

The Influence of Educational Service Quality and Instructional Quality on Students' Learning Satisfaction in Senior Secondary Schools Along the Indonesia-Malaysia Border

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ABSTRACT

Objective: This study examines the influence of service quality and learning quality on high school students' learning satisfaction in the Indonesia-Malaysia border region of Sanggau Regency, West Kalimantan. Learning satisfaction is conceptualized as a reflection of students' well-being and the fulfillment of their educational needs based on Maslow's Hierarchy of Needs. **Method:** A quantitative explanatory survey was conducted involving 277 twelfth-grade students from five senior secondary schools. Data were collected using a structured questionnaire adapted from SERVQUAL, the TIMSS 2019 framework, and the Students' Learning Satisfaction Questionnaire (SLSQ). Content validity was assessed using Aiken's V, while hypothesis testing employed the Disjoint Two-Stage Higher-Order PLS-SEM approach using SmartPLS 4. **Results:** Service quality had a positive and significant effect on learning satisfaction ($\beta = 0.460$; $t = 4.520$; $p < 0.001$; $f^2 = 0.214$), as did learning quality ($\beta = 0.333$; $t = 3.026$; $p = 0.001$; $f^2 = 0.113$). Together, both predictors explained 54.8% of the variance in learning satisfaction ($R^2 = 0.548$), with strong predictive relevance ($Q^2 = 0.522$). At the higher-order level, Assurance (loading = 0.911), Supportive Climate (loading = 0.929), and Learning Outcomes & Individual Characteristics (loading = 0.908) were the strongest dimensions reflecting service quality, learning quality, and learning satisfaction, respectively. **Novelty:** The study integrates institutional service quality, learning quality, and student learning satisfaction within a higher-order PLS-SEM framework in border-region education.

INTRODUCTION

The evaluation of educational quality today no longer relies solely on academic achievement but also on student learning satisfaction, which reflects the totality of their educational experience. This satisfaction encompasses students' perceptions of the school environment, the effectiveness of instruction, and opportunities for self-actualization. Students who feel satisfied tend to demonstrate higher levels of motivation, academic engagement, and psychological well-being; conversely, low satisfaction risks reducing participation and persistence in learning. Therefore, identifying the factors that shape learning satisfaction has become a priority in educational research.

Previous research has consistently identified the quality of school services as a key determinant of satisfaction, generally adopting the SERVQUAL model, which focuses on administrative and managerial aspects—physical facilities, responsiveness, assurance, reliability, and institutional empathy (Alves & Raposo, 2007; Annamdevula & Bellamkonda, 2016; Parasuraman et al., 1988). Although important, this approach tends to view satisfaction from the perspective of institutional bureaucracy and does not sufficiently capture the dynamics of learning experienced by students in the classroom on a daily basis. To address this gap, contemporary research trends are shifting toward the importance of instructional quality. Based on the TIMSS 2019 framework, three key dimensions—classroom management, supportive climate, and cognitive activation—

have been shown to directly influence student engagement and achievement (Senden et al., 2023). However, conceptual models that examine both institutional service quality and teaching quality simultaneously remain very rare.

These theoretical limitations become even more apparent when confronted with the reality of educational institutions in the Indonesia-Malaysia border region. High schools along the border continue to grapple with infrastructure limitations, unequal access to resources, and a lack of digital connectivity. Amid these geographical obstacles, the effectiveness of teachers' instruction and a responsive school service system are expected to serve as catalysts for creating a conducive learning environment. However, empirical evidence on how these two variables interact to influence student satisfaction in border regions remains very limited. Another weakness of previous studies lies in the conceptualization of learning satisfaction itself, which is often reduced to a business management framework—such as customer loyalty or consumer satisfaction—a framework that fails to capture the deepest essence of the educational process.

This study offers a new perspective by conceptualizing learning satisfaction as a form of student well-being rooted in Maslow's Hierarchy of Needs. From this perspective, students achieve genuine satisfaction when their basic needs—physiological, safety, social, self-esteem, and self-actualization—are progressively met through school facilities and meaningful learning processes. This concept is operationalized using the Student Learning Satisfaction Questionnaire (SLSQ) by (Topala & Tomozii, 2014), which measures five main dimensions: material facilities, learning atmosphere, peer relationships, teachers' pedagogical performance, and individual learning outcomes.

Based on the identification of these conceptual, contextual, and empirical gaps, this study proposes an integrated model that combines the SERVQUAL dimensions, the TIMSS 2019 framework, and the SLSQ instrument, grounded in Maslow's Theory. Thus, satisfaction is no longer viewed merely as a service evaluation score but as a holistic indicator of students' happiness and well-being. This study aims to analyze the influence of educational service quality and teaching quality on the learning satisfaction of high school students in the Indonesia-Malaysia border region, Sanggau Regency, West Kalimantan.

More specifically, this study aims to examine the influence of the quality of educational services and the quality of teaching on student learning satisfaction at senior high schools (SMA) in the Indonesia-Malaysia border region, Sanggau Regency, West Kalimantan. To achieve this objective, the following three research questions were formulated: (1) Does the quality of educational services have a significant effect on student learning satisfaction? (2) Does the quality of teaching have a significant effect on student learning satisfaction? and (3) Do the quality of educational services and the quality of teaching simultaneously have a significant effect on student learning satisfaction?.

RESEARCH METHOD

This study employed a quantitative approach with an explanatory survey design to examine the effects of service quality and learning quality on student learning satisfaction. The population comprised 900 twelfth-grade students from five senior secondary schools in the border region of Sanggau Regency, West Kalimantan. The sample size was determined using Slovin's formula with a 5% margin of error, resulting in 277 respondents. Respondents were selected through stratified random sampling

based on school, with proportional allocation according to the student population of each school, followed by simple random sampling within each stratum.

Data were collected using a closed-ended questionnaire with a five-point Likert scale, administered through a hybrid method combining paper-based questionnaires and Google Forms to accommodate limited internet access in the border region. The instrument integrated three established frameworks: SERVQUAL for service quality (Parasuraman et al., 1988), the TIMSS 2019 framework for learning quality (Senden et al., 2023), and the *Students' Learning Satisfaction Questionnaire* (SLSQ) for student learning satisfaction (Topala & Tomozii, 2014). Content validity was examined through Aiken's V coefficient derived from expert judgment. The resulting V-values were compared with the critical threshold established by Aiken's table, determined by the number of raters and the scale categories used in the instrument (Aiken, 1985).

Data were analyzed using PLS-SEM with SmartPLS 4. The three study variables were specified as higher-order constructs (HOCs) comprising several lower-order constructs (LOCs). Service quality consisted of *Tangibles*, *Reliability*, *Responsiveness*, *Assurance*, and *Empathy*; learning quality comprised *Classroom Management*, *Cognitive Activation*, and *Supportive Climate*; while student learning satisfaction consisted of *Material Conditions & Learning Facilities*, *Teacher & Instructional Activity*, *Learning Environment*, *Peer Relationships*, and *Learning Outcomes and Individual Characteristics*.

Instrument development commenced with a content validity assessment conducted via expert judgment. Inter-rater agreement was quantified using Aiken's V coefficient, with the calculated values benchmarked against the critical thresholds in Aiken's significance table based on the number of expert raters and response scale categories. All indicator items across the three constructs—Service Quality, Learning Quality, and Student Learning Satisfaction—demonstrated robust content validity, yielding Aiken's V coefficients between 0.87 and 1.00, well above the critical cut-off value. Following content validation, construct validity and instrument reliability were evaluated through outer model assessment in Stage 1 of the Disjoint Two-Stage Higher-Order PLS-SEM approach. In Stage 1, the first-order measurement models were evaluated for convergent validity and reliability using outer loadings ≥ 0.70 , AVE ≥ 0.50 , Cronbach's Alpha ≥ 0.70 , and Composite Reliability ≥ 0.70 . The latent variable scores of validated first-order dimensions were then extracted and used as indicators of the HOCs in Stage 2. The higher-order constructs were evaluated for reliability, convergent validity, and discriminant validity using the HTMT criterion (< 0.90). The structural model was assessed using R^2 , f^2 , and Q^2 , while hypothesis testing was conducted through bootstrapping with 5,000 resamples. Statistical significance was determined at $t > 1.96$ and $p < 0.05$ (Hair et al., 2021; Henseler et al., 2009).

Table 1. Operationalization of Research Constructs

Variable	Dimension	Indicator Codes	Number of Items	Source
Educational Service Quality	Tangibles	TP1-TP4	8	Parasuraman et al. (1988)
	Reliability	RL1-RL4	8	Parasuraman et al. (1988)
	Responsiveness	RS1-RS4	8	Parasuraman et al. (1988)
	Assurance	AS1-AS4	8	Parasuraman et al. (1988)
	Empathy	EM1-EM4	8	Parasuraman et al. (1988)
Instructional Quality	Classroom Management	CM1-CM2	6	TIMSS 2019; Senden et al. (2023)

Variable	Dimension	Indicator Codes	Number of Items	Source
Students' Learning Satisfaction	Supportive Classroom Climate	SC1-SC2	6	TIMSS 2019; Senden et al. (2023)
	Cognitive Activation	CA1-CA2	6	TIMSS 2019; Senden et al. (2023)
	Material Conditions and Learning Facilities	MF1-MF2	7	Topala & Tomozii (2014)
	Learning Environment	LE1-LE2	7	Topala & Tomozii (2014)
	Peer Relationships	PR1-PR2	7	Topala & Tomozii (2014)
	Teacher and Instructional Activities	TA1-TA2	7	Topala & Tomozii (2014)
	Learning Outcomes and Individual Characteristics	LO1-LO2	7	Topala & Tomozii (2014)

RESULTS AND DISCUSSION

Results

Content Validity (Aiken's V)

Research data were systematically collected using a closed-ended questionnaire with a Likert scale, administered to respondents through a hybrid method. Prior to data collection, the research instrument underwent content validity assessment through expert judgment. This assessment was conducted to ensure that each indicator was appropriate and adequately representative of the constructs being measured, namely Service Quality, Learning Quality, and Student Learning Satisfaction.

Table 2. Content Validity Results (Aiken's V)

Construct	Initial Items	Items Deleted	Final Items	Aiken's V Final Range
Service Quality	40	2	38	0,87-1,00
Learning Quality	18	-	18	0,87-1,00
Student Learning Satisfaction	35	-	35	0,87-1,00

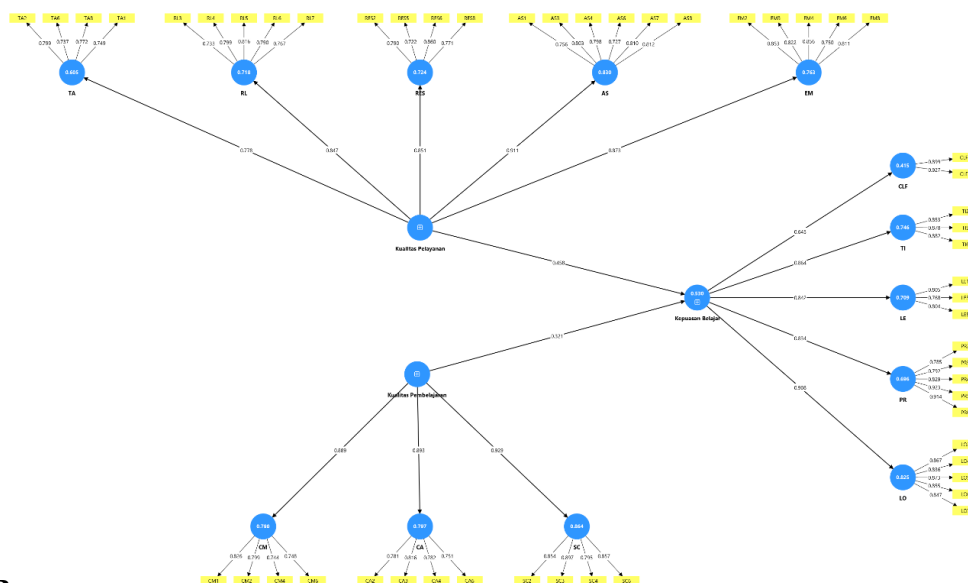
The results of the Aiken's V coefficient analysis presented in Table 2 indicate that the *Service Quality* instrument initially comprised 40 items, of which 2 items were eliminated because they did not meet the predetermined criterion. Consequently, 38 items were retained as the final instrument, with Aiken's V coefficients ranging from 0.87 to 1.00. Meanwhile, all 18 items measuring *Learning Quality* and all 35 items measuring *Student Learning Satisfaction* met the content validity criteria, with Aiken's V coefficients ranging from 0.87 to 1.00. Overall, these findings demonstrate that the research instruments achieved an adequate level of content validity based on the expert assessment.

The subsequent analysis involved evaluating the measurement and structural models using the Disjoint Two-Stage PLS-SEM approach to accommodate the multidimensional structure of the higher-order constructs. In Stage 1, the outer model

was evaluated by assessing the convergent validity and reliability of the indicators at the first-order construct level. After the first-order dimensions met the specified measurement criteria, their latent variable scores were extracted and used as indicators of the higher-order constructs in Stage 2, namely *Service Quality*, *Learning Quality*, and *Student Learning Satisfaction*. At this stage, the structural relationships and research hypotheses were examined using a bootstrapping procedure with 5,000 resamples.

The integration of the measurement model (*outer model*) and structural model (*inner model*) for the higher-order constructs is presented in Figure 1. The Stage 1 results indicate that all reflective indicators demonstrated adequate measurement quality, as evidenced by outer loadings ≥ 0.70 . In Stage 2, the latent variable scores of the validated first-order dimensions were used to represent the higher-order constructs of *Service Quality*, *Learning Quality*, and *Student Learning Satisfaction*. Structural model testing demonstrated that *Service Quality* had a positive effect on *Student Learning Satisfaction*, with a path coefficient of $\beta = 0.460$, while *Learning Quality* also showed a positive effect, with $\beta = 0.333$. The structural model produced an R^2 value of 0.548, indicating that the two exogenous constructs jointly explained 54.8% of the variance in *Student Learning Satisfaction*.

Panel A



Panel B

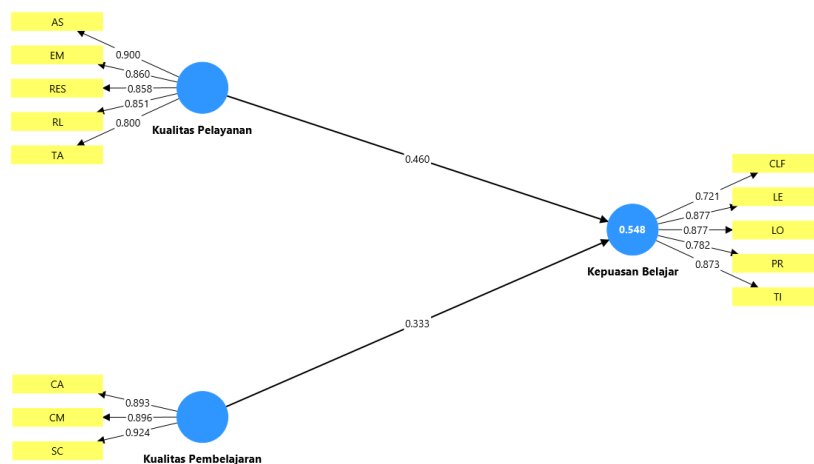


Figure 1. Disjoint Two-Stage Higher-Order PLS-SEM Model: (A) Stage 1 – Measurement Model of Lower-Order Constructs; (B) Stage 2 – Higher-Order and Structural Model.

Data analysis was conducted using the Disjoint Two-Stage Higher-Order PLS-SEM approach to ensure the accuracy of the parameter estimates shown in Figure 1. In Stage 1, the evaluation focused on the outer model at the first-order dimension level, examining the *outer loadings*, Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). Indicators with *outer loading* values below 0.70 were excluded from the model, while those meeting the specified criteria were retained to establish the final measurement model and generate latent variable scores. In Stage 2, the latent scores obtained from the validated dimensions were used as indicators to form higher-order constructs—namely, *Service Quality*, *Learning Quality*, and *Student Learning Satisfaction*. These higher-order constructs were then evaluated in terms of reliability, convergent validity, discriminant validity, and the significance of their dimension loadings using a bootstrapping procedure. The Stage 2 structural model was subsequently evaluated using bootstrapping with 5,000 resamples to test the research hypotheses, while the model's explanatory and predictive capabilities were assessed using the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2).

Evaluation of the Outer Measurement Model (Stage 1)

The outer measurement model in Stage 1, focusing on the first-order dimensions, was evaluated to assess the quality of the measurement model in terms of convergent validity and indicator reliability. The evaluation criteria included outer loadings ≥ 0.70 , internal consistency as indicated by Cronbach's Alpha (CA) ≥ 0.70 and Composite Reliability (CR) ≥ 0.70 , and convergent validity based on the Average Variance Extracted (AVE) ≥ 0.50 .

Table 3. Convergent Validity and Reliability of First-Order Dimensions (Stage 1)

Constructs' Indikator	Outer Loading	Cronbach's Alpha (CA)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Service Quality				
Tangible (TA)		0.767	0.849	0.584
TA1	0.749			
TA2	0.799			
TA6	0.737			
TA8	0.772			
Reliability (RL)		0.84	0.887	0.611
RL3	0.733			
RL4	0.799			
RL5	0.816			
RL6	0.79			
RL7	0.767			
Responsiveness (RES)		0.796	0.867	0.62
RES2	0.79			
RES5	0.722			
RES6	0.86			
RES8	0.771			
Assurance (AS)		0.875	0.906	0.616
AS1	0.756			
AS3	0.803			
AS4	0.798			
AS6	0.727			
AS7	0.81			
AS8	0.812			
Empathy (EM)		0.877	0.91	0.671
EM2	0.853			
EM3	0.822			
EM4	0.856			



Constructs' Indikator	Outer Loading	Cronbach's Alpha (CA)	Composite Reliability (CR)	Average Variance Extracted (AVE)
EM6	0.75			
EM8	0.811			
Learning Quality				
Classroom Management (CM)		0.785	0.861	0.608
CM1	0.826			
CM2	0.799			
CM4	0.744			
CM6	0.748			
Cognitive Activation (CA)		0.789	0.863	0.613
CA2	0.781			
CA3	0.816			
CA4	0.782			
CA6	0.751			
Supportive Climate (SC)		0.873	0.913	0.725
SC2	0.854			
SC3	0.897			
SC4	0.795			
SC6	0.857			
Student Learning Satisfaction				
Material Conditions & Learning Facilities (CLF)		0.801	0.909	0.834
CLF1	0.899			
CLF2	0.927			
Teacher & Instructional Activity (TI)		0.84	0.904	0.758
TI2	0.853			
TI5	0.878			
TI6	0.882			
Learning Environment (LE)		0.704	0.835	0.628
LE1	0.805			
LE3	0.768			
LE5	0.804			
Peer Relationships (PR)		0.903	0.929	0.724
PR2	0.785			
PR3	0.792			
PR4	0.829			
PR5	0.923			
PR6	0.914			
Learning Outcomes and Individual Characteristics (LO)		0.909	0.932	0.733
LO2	0.867			
LO4	0.836			
LO5	0.873			
LO6	0.855			
LO7	0.847			

Based on the estimation results presented in Table 3, all individual indicators demonstrated outer loading values above the minimum threshold of 0.70, indicating adequate measurement quality at the indicator level. Internal consistency was also confirmed by the Cronbach's Alpha and Composite Reliability values across all first-order dimensions, which consistently exceeded the minimum threshold of 0.70.

Furthermore, the Average Variance Extracted (AVE) values ranged from 0.584 to 0.834, exceeding the minimum threshold of 0.50. These findings confirm that all first-order dimensions met the criteria for convergent validity and internal consistency in the Stage 1 measurement model evaluation.

Evaluation of the Higher-Order Measurement Model (Stage 2)

The higher-order constructs were evaluated using the Disjoint Two-Stage PLS-SEM approach to assess their reliability, convergent validity, and discriminant validity. The results of the reliability and construct validity assessments are presented in Table 4, while the magnitude and significance of the first-order dimension loadings on their respective higher-order constructs are presented in Table 4.

Table 4. Reliability, Convergent Validity, and Discriminant Validity of Higher-Order Constructs (Stage 2)

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Student Learning Satisfaction	0.884	0.892	0.916	0.686
Service Quality	0.907	0.912	0.931	0.73
Learning Quality	0.888	0.893	0.931	0.817

Fornell-Larcker criterion (square roots of AVE on the diagonal)

Construct	Student Learning Satisfaction	Service Quality	Learning Quality
Student Learning Satisfaction	0.828		
Service Quality	0.705	0.854	
Learning Quality	0.672	0.736	0.904

HTMT ratios between higher-order constructs

Construct	Student Learning Satisfaction	Learning Service Quality	Learning Quality
Student Learning Satisfaction			
Service Quality	0.783		
Learning Quality	0.752	0.818	

HTMT Ratios: Satisfaction–Service Quality (0.783); Satisfaction–Learning Quality (0.752); Service Quality–Learning Quality (0.818).

Based on the results presented in Table 4, the three higher-order constructs demonstrate strong internal consistency, as indicated by Cronbach's Alpha values ranging from 0.884 to 0.907 and Composite Reliability values ranging from 0.916 to 0.931. The Average Variance Extracted (AVE) values ranged from 0.686 to 0.817, with all values exceeding the established minimum threshold. These results indicate that the higher-order constructs demonstrate adequate internal consistency and convergent validity.

Discriminant validity was also established for all three higher-order constructs. The square roots of AVE, presented on the main diagonal of the Fornell-Larcker matrix, ranged from 0.828 to 0.904 and exceeded the corresponding interconstruct correlation coefficients. This finding is further supported by the Heterotrait-Monotrait (HTMT) ratios, which were all below 0.90: Satisfaction–Service Quality (0.783), Satisfaction–Learning Quality (0.752), and Service Quality–Learning Quality (0.818). These results confirm that the three higher-order constructs demonstrate adequate discriminant validity and can be empirically distinguished from one another.

Table 5. Outer Loadings of First-Order Dimensions on Higher-Order Constructs (Stage 2)

Higher Order Construct	Dimensi	Loading	Sample mean (M)	Standard deviation (STDEV)	t-statistics (O/STDEV)	p values
Student Learning Satisfaction	CLF	0.645	0.644	0.046	14.136	0.000
	LE	0.842	0.842	0.023	36.685	0.000
	LO	0.908	0.909	0.012	75.272	0.000
	PR	0.834	0.835	0.024	35.227	0.000
	TI	0.864	0.864	0.018	48.454	0.000
Service Quality	AS	0.911	0.911	0.014	63.183	0.000
	EM	0.873	0.874	0.019	45.164	0.000
	RES	0.851	0.852	0.018	46.229	0.000
	RL	0.847	0.848	0.021	40.54	0.000
	TA	0.778	0.779	0.031	24.841	0.000
Learning Quality	CA	0.893	0.892	0.018	50.721	0.000
	CM	0.889	0.889	0.018	48.86	0.000
	SC	0.929	0.929	0.01	93.755	0.000

The results presented in Table 5 demonstrate that all first-order dimensions significantly load onto their respective higher-order constructs, as indicated by p-values < 0.001 and t-statistics > 1.96. Specifically, Assurance (AS = 0.911) exhibited the highest loading on *Service Quality*, followed by Supportive Climate (SC = 0.929), which showed the highest loading on *Learning Quality*. Meanwhile, Learning Outcomes & Individual Characteristics (LO = 0.908) demonstrated the highest loading on *Student Learning Satisfaction*. These findings indicate that the respective dimensions significantly contribute to the measurement of their corresponding higher-order constructs.

Structural Model Assessment and Hypothesis Testing (Stage 2)

The structural model was evaluated to test the hypotheses concerning the effects of *Service Quality* and *Learning Quality* on *Student Learning Satisfaction* using a bootstrapping procedure with 5,000 resamples. The results of the direct effect tests are presented in Table 6, while the model's explanatory and predictive parameters, including the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2), are presented in Table 7.

Table 6. Structural Model Hypothesis Testing Results

Path	β	Sample mean (M)	Standard deviation (STDEV)	t-statistics (O/STDEV)	p values	Result
Service Quality -> Student Learning Satisfaction	0.460	0.451	0.102	4.520	0.000	Accepted
Learning Quality -> Student Learning Satisfaction	0.333	0.344	0.11	3.026	0.001	Accepted

Based on the results presented in Table 6, the path coefficient analysis demonstrates that Service Quality has a positive and significant effect on Student Learning Satisfaction ($\beta = 0.460$; $t = 4.520$; $p < 0.001$). Therefore, Hypothesis 1 is supported. Likewise, Learning Quality has a positive and significant effect on Student Learning Satisfaction ($\beta = 0.333$; $t = 3.026$; $p = 0.001$), providing support for Hypothesis 2. These findings confirm that both Service Quality and Learning Quality are significant positive predictors of Student Learning Satisfaction.

Table 7. Effect Size (f^2), Coefficient of Determination (R^2), and Predictive Relevance (Q^2)

Construct	Effect Size (f^2) on Student Learning Satisfaction	R^2	Q^2
Service Quality	0.214		
Learning Quality	0.113		
Student Learning Satisfaction		0.548	0.522

Based on the results presented in Table 7, the coefficient of determination (R^2) value of 0.548 indicates that 54.8% of the variance in student learning satisfaction can be explained simultaneously by service quality and learning quality. In terms of the magnitude of the effect of each variable, service quality has an f^2 value of 0.214, which falls into the moderate category, while the quality of instruction has an f^2 value of 0.113, which falls within the small-to-moderate range. Furthermore, the Q^2 value of 0.522, which is greater than zero, indicates that the structural model used has very strong predictive relevance.

Discussion

This study examines the effects of Service Quality and Learning Quality on Student Learning Satisfaction at senior high schools in the Indonesia–Malaysia border region of Sanggau Regency. The analysis employed the Disjoint Two-Stage Higher-Order PLS-SEM approach to accommodate the multidimensional structure of the three constructs. The results demonstrate that both Service Quality and Learning Quality have positive and significant effects on Student Learning Satisfaction. Service Quality yielded a path coefficient of $\beta = 0.460$ ($t = 4.520$; $p < 0.001$), while Learning Quality yielded a path coefficient of $\beta = 0.333$ ($t = 3.026$; $p = 0.001$). Collectively, the two predictor variables explained 54.8% of the variance in Student Learning Satisfaction ($R^2 = 0.548$). Furthermore, the Q^2 value of 0.522 indicates that the structural model demonstrates strong predictive relevance.

These findings indicate that students' learning satisfaction is not determined solely by the quality of the learning process within the classroom but is also shaped by students' perceptions and experiences of the overall quality of institutional services provided by the school. This finding is consistent with Alves & Raposo (2007), who conceptualize educational satisfaction as a consequence of students' perceived service quality and the cumulative experiences they gain throughout the educational process.

The Effect of Service Quality on Student Learning Satisfaction

The results indicate that Service Quality has a positive and significant effect on Student Learning Satisfaction, as evidenced by $\beta = 0.460$, $t = 4.520$, and $p < 0.001$. The f^2 value of 0.214 indicates that the effect size of Service Quality on Student Learning Satisfaction is in the moderate category. Accordingly, Hypothesis 1, which states that Service Quality has a positive effect on Student Learning Satisfaction, is supported.

At the higher-order construct level, the Assurance dimension ($AS = 0.911$) demonstrated the highest loading on Service Quality, indicating that it is the most strongly reflected dimension of the construct. This was followed by Empathy ($EM = 0.873$), Responsiveness ($RES = 0.851$), Reliability ($RL = 0.847$), and Tangibles ($TA = 0.778$). All five dimensions demonstrated statistically significant loadings on the Service Quality construct.

The dominance of the Assurance dimension indicates that students place considerable importance on assurance, safety, certainty regarding school rules, and trust in the services provided by the school. This finding is consistent with the SERVQUAL

framework developed by Parasuraman et al. (1988), which conceptualizes Assurance as encompassing the knowledge, courtesy, and competence of service providers in fostering trust and a sense of security among service recipients.

The findings of this study are consistent with those of Annamdevula and Bellamkonda (2016), who demonstrated that the quality of educational services has a significant effect on student satisfaction. Similarly, (Hwang & Choi, 2019) found that the effectiveness of educational services is directly associated with student satisfaction and contributes to the development of positive perceptions of educational institutions. In the Indonesian educational context, these findings further support the study by Setiawati (2023), which demonstrated that the quality of educational services and school principal leadership contribute to student satisfaction. In addition, the findings are consistent with (Trisela & Hermanto (2022), who identified a strong relationship among excellent service, student satisfaction, and student loyalty.

Although consistent with previous studies, this research offers a distinctive contribution through its focus on educational institutions in the Indonesia-Malaysia border region. Surya et al. (2021) highlighted that the provision and governance of educational services in the outermost regions of Kalimantan face distinctive structural challenges. Within this context, the ability of schools to provide consistent, responsive, and student-centered services represents a crucial added value that shapes students' educational experiences and is recognized and appreciated by them.

The findings of this study are further supported by Maslow's Hierarchy of Needs (Maslow, 1954), which identifies the need for safety as one of the fundamental human needs. In the context of education in border regions, schools not only function as settings for academic activities but also serve as social environments that provide protection, security, and a sense of certainty for students. Therefore, the dominance of the Assurance dimension in reflecting Service Quality indicates that the fulfillment of students' need for safety constitutes an essential component of their overall educational experience.

These findings also contribute contextual insight to the literature on educational satisfaction, which has predominantly focused on higher education or urban settings. (Quintal et al. (2012) and Teeroovengadum et al. (2016) further establish the important role of service quality in shaping students' educational experiences. In contrast, the present study demonstrates that the importance of Service Quality becomes particularly pronounced when examined in educational settings characterized by geographical constraints and limited access to public facilities, as found in border regions.

The Effect of Learning Quality on Student Learning Satisfaction

Learning Quality was found to have a positive and significant effect on Student Learning Satisfaction, as indicated by $\beta = 0.333$, $t = 3.026$, and $p = 0.001$. The f^2 value of 0.113 indicates that the effect size of Learning Quality falls within the small-to-moderate range. Accordingly, Hypothesis 2, which states that Learning Quality has a positive effect on Student Learning Satisfaction, is supported. At the higher-order construct level, the Supportive Climate dimension ($SC = 0.929$) demonstrated the highest loading on Learning Quality, indicating that it is the most strongly reflected dimension of the construct. This was followed by Cognitive Activation ($CA = 0.893$) and Classroom Management ($CM = 0.889$). All three dimensions demonstrated statistically significant loadings on the Learning Quality construct.

The dominance of the Supportive Climate dimension indicates that effective learning is determined not only by academic aspects but also by the presence of a classroom climate that provides emotional and social support. A conducive learning environment can foster experiences in which students feel valued and accepted while being encouraged to actively engage in instructional activities.

These findings are consistent with Pianta et al. (2012), who emphasized the importance of positive teacher-student interactions in fostering student engagement in learning. Similarly, Skinner et al. (2008) found that a supportive classroom climate is closely associated with increased student engagement and reduced disaffection during the learning process.

In addition to Supportive Climate, the relatively high loading of Cognitive Activation highlights the importance of learning strategies that encourage students to develop critical thinking skills. Through the COACTIV project, Kunter et al. (2013) demonstrated the important role of cognitive activation in supporting learning quality, while Blömeke et al. (2016) established a direct relationship between teacher instructional quality and student learning outcomes. In relation to Student Learning Satisfaction, Chien (2007) also developed a framework emphasizing the improvement of learning quality as an important effort to enhance student satisfaction.

Theoretically, these findings can be explained through Self-Determination Theory (SDT) developed by (Deci & Ryan, 2000). A supportive learning environment can facilitate the fulfillment of students' basic psychological needs, particularly the need for relatedness, which refers to the need to feel accepted, valued, and connected to one's social environment. The fulfillment of these needs can, in turn, promote intrinsic motivation and contribute to a more satisfying learning experience.

Another noteworthy finding is that the effect size of Learning Quality ($f^2 = 0.113$) is relatively lower than that of Service Quality ($f^2 = 0.214$). This finding differs from the general trend in the literature, including Hattie (2012) and Senden et al. (2023), which generally position teaching quality as a more dominant predictor of learning satisfaction.

This discrepancy constitutes an important aspect of the novelty of the present study. In the context of schools in border regions, the role of teachers remains crucial in addressing resource constraints through supportive learning practices oriented toward Cognitive Activation. However, the empirical findings of this study indicate that the quality of institutional services, particularly services that provide a sense of security, certainty, and personal attention, exerts a stronger influence on the development of Student Learning Satisfaction.

Determinants of Student Learning Satisfaction

The results of the Stage 2 analysis indicate that Learning Outcomes and Individual Characteristics (LO = 0.908) demonstrated the highest loading in reflecting Student Learning Satisfaction. This dimension was followed by Teacher & Instructional Activity (TI = 0.864), Learning Environment (LE = 0.842), Peer Relationships (PR = 0.834), and Material Conditions & Learning Facilities (CLF = 0.645). All of these dimensions demonstrated statistically significant loadings on the higher-order construct of Student Learning Satisfaction.

These findings indicate that the availability of physical facilities is not the most dominant factor in shaping students' Student Learning Satisfaction. Instead, students' perceptions of their learning outcomes and individual characteristics, as well as their

experiences with learning activities facilitated by teachers, demonstrate stronger contributions. These findings are consistent with the multidimensional structure of the Students' Learning Satisfaction Questionnaire (SLSQ) developed by Topala & Tomozii (2014). In the context of the present study, this multidimensional structure demonstrates that Student Learning Satisfaction extends beyond students' assessment of the availability of physical school facilities and infrastructure.

These findings are consistent with the arguments of Lizzio et al. (2002) regarding the strong relationship between the quality of the learning environment and academic outcomes. This perspective is further supported by Kuh (2009), Appleton et al. (2008), and Fredricks et al. (2004), who emphasize the important role of *student engagement* in fostering meaningful and valuable educational experiences. Furthermore, empirical evidence from Vidić (2021) demonstrates a significant relationship between classroom climate, *student engagement*, and students' school satisfaction, further highlighting the important role of the social and learning environment in shaping students' satisfaction with their educational experience.

Thus, in the context of schools in border regions, limited facilities and infrastructure do not necessarily result in low Student Learning Satisfaction. The findings of this study instead demonstrate that the quality of pedagogical interactions, the learning environment, social relationships among peers, and positive perceptions of learning outcomes play crucial roles in shaping students' learning satisfaction.

The Simultaneous Effect of Service Quality and Learning Quality

The results of the structural model evaluation show that the R^2 value for Student Learning Satisfaction is 0.548. This value indicates that Service Quality and Learning Quality jointly explain 54.8% of the variance in Student Learning Satisfaction, while the remaining 45.2% is attributable to other factors not included in the research model. These findings demonstrate that the combination of the two exogenous constructs provides substantial explanatory power for variations in Student Learning Satisfaction.

Furthermore, the results of the bootstrapping analysis demonstrate that Service Quality and Learning Quality each have a positive and significant effect on Student Learning Satisfaction. Thus, both constructs can be regarded as important predictors within the Student Learning Satisfaction model. Meanwhile, the R^2 value of 0.548 indicates that the structural model has a substantial capacity to explain the variance in the endogenous construct, Student Learning Satisfaction.

Theoretical and Practical Implications and Research Contributions

The findings of this study provide theoretical implications by integrating the SERVQUAL framework, Maslow's Hierarchy of Needs, Self-Determination Theory (SDT), and the literature on student engagement to explain Student Learning Satisfaction in border regions. The dominance of the Assurance dimension in reflecting Service Quality indicates that the fulfillment of students' needs for security, certainty, and trust constitutes a fundamental component of their educational experience. In the context of border regions, schools not only serve instructional functions but also function as social environments that provide protection, security, and certainty. Meanwhile, the dominance of Supportive Climate and the substantial contribution of Cognitive Activation indicate that Learning Quality operates through an environment that facilitates students' need for relatedness while simultaneously encouraging their development and meaningful learning experiences. Thus, Student Learning Satisfaction is shaped through two

complementary mechanisms: strengthening students' sense of security through institutional services and fulfilling their psychological needs through supportive learning environments.

In practical terms, these findings indicate that improving the quality of education in border regions cannot rely solely on the provision of physical facilities. At the school level, the dominance of Assurance (0.911) and Empathy (0.873) highlights the need to strengthen service management that provides certainty, a sense of security, responsiveness, and individual attention to students. This strategy can be implemented through clear and transparent service procedures, consistent enforcement of school rules, inclusive organizational communication, timely responses to student concerns, strengthened guidance and counseling services, and capacity building for educational staff. In the instructional domain, the dominance of Supportive Climate (0.929) and Cognitive Activation (0.893) underscores the importance of teacher professional development programs focused on creating a conducive classroom climate and fostering students' higher-order thinking skills. This orientation is consistent with the principles of Total Quality Management (TQM), which place service user satisfaction at the center of quality improvement, as well as with the literature on effective teacher professional development and collaborative instructional leadership.

At the policymaking level, the finding that the contribution of Material Conditions & Learning Facilities is relatively lower than that of Learning Outcomes, Teacher & Instructional Activity, and other internal dimensions highlights the need for a more balanced approach to educational development in border regions. Although infrastructure development remains necessary, it should be accompanied by efforts to strengthen teachers' pedagogical capacity and the quality of institutional services. Policy formulation should also consider local socio-geographic characteristics through an ethnopedagogical approach and promote digital literacy to address limited access to learning resources. More broadly, these empirical findings reinforce the importance of equitable service quality and a conducive learning environment as integral components of national educational transformation.

The main contribution of this study lies in providing empirical evidence that Service Quality exerts a more decisive influence on Student Learning Satisfaction than Learning Quality in schools located in the Indonesia-Malaysia border region. Within the multidimensional framework, Assurance and Empathy emerge as the primary dimensions reflecting Service Quality, while Supportive Climate and Cognitive Activation represent the dominant dimensions of Learning Quality. For the endogenous construct, Learning Outcomes and Individual Characteristics and Teacher & Instructional Activity show the strongest loadings in reflecting Student Learning Satisfaction. These findings extend the literature on educational satisfaction, which has largely focused on higher education and urban contexts, by demonstrating that in geographic settings characterized by structural constraints, Student Learning Satisfaction is not determined solely by the availability of physical facilities, but also by the school's capacity to provide a sense of security, individual attention, a conducive social environment, and meaningful learning experiences.

CONCLUSION

Fundamental Finding: This study demonstrates that Service Quality and Learning Quality have positive and significant effects on high school students' Student Learning

Satisfaction in the Indonesia-Malaysia border region, Sanggau Regency, with Service Quality emerging as the more dominant predictor ($\beta = 0.460$; $f^2 = 0.214$) compared with Learning Quality ($\beta = 0.333$; $f^2 = 0.113$). Collectively, these two constructs explain 54.8% of the variance in Student Learning Satisfaction ($R^2 = 0.548$; $Q^2 = 0.522$). Assurance and Empathy are the dimensions that most strongly reflect Service Quality, while Supportive Climate and Cognitive Activation are the dominant dimensions reflecting Learning Quality. Meanwhile, Learning Outcomes and Individual Characteristics and Teacher & Instructional Activity show the strongest loadings in reflecting Student Learning Satisfaction. These findings confirm that student satisfaction in border-region schools is shaped not only by the classroom learning process but also by the quality of institutional services, a sense of security, a supportive social environment, and meaningful learning experiences. **Implication:** Theoretically, this study extends the application of Maslow's Hierarchy of Needs and Self-Determination Theory (SDT) by demonstrating that safe and reliable institutional services and a learning environment that fulfills students' need for relatedness constitute two complementary mechanisms in shaping Student Learning Satisfaction. Practically, schools and policymakers should strengthen student-centered services, particularly in terms of safety, responsiveness, and individual attention, while simultaneously fostering a Supportive Climate and strengthening teacher professionalism. Improving the quality of education in border regions therefore requires a balanced approach that integrates institutional services, pedagogical capacity, and infrastructure development, rather than focusing solely on the provision of physical facilities. **Limitation:** The cross-sectional design limits the study's ability to capture changes in the relationships among constructs over time, while the use of self-reported questionnaires may introduce subjectivity bias. The study was limited to 12th-grade students from five high schools in the border region of Sanggau Regency, which requires caution when generalizing the findings to other educational and geographic contexts. Furthermore, 45.2% of the variance in Student Learning Satisfaction remains attributable to factors outside the scope of the research model. **Future Research:** Future research should consider using longitudinal or mixed-methods designs to examine the development of Student Learning Satisfaction in greater depth and incorporate additional predictors, such as student engagement, academic motivation, psychological well-being, and school leadership. Comparative studies involving schools in other border regions, urban areas, and 3T contexts are also recommended to determine whether the stronger influence of Service Quality identified in this study represents a broader pattern in educational settings characterized by similar geographic and structural constraints.

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