between 0.407 and 0.557, signifying that a substantial fraction of variance in these variables was elucidated by this factor.

The third element, Psychosocial Well-being (PWB), encompassed average school life well-being (0.533), average well-being (0.471), life satisfaction (0.458), and health (0.447). All these factors were marginally and positively correlated, reflecting students' psychological and health-related well-being both in and outside of school. The uniqueness scores ranged from 0.674 to 0.758, indicating the intricate, multidimensional essence of well-being.

Table 6 Factor load matrix after rotation and the extracted four common factors

Variables	Factors					Extracted Common Factors
	1	2	3	4	5	
Safety Satisfaction	0.641					Transportation Satisfaction (TS)
Comfort Satisfaction	0.531					
Punctuality Satisfaction	0.51					
Travel Time Satisfaction	0.485					
Travel Cost Satisfaction	0.403					
Accessibility Satisfaction	0.45				0.728	
Age		0.734				Academic-Stress Profile (ASP)
Average		0.683				
Stress		-0.579				
Ave School Life WB			0.533			Psychosocial Well-being (PWB)
Ave WB			0.471			
Life Satisfaction			0.458			
Health			0.447			
Travel Distance				0.879		Travel Characteristics (TC)
Travel Time				0.468		

Note. The 'Maximum likelihood' extraction method was used in combination with a 'varimax' rotation

Table 7 Factor Loadings

Factor	Indicator	Estimate	SE	Z	p
TS	Travel Time Satisfaction	0.28	0.0193	14.5	<.001
	Safety Satisfaction	0.369	0.0197	18.7	<.001
	Comfort Satisfaction	0.326	0.0187	17.5	<.001
	Punctuality Satisfaction	0.401	0.0205	19.6	<.001
	Accessibility Satisfaction	0.423	0.0221	19.2	<.001
	Travel Cost Satisfaction	0.325	0.0205	15.9	<.001
ASP	Stress	0.704	0.0403	17.5	<.001
	Average	-0.57	0.0323	-17.6	<.001
	Age	-0.839	0.0369	-22.7	<.001
PWB	Health	0.517	0.0361	14.3	<.001
	Average WB	0.202	0.018	11.2	<.001
	Life Satisfaction	0.444	0.0347	12.8	<.001
	Ave School Life WB	0.257	0.0177	14.5	<.001
TC	Travel Time	0.746	0.0581	12.8	<.001
	Travel Distance	1.186	0.0923	12.8	<.001

The fourth element, Travel Characteristics (TC), was characterized by travel distance (0.879) and travel duration (0.468). The travel distance exhibited a notably strong loading, but the travel duration displayed a moderate correlation. The uniqueness values varied from 0.212 to 0.738, with trip distance exhibiting a notably low uniqueness of 0.212, signifying that a substantial portion of its variance was well accounted for by this factor, hence underscoring its significance in comprehending students' physical travel experiences.

4.4.2. CFA

Confirmatory Factor Analysis (CFA) was employed to validate and assess the reliability of the measurement model. This statistical method evaluated the extent to which observable variables represent the underlying latent constructs. A series of model modifications and simulations were conducted to enhance factor loadings, remove weak indicators, and achieve an acceptable model fit. In this study, it evaluated the measurement framework established by the preceding EFA, affirming the four proposed latent constructs: Transportation Satisfaction (TS), Academic-Stress Profile (ASP), Psychosocial Well-Being (PWB), and Travel Characteristics (TC).

Table 7 exhibited robust and statistically significant factor loadings (all $p < .001$), signifying that the observed indicators consistently assessed their corresponding latent

variables. In Transportation Satisfaction (TS), all six variables exhibited positive and substantial loadings, with values varying from 0.280 (Travel Time Satisfaction) to 0.423 (Accessibility Satisfaction). Punctuality pleasure (0.401), Accessibility Satisfaction (0.423), and Safety Satisfaction (0.369) exhibited elevated standardized loadings, indicating that these factors significantly influence pupils' pleasure with school transportation.

In the Academic-Stress Profile (ASP), Stress had a substantial positive loading of 0.704, whilst Average grade and Age demonstrated significant negative loadings of -0.570 and -0.839, respectively. The negative loadings signify an inverse correlation between stress and both age and average grade, suggesting that when age or grade rises, stress typically diminishes within this student cohort, aligning with anticipated academic coping patterns.

All four measures of Psychosocial Well-Being (PWB) exhibited positive and substantial loadings, with Health (0.517) showing the highest loading, followed by Life Satisfaction (0.444). The Average Well-Being score (0.202) demonstrated a relatively lesser, yet still significant, correlation. These findings confirm that students' health views and life satisfaction are fundamental elements of their total psychological well-being.

In the Travel Characteristics (TC) factor, both Travel Distance (1.186) and Travel Time (0.746) exhibited substantial and significant loadings. The notably high loading for Travel Distance highlights its significance in elucidating disparities in students' travel-related experiences, potentially indicating the logistical burdens and opportunity costs associated with school travel.

4.3 SEM Simulation

The proposed model examines the relationships among travel characteristics, academic – stress profile, psychosocial well-being and school travel satisfaction considering both direct and mediated effects. The model proposed that school travel experiences influence students' well-being, which in turn affects their academic achievement. Prior studies have demonstrated that the conditions of school travel affect students' psychological and academic experiences (Ding & Feng, 2022). The Diagonally Weighted Least Squares (DWLS) method with robust standard errors was employed to estimate the model parameters. This strategy adjusts for measurement errors and enhances the validity of structural relationships within the model. The estimation process used the NLMINB optimization method, ensuring efficient and accurate parameter estimation. The model was based on data from 1110 student observations and estimated 90 free parameters. It successfully converged after 67 iterations, indicating that the model structure was appropriate and that the relationships among the four latent constructs and their indicators could be reliably estimated.

The factor loadings for each latent construct validate that the indicators consistently represent their foundational variables, as shown in Table 8. The indices of trip Satisfaction (TS), such as trip time satisfaction, safety, and comfort, exhibited substantial loadings, with standardized coefficients between 0.543 and 0.679, signifying that these elements consistently characterized students' happiness with school travel. Indicators of Perceived Well-being (PWB), encompassing school life well-being, health, average well-being, and life satisfaction, exhibited satisfactory loadings ranging from 0.504 to 0.654, signifying their unified depiction of students' overall psychosocial condition. Within the Academic Self-Perception (ASP) construct, stress appeared as a robust indicator with a loading of 0.782, underscoring its significant influence on students' academic-related self-perceptions.

The structural model illustrates several significant and interpretable links among the latent constructs as presented in Table 9. Travel Satisfaction (TS) is significantly and favorably affected by Travel Time (estimate = 0.114), suggesting that extended or efficiently managed travel time enhances students' satisfaction with their school travel experience. The Travel Distance showed a slight positive effect on TS (estimate = 0.037), while its impact is

Table 8 Measurement Model

Latent	Observed	Estimate	β
TC	Travel Distance	1	0.39
	Travel Time	0.556	0.216
TS	TT Satisfaction	1	0.543
	Safety Satisfaction	1.202	0.651
	Comfort Satisfaction	1.131	0.613
	Punctuality Satisfaction	1.249	0.676
	Accessibility Satisfaction	1.255	0.679
	T Cost Satisfaction	1.074	0.583
ASP	Stress	1	0.782
	Average	-1.913	-1.505
	Age	-0.923	-0.722
PWB	Ave School Life	1	0.654
	Health	0.875	0.574
	Average WB	0.739	0.487
	Life Satisfaction	0.767	0.504

Table 9 Path Coefficients

Path	Estimate	Interpretation
TS ← TC	-0.016	Non-significant
PWB ← TS	0.682	Strong positive effect
PWB ← TC	0.001	Negligible
ASP ← PWB	0.809	Very strong effect
ASP ← TS	-0.329	Significant negative
TS ← Travel Time	0.114	Significant positive
TS ← Travel Distance	0.037	Positive but small
PWB ← Travel Time	0.089	Positive
PWB ← Travel Distance	0.066	Positive

comparatively negligible. The direct relationship from Travel Characteristics (TC) to TS was non-significant (estimate = -0.016), indicating that the aggregate physical attributes of travel, viewed as a latent factor, do not directly influence satisfaction to the same extent as specific indicators such as travel time.

Perceived Well-being (PWB) is predominantly forecasted by Travel Satisfaction (TS), with a substantial positive impact (estimate = 0.682). This highlights how students' evaluations of their daily commuting experience significantly influence their psychosocial well-being. Travel-related variables such as Travel Time (estimate = 0.089) and Travel Distance (estimate = 0.066) positively influence PWB, albeit to a lesser extent. Simultaneously, the direct impact of TC on PWB was minimal (estimate = 0.001), confirming that perceived travel satisfaction, rather than solely objective travel attributes, significantly influences well-being.

Ultimately, Academic Self-perception (ASP) is primarily influenced by Psychological Well-Being (PWB), exhibiting a robust positive correlation (estimate = 0.809), indicating that students with enhanced life and health perceptions generally possess more positive academic self-assessments. Conversely, TS exerts a substantial negative impact on ASP (estimate = -0.329), indicating that discontent or difficulties with travel may indirectly increase academic stress, undermining students' academic confidence or participation.

The examination of indirect effects within the structural model underscores the significant mediating function of Perceived Well-being (PWB) in linking students' travel experiences to their academic self-perception, as shown in Table 10. The most robust indirect pathway was identified from Travel Satisfaction (TS) via Psychological Well-Being (PWB) to Academic Self-Perception (ASP), with an estimate of 0.552. The substantial mediation effect suggests that enhancements in trip satisfaction markedly boost students' well-being, which subsequently elevates their academic self-perception. It affirms that the beneficial impact of

Table 10 Indirect Effects

Indirect Effect	Estimate	Interpretation
TS → PWB → ASP	0.552	Large mediation effect
Travel Time → TS → PWB → ASP	0.063	Positive mediation
Travel Time → TS → ASP	-0.038	Negative mediation
Travel Time → PWB → ASP	0.072	Direct mediation via well-being

travel satisfaction on academic self-perception is predominantly mediated by students' psychosocial well-being.

Furthermore, Travel Time had an indirect positive influence on ASP through TS and PWB (estimate = 0.063), indicating that travel time, by enhancing travel satisfaction and consequently well-being, can positively affect students' perceptions of their academic competence. Notably, there was a minor negative mediation from Travel Time to ASP via TS (estimate = -0.038). This suggests that when extended travel durations influence pleasure independently of well-being, it may slightly increase academic stress or diminish academic confidence.

Finally, the direct and indirect effect of Travel Time on Academic Self-Perception (ASP) via Psychological Well-Being (PWB) (estimate = 0.072) was positive, indicating that travel experiences indirectly shape students' academic self-perception primarily by impacting their physical, emotional, and social well-being. These results collectively corroborate the proposed indirect pathways and underscore Perceived Well-being as a fundamental psychological mechanism connecting the school travel environment to students' academic views. The SEM model pathway is presented in Figure 3.

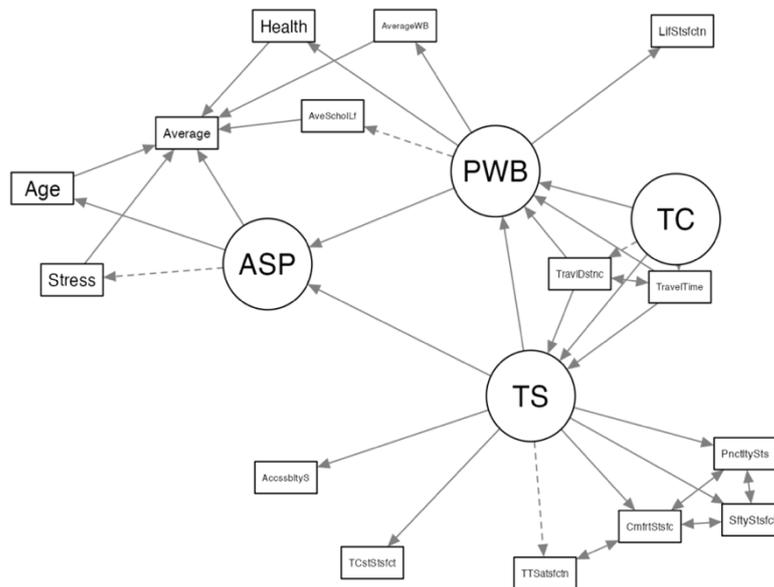


Figure 3 Path Model

5. DISCUSSION

The correlation study revealed distinct relationships among students' backgrounds, travel experiences, well-being, stress, and academic achievement. Students of greater age and those from affluent families typically achieved superior academic performance, whereas individuals with extended commutes or those enrolled at schools beyond their barangay generally exhibited poorer results. Improved road conditions were correlated with enhanced academic

performance. Students in good health and with high life satisfaction reported enhanced well-being, whereas those under greater stress exhibited diminished well-being and inferior academic performance. Students who travelled greater distances, endured longer commutes, or incurred higher travel cost experienced elevated stress levels, underscoring the direct impact of travel conditions on their daily lives. The travel conditions were intrinsically linked; students who travelled greater distances inherently invested more time in commuting and frequently incurred higher travel costs. Individuals with inadequate road access encountered additional difficulties. These findings show that school travel is not merely a logistical concern but one that impacts children's academic achievement and emotional health, particularly for those in disadvantaged, isolated communities.

The multiple regression models provide significant insights into the determinants influencing academic achievement and well-being among students. The first model forecasting academic attainment used variables such as age, income, gender, average well-being, stress, trip distance, and road type. The investigation indicated that academic achievement was positively affected by increased age, higher wealth, improved well-being, male gender, and more advantageous travel conditions, such as shorter distances and better road quality. In contrast, elevated stress levels exhibited an inverse correlation with academic achievement, substantiating the documented association between stress and diminished educational results. In the second model forecasting well-being, the predominant determinants encompassed academic achievement, health status, life satisfaction, travel duration, road accessibility, and road type. Enhanced academic achievement, improved self-assessed health, and increased life satisfaction were correlated with elevated well-being. Transportation characteristics such as improved road accessibility, reduced travel distances, and enhanced safety, together with manageable travel durations, favorably influenced students' well-being. This model highlighted that daily travel experiences transcend practical issues, influencing students' emotional, social, and academic experiences.

Collectively, these models underscore that although sociodemographic factors like age, gender, and wealth are fundamental, the quality of travel experiences and students' psychological states directly and indirectly influence educational outcomes and personal well-being. The findings emphasize the necessity of integrating transport accessibility, safety, and infrastructure enhancements with academic interventions to foster comprehensive student development.

The Structural Equation Model used in this study provides a definitive, evidence-based depiction of the relationship between transportation experiences, student well-being, and academic achievement. The model indicates that transportation satisfaction is essential in influencing students' perceived well-being. Factors including safety, comfort, punctuality, accessibility, and cost directly impact students' evaluations of their daily commutes to school, hence greatly influencing their overall emotional and psychological well-being.

Although duration and distance of school trip do not directly and significantly influence well-being, their impact is mediated by travel satisfaction. Lengthy or remote travel may be less harmful if students perceive their travel experience as secure, comfortable, and satisfactory. This underscores the significance of service quality and infrastructural conditions in alleviating the impact of distance and travel time on child commuters.

Furthermore, the model illustrates that psychosocial well-being serves as a significant mediator connecting transportation experiences to academic self-perception. Well-being outcomes are strong predictors of students' perceptions regarding their academic success and stress levels. Discontent with school transport indirectly diminishes academic self-esteem by adversely affecting well-being. This multifaceted approach highlights the significance of psychosocial factors in comprehending the impact of infrastructure and services on educational results.

These findings have significant practical consequences for transportation planning and educational policy. Enhancing the quality of school transport services — via improved road infrastructure, dependable scheduling, accessible routes, and secure settings — can provide not only logistical benefits but also significant emotional and academic advantages for students. Moreover, strategies must recognize that long commutes are not intrinsically detrimental if transport satisfaction is maintained at a high level. Finally, incorporating psychological indicators into evaluations of school transport systems will facilitate a comprehensive knowledge of the impact of travel on students' everyday experiences and long-term educational outcomes.

6. CONCLUSION

This study conclusively illustrated that students' academic achievement and psychological well-being are intricately linked to their sociodemographic factors and everyday commuting experiences. The correlation studies indicated that older, affluent students generally have higher academic achievement, whereas individuals with longer, more expensive, and challenging commutes—especially when studying beyond their local barangay—encounter heightened educational and emotional difficulties. Stress regularly appeared as a significant component, inversely correlated with both academic achievement and well-being, and directly linked to detrimental travel conditions, including long distances, inadequate road access, and higher travel expenses.

The multiple regression models substantiated these correlations by identifying age, income, stress, travel conditions, and average well-being as important predictors of academic success. Likewise, well-being was influenced not only by academic achievement but also by life satisfaction, health, and daily travel experiences. These findings affirm that school travel transcends mere logistical necessity; it significantly influences children's mental health, educational engagement, and general quality of life, especially for children from marginalized or geographically isolated communities.

The Structural Equation Model offered a comprehensive analysis of these relationships, confirming that transportation satisfaction is a key determinant of student well-being and indirectly affects academic achievement. Travel duration and distance, although not directly influencing well-being, affect it indirectly through the mediating factor of transport satisfaction. Significantly, well-being functions as a vital mediator, connecting travel experiences to students' academic achievement and stress management. This stratified, relational model explains the psychosocial mechanisms by which infrastructure and daily commuting influence educational outcomes.

The analysis highlights the pressing necessity for cohesive, equity-focused transport and education strategies. Enhancing the quality of transport services—regarding safety, punctuality, accessibility, and affordability—coupled with improvements in road infrastructure, can provide both tangible and psychosocial advantages for students. Policymakers should incorporate well-being measures into evaluations of school transport systems, ensuring that educational planning considers not just academic achievement but also the daily experiences of students whose educational journeys extend beyond the classroom.

7. RECOMMENDATIONS AND FUTURE STUDIES

The outcomes of this study highlight the significant impact of school travel experiences on the academic achievement and psychosocial well-being of students, especially those from marginalized or geographically isolated communities. It is advised that local governments and educational planners prioritize improvements in the quality of school transport services,

focusing on safety, comfort, punctuality, affordability, and accessibility. Enhancements in road infrastructure, especially in rural areas, should be prioritized to alleviate travel-related stress and commuting challenges. The incorporation of psychological well-being metrics into the assessment frameworks of school transport systems is equally important, guaranteeing that student health, life satisfaction, and emotional resilience are evaluated alongside operational efficiency.

Initiatives aimed at vulnerable populations—such as fare discounts, complimentary school transportation, or targeted school placements for underprivileged students—should be augmented to enhance equal educational access. Furthermore, schools are urged to establish health and well-being promotion activities, offering coping strategies and psychosocial assistance for students facing prolonged or challenging travels. These strategies collectively seek to enhance both educational achievement and the daily emotional experiences of school children.

Future research should include longitudinal studies that examine the long-term effects of school travel conditions on educational and psychological results. Utilizing qualitative and mixed-method approaches would provide profound insights into students' commuting experiences. Broadening the geographic scope and incorporating various educational levels would facilitate the identification of context-specific trends and difficulties. Moreover, intervention-focused research evaluating the impacts of policy modifications or infrastructure enhancements would yield significant, evidence-based recommendations for practice. Finally, investigating further mediating and moderating variables, such as parental support or resilience, could enhance the comprehension of how school travel influences children's academic and emotional well-being. These directives emphasize the necessity for cohesive, equity-centered transport and educational strategies that tackle both logistical and psychosocial aspects of school commuting.

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