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The Geography of Language Learning: How Region and School Type Shape English Proficiency in Costa Rica

Geografía del aprendizaje de idiomas: Cómo la región y la modalidad del colegio moldean el nivel de dominio del inglés en Costa Rica

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Abstract: *This study investigates how high school type (public vs. private) and geographic region (Greater Metropolitan Area [GMA] vs. Non-GMA) intersect to influence English language proficiency outcomes among Costa Rican students. Drawing on national data from 66 886 high school students collected by the Foreign Language Assessment Program (PELEx, for its acronym in Spanish) in 2022, the study aimed to assess whether regional context moderates the relationship between school type and proficiency scores, with a focus on the effectiveness of public bilingual programs. Two moderation models were estimated using multiple regression with robust standard errors. The first model compared typical public and private schools (excluding bilingual types), while the second examined outcomes among public bilingual programs (Experimental Bilingual Schools and Bilingual Groups) relative to private schools. Results showed that public school students in Non-GMA areas were the most disadvantaged, scoring significantly lower than peers in private GMA schools (A2 vs. B2 levels). In contrast, public bilingual programs in GMA regions performed nearly on par with private schools, but their effectiveness declined in Non-GMA areas, where most students reached only B1. These findings demonstrate how regional inequalities compound school-based disparities and highlight the importance of context-sensitive evaluation when interpreting the promise and limitations of bilingual education systems.*

Keywords*: bilingual education, language testing, English proficiency, inequality in education*

Resumen: *Este artículo demuestra cómo la modalidad del colegio (público vs. privado) y la región geográfica (Gran Área Metropolitana [GAM] vs. fuera de la GAM [No-GAM]) se intersecan para influir en los resultados de dominio del inglés entre estudiantes costarricenses. A partir del análisis de los datos de 66 886 estudiantes de secundaria recopilados por el Proyecto Evaluación en Lengua Extranjera (PELEx) en 2022, el estudio tuvo como objetivo evaluar si el contexto regional modera la relación entre el tipo de colegio y las puntuaciones de competencia, con especial énfasis en la eficacia de los programas bilingües públicos. Se estimaron dos modelos de moderación mediante regresión múltiple con errores estándar robustos. El primer modelo comparó colegios públicos y privados típicos (excluyendo los tipos bilingües), mientras que el segundo examinó los resultados de los programas bilingües públicos (Liceos Experimentales Bilingües y Secciones Bilingües) en relación con los colegios privados. Los resultados mostraron que el estudiantado de colegios públicos ubicados fuera de la GAM fueron los más desfavorecidos, pues obtuvieron puntuaciones significativamente más bajas que sus pares de colegios privados de la GAM (niveles A2 frente a B2). En contraste, los programas bilingües públicos en la GAM rindieron casi al mismo nivel que los colegios privados, pero su eficacia disminuyó fuera de la GAM, donde la mayoría de las personas estudiantes alcanzaron únicamente el nivel B1. Estos hallazgos demuestran cómo las desigualdades regionales agravan las disparidades basadas en el tipo de colegio y subrayan la importancia de una evaluación sensible al contexto al interpretar las promesas y limitaciones de los sistemas de educación bilingüe.*

Palabras clave*: educación bilingüe, evaluación de idiomas, dominio del idioma inglés, inequidad en educación*

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1. Introduction

The historical evolution of English as a global lingua franca highlights its indispensable role in communication, knowledge exchange, and economic participation worldwide. While early efforts to create international languages, such as Lazaro Ludoviko Zamenhof's Esperanto in 1887, aimed to bridge cultural divides, English has emerged as the dominant language of international interactions (Li, 2003). This dominance reinforces the urgency for non-native English-speaking regions, such as Latin America, to enhance English education to remain competitive in a globalized world.

In Latin America, the adoption of English language education has been shaped by linguistic, cultural, and historical dynamics. While Spanish and Portuguese are the dominant official languages, the region is home to hundreds of indigenous languages, which governments have sought to preserve while advancing broader educational goals (Hernández-Fernández & Rojas, 2018). For much of the 20th century, monolingual policies prioritized expanding access and reducing dropout rates, leaving foreign languages—particularly English—outside early reforms (Hernández-Fernández & Rojas, 2018). Nationalist sentiments tied to colonial legacies also delayed its inclusion in public education, restricting English instruction primarily to elite private institutions. It was only with the pressures of globalization that English began to be framed as a means for social mobility and economic growth (Starkey, 2010).

Recent policy reforms across the region have sought to expand English Language Learning (ELL), though proficiency outcomes remain modest. According to Education First's English Proficiency Index (2019), no Latin American country ranks in the high-proficiency tier. Even the stronger performers—Argentina, the Dominican Republic, and Costa Rica—show only moderate results. Nonetheless, some progress is evident: Chile tripled the percentage of students reaching B1-level proficiency between 2004 and 2016, while Colombia's Saber 11 and Uruguay's national assessments report steady improvements in reading, vocabulary, and grammar (Cronquist & Fizbein, 2017; Hernández-Fernández & Rojas, 2018).

Governments have responded by incorporating English into national curricula at earlier stages of schooling (Cronquist & Fizbein, 2017). Costa Rica was a pioneer, mandating English instruction in primary schools in 1944, decades before most of its neighbors. Since then, countries such as Mexico, Chile, Ecuador, Panama, and Brazil have implemented similar measures, though with different strategies and timelines.

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Costa Rica's sustained investment has made it a regional reference point, but internal challenges persist. Marked disparities between urban and rural areas, and between public and private schools, limit equal opportunities for language learning (Quesada et al., 2023). While national policies highlight the value of bilingualism, uneven distribution of resources continues to hinder consistent outcomes. These gaps raise important questions about whether bilingual programs are fulfilling their promise of greater equity or unintentionally reinforcing social divides.

This study contributes to that discussion by analyzing how school type (public vs. private) and geographic location (Greater Metropolitan Area [GMA] vs. Non-GMA) interact in shaping students' English proficiency. Specifically, it examines whether public bilingual programs—such as Experimental Bilingual Schools and Bilingual Groups—are producing results comparable to private institutions, and how these outcomes vary across regions. By employing moderation analyses, the study goes beyond average comparisons to assess whether regional context intensifies or mitigates the relationship between school type and proficiency.

The research is guided by the following questions:

- Main Research Question**:** How do high school type (public vs. private) and region (GMA vs. Non-GMA) affect English language proficiency scores among Costa Rican high school students?
- RQ1**:** Among typical public and private high school students (excluding public bilingual schools), how do school type and region interact to influence English proficiency?
- RQ2: Among students enrolled in bilingual high school types (Experimental Bilingual and Bilingual Groups), how does their performance compare to private school students, and how does this relationship vary by region?

2. Literature review

2.1 The implementation of bilingual programs in Latin America

Bilingual education has emerged as a key strategy for improving global competitiveness and addressing linguistic diversity within national education systems. However, its successful implementation requires a long-term, systemic approach—particularly in regions marked by entrenched inequalities. Short-term initiatives, such as overseas teacher training programs, often fail to generate sustained change. Instead, experts recommend the development of five- to ten-year national plans grounded in project management principles, with clearly defined goals, milestones, and mechanisms for evaluation (Rodríguez Garcés, 2015). Such plans must

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be informed by comprehensive research on language learning outcomes and teacher performance (Sistema de evaluación de aprendizajes [SEA], 2013), and supported through coordinated policy efforts in curriculum design, teacher development, and assessment (Ministerio de Educación del Perú, 2016).

Investment priorities also matter. While early English instruction at the primary level may yield long-term benefits, secondary education programs tend to show more immediate societal returns. Resource allocation should emphasize teacher training and instructional materials, avoiding disproportionate investments in technology that may not be sustainable in under-resourced settings (Quesada Pacheco, 2013). Above all, teacher capacity remains the linchpin of bilingual program success. Across Latin America, persistent challenges include shortages of qualified personnel, insufficient English proficiency among teachers, and outdated pedagogical models. Upgrading training curricula, implementing practical certifications such as the Certificate in Secondary English Language Teaching (CiSELT) or Certificate in English Language Teaching – Secondary (CELT-S), and offering structured language and methodology programs are essential reforms (Centro Ceibal, n.d.; SEA, 2013). Improving working conditions and elevating the professional status of teachers can further enhance recruitment and retention (Ministerio de Educación Nacional de Colombia, n.d.).

Latin American countries offer valuable insights into implementing bilingual programs. Successful cases, such as Chile's *Programa de Inglés Abre Puertas* (PIAP) and Uruguay's *Ceibal en Inglés*, show the importance of program continuity, robust institutional settings, and strong monitoring and evaluation (M&E) frameworks. Long-lasting programs often benefit from political and institutional support. For instance, PIAP's integration with Chile's Ministry of Education ensures sustained efforts over multiple administrations (Gobierno de Chile, 2014). Similarly, *Ceibal en Inglés*' collaboration with Uruguay's public education councils fosters program resilience (Centro Ceibal, n.d.). Embedding programs within national and regional education systems enhances their scalability and alignment with broader policy goals. Peru's *Inglés, Puertas al Mundo* exemplifies effective multi-sectoral collaboration (Ministerio de Educación Perú, 2016). M&E frameworks are critical for tracking progress and adapting strategies. *Ceibal en Inglés* employs online adaptive assessments to evaluate student proficiency and measure program impact in real time, ensuring data-driven and responsive interventions (SEA, 2013). Despite notable successes, challenges such as inadequate funding, limited teacher availability, and technological dependency persist. Addressing these issues requires allocating resources equitably across teacher training, curriculum development, and

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technological infrastructure (Quesada Pacheco, 2013). Programs must be tailored to the specific needs of communities, leveraging existing institutional capacities. Pilot projects should be implemented to test and refine strategies before scaling them nationally. Ensuring sustainability involves building robust institutional frameworks, fostering public-private partnerships, and continuously updating curricula and methodologies to reflect evolving educational needs (Ministerio de Educación Nacional de Colombia, n.d.).

Costa Rica represents a particularly illustrative case in the region. In the 1990s, the country began investing in bilingual education as part of broader efforts to align with global economic demands. According to Escalante and Masis (2021), during this period, foreign language proficiency became increasingly valued alongside technical and technological skills. In response, the Ministry of Public Education (MEP) launched the Experimental Bilingual High Schools (LEBs, for its acronym in Spanish) in 1994, with a curriculum emphasizing English, computing, and business management. The first LEB, Liceo José Figueres Ferrer, opened in 1995 in the province of Cartago to simultaneously promote bilingualism and alleviate student overcrowding (Marín, 2013). That same year, a second LEB was launched in Grecia, with both schools operating without dedicated infrastructure initially (MEP, 2004). By 1998, the model had expanded to other regions, including Pococí, Santa Cruz, La Trinidad, and La Cruz. Today, 17 institutions follow the LEB model, offering 14 English lessons per week across literature, grammar, listening, reading, and speaking (Escalante & Masis, 2021). Also, more recently, Costa Rica introduced the Bilingual Groups type, which now serves over 1 000 students across eight public high schools (Vargas González et al., 2024). The program includes 14 English lessons per week and supplementary coursework in business, computer science, and extracurricular workshops like theater and dance. It aims for B2 proficiency under the CEFR, positioning graduates as independent language users (Díaz Rojas, 2019; 2021).

In 2021, MEP launched new national English programs to modernize methodologies and expand resource availability (Díaz Rojas, 2021), which introduced curricular features consistent with international evidence on effective methodologies for English language teaching, which highlight the value of project-based, communicative, student-centered instruction that fosters interaction (Rakhimovna et al., 2019), the integration of authentic, real-world materials that sustain motivation and develop higher-order skills (Rao, 2019), and the effective use of digital tools, such as apps and digital dictionaries, to enhance all four language skills, particularly listening and speaking (Van et al., 2021). These reforms emphasize reaching at least a B1 level in English as part of preparing students for participation in a diverse, globalized workforce. As

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Escalante and Masis (2021) note, these efforts reflect Costa Rica's continued commitment to making bilingualism a core pillar of its educational policy.

It should be noted that the Ministry of Public Education (MEP, 2020) presents bilingualism as the ability to understand, converse, and write effectively in a second language—such as English, French, Portuguese, Mandarin, Italian, or German—and promotes this competency across all levels of the education system, from preschool through secondary school. Within this policy vision, bilingualism is tied to preparing students to communicate in real-life contexts and to acquire the skills necessary to participate confidently in a globalized world. The concept extends beyond oral fluency to include reading, writing, and cognitive processing in both languages, with strategies such as early immersion, contextualized teaching resources, and bilingual educators framed as the foundation for developing bilingual competency (Quesada Pacheco, 2024).

Bilingualism, however, extends beyond MEP's policy definition, as scholars conceptualize it as a dynamic practice shaped by interaction, identity, and context. Scholars emphasize that language proficiency is not a fixed skill measured against monolingual norms but a dynamic practice shaped by interaction, identity, and context. García and Wei (2014) describe translanguaging as the way bilinguals fluidly mobilize their full repertoire, challenging the artificial separation of languages. Hornberger and Link (2012) similarly view competence as unfolding along biliteracy continua, highlighting how meaning-making emerges through socially situated practices rather than abstract benchmarks. From a critical perspective, Flores and Rosa (2015) demonstrate that notions of "appropriateness" and "proficiency" are often filtered through raciolinguistic ideologies that privilege dominant language practices while stigmatizing others. Their work stresses that bilingualism is inseparable from social relations and power structures, where institutional assessments risk reinforcing inequities rather than recognizing students' actual linguistic abilities. Taken together, these perspectives highlight that research on bilingualism in Costa Rica can be enriched by moving beyond policy operationalizations to consider it as a socially mediated and evolving construct shaped by identity, ideology, and inequity.

2.2 Socioeconomic, Regional, and Resource-Based Disparities in EFL Outcomes in Costa Rica

Unequal English language learning outcomes are shaped by overlapping conditions—economic status, geography, school resources, and institutional support—and this intersection calls for analytic tools that model these interactions. Across both national and international

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contexts, evidence shows that disparities in English proficiency cannot be explained by a single factor alone. As Pace et al. (2017) note, Socioeconomic Status (SES) plays a foundational role in shaping language learning from early childhood through adolescence, interacting with school systems, instructional quality, and broader structural conditions. Then, SES, regional access, and the availability of educational resources converge to influence students' language development trajectories and motivations in profound and persistent ways, where more resource availability is associated with higher foreign language attainment (Alogiliy, 2024; Dong, 2024; Iwaniec, 2015; 2020; Lamb, 2012; Ma et al., 2022; 2023; Muttaqin et al., 2022; Shin & So, 2018; Xu & Jin, 2024), influencing teachers' expectations of students' attainment in foreign language learning based on their backgrounds, where lower SES background students are expected to achieve less and tend to receive less support (Auwarter & Aruguete, 2008; Ma et al., 2022).

In Costa Rica, these dynamics are clearly reflected in national assessment data. The introduction of a standardized English proficiency test in 2019 administered by the Foreign Language Assessment Program (PELEx, for its acronym in Spanish) revealed profound gaps in linguistic achievement across different educational settings. Public schools, which represented most test participants, exhibited limited proficiency levels, with 77% of students attaining only A2 proficiency on the Common European Framework of Reference for Languages (CEFR) (Araya, 2021). This level indicates basic communication skills, pointing to the urgent need for more effective teaching methodologies and resources. Public school outcomes contrasted with those of private institutions, where over half of the students achieved B1 proficiency, and nearly 28% reached B2 proficiency. These superior results in private schools are often attributed to enhanced instructional hours, better teacher training, and greater access to resources (Araya, 2021). In Costa Rica's technical schools, where programs are often tailored to bilingual professions, outcomes were somewhat better than in public schools, with 34% of students reaching the B1 level. However, the most striking results were observed in bilingual experimental schools, where intensive English language programs contributed to 58% of students achieving B1 proficiency and 14% reaching B2. These schools' success highlights the critical role of increased exposure to English, specialized curriculum design, and enriched learning environments (Araya, 2021).

Further analysis by Quesada et al. (2023) confirms these patterns, showing that students in Non-GMA (Greater Metropolitan Area) regions were overrepresented in the lower proficiency categories. Many came from rural schools, night schools, or adult education programs where

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curriculum coverage and teaching time were inconsistent. Teachers in these settings noted a lack of prior English instruction at the primary level and curriculum designs that failed to account for real classroom conditions. In contrast, students in urban GMA areas, particularly those enrolled in technical or bilingual experimental schools, were more likely to be represented in the B1 and B2 groups. While a few Non-GMA regions, such as Los Santos and Pérez Zeledón, showed moderate gains, reaching B1 proficiency by graduation remained a challenge for most schools outside urban centers.

These patterns in Costa Rica reflect not only socioeconomic and geographic disadvantage, but also systemic constraints in educational delivery that mirror conditions documented in other under-resourced contexts. As Curtis (2021) observes, schools in such environments are frequently marked by overcrowded classrooms, limited instructional time, outdated materials, and a shortage of qualified teachers. In Costa Rica, these challenges are especially pronounced in rural and Non-GMA regions, where teachers report working in classrooms separated by thin partitions, with unreliable electricity, inadequate internet access, and a lack of audio equipment—barriers that directly affect the teaching of language skills such as listening comprehension (Quesada et al., 2023).

The stratified outcomes within Costa Rica align with trends observed in other low- and middle-income countries, where bilingual education programs often mirror and reproduce existing social inequalities. In Indonesia, for example, critics have noted that bilingual schools disproportionately serve affluent families and offer vastly superior conditions compared to regular public institutions—ranging from infrastructure to teacher qualifications and international affiliations (Jayanti & Sujarwo, 2019). These parallels reveal a recurring challenge: even when national policies promote bilingualism as a tool for equity and global engagement, uneven implementation across school types and regions often results in highly differentiated learning opportunities.

One of the most visible manifestations of this unevenness in Costa Rica is the gap in access to instructional materials and technological infrastructure. Despite national efforts to integrate information and communication technologies (ICT) into the curriculum, the absence of basic tools—such as reliable internet and functioning audio equipment—continues to limit implementation, especially in Non-GMA regions. Teachers often resort to creative but unsustainable workarounds, such as pre-charging laptops at home or projecting lessons on small personal screens (Quesada et al., 2023). These conditions closely resemble those reported in other resource-limited settings, such as Nepal and South Africa, where educators

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also rely on improvisation to deliver lessons in the absence of structural support (Shrestha & Gautam, 2022; Kajee, 2011). The scarcity of appropriate teaching materials further complicates instruction, requiring Costa Rican educators to spend significant time developing or adapting content to suit their students' needs. Yet, as Quesada et al. (2023) note, access to high-quality textbooks and digital resources remains out of reach for many students due to financial constraints.

These localized challenges align with broader research showing that structural barriers—rather than pedagogical intent—frequently suppress learning outcomes. National Center on Time & Learning (2015) links reduced classroom time to lower academic performance, while Huang and Hong (2016) emphasize that the effectiveness of educational technologies depends on their strategic and context-sensitive use. Even where innovations are introduced, Adhikari (2019) asserts that infrastructure and personnel capacity remain critical to implementation. Taken together, these studies reinforce the view that material conditions and institutional capacity must be considered central variables in understanding language learning outcomes in resource-limited settings like Costa Rica.

Research across Costa Rica and comparable settings points to the compounded effects of regional, institutional, and economic factors on English learning outcomes. These effects are reflected not only in standardized test scores but also in the conditions under which instruction is delivered—ranging from disparities in teacher expertise to infrastructural constraints such as internet connectivity and classroom space (Quesada et al., 2023). Together, these findings emphasize the importance of analyzing the interaction between context and program implementation when evaluating the outcomes of bilingual education.

3. Methods

3.1. Approach

This study adopts a quantitative approach with a cross-sectional design. The research is explanatory in scope, as it examines how regional context modifies the relationship between high school type and English proficiency outcomes.

3.2. Participants

The dataset was collected in 2022 by PELEx and included 66 886 high school students from diverse educational settings across Costa Rica. Students were registered through the Ministry of Public Education (MEP), and participation was mandatory for all eligible public high

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school students but optional for private high school students. Participants were categorized by school type (public or private) and region (GMA or Non-GMA), based on the geographical zoning established by the *Instituto Nacional de Estadística y Censos* (INEC, 2019) and test location information provided by MEP. No additional filtering or exclusion was applied by the researchers. This study used a secondary dataset of de-identified data that is publicly available through PELEx. Participant consent was not individually requested, as the MEP and PELEx had established a formal agreement indicating that assessment results would be used in aggregate form for research and publication purposes. Participants were informed of this agreement prior to testing. Consequently, the study did not undergo ethical review by an Institutional Review Board (IRB).

Public schools encompassed various types, including Academic, Technical, and Scientific programs. Experimental Bilingual schools and Bilingual Groups, which focus on intensive foreign language instruction, were treated separately in some analyses due to their distinct curricula (MEP, 2004). Private schools, including fully private and semi-private institutions, generally have greater access to resources compared to public schools. Public school students represented 92.5% of the sample, while private school students accounted for 7.5% (Table 1). This distribution closely mirrors the national composition of Costa Rica's secondary system, where roughly 7% of students are enrolled in private institutions (Alfaro, 2023). Thus, although the dataset is imbalanced across sectors, it remains representative of the broader population. The relatively smaller private school subsample is nonetheless sufficiently large (n ≈ 5,000) to yield stable estimates, though results are interpreted with attention to this asymmetry.

The Greater Metropolitan Area (GMA), Costa Rica's most urbanized region, includes the capital and surrounding cities and benefits from greater access to resources. In contrast, Non-GMA regions are predominantly rural and face significant resource limitations (INEC, 2019; McCoy-Torres, 2023). Participants were nearly evenly distributed across regions, with 53.6% in GMA and 46.4% in Non-GMA areas (Table 1).

Table 1
Costa Rica: Participant Distribution by High School Type and Region, 2025

Variable	Category	n	%
School Type	Public	61 871	92.50%
	Private	5 015	7.50%
Region	GMA	35 876	53.64%
	Non-GMA	31 010	46.36%
Total		66 886	100.00%

Source: Compiled by the authors based on PELEx data, 2025.

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Building on this summary, Table 2 provides a detailed breakdown of participants by school type within each school type and region, illustrating the diversity of educational pathways represented in the dataset.

Table 2
Costa Rica: Participant Distribution by School Type, Region, and Type (ordered by Type), 2025

Type	Region	Type	n	%
Public	GMA	Academic Day	15 651	23.40
Public	Non-GMA	Academic Day	11 818	17.67
Public	GMA	Academic Night	2 470	3.69
Public	Non-GMA	Academic Night	3 967	5.93
Public	GMA	Bilingual Groups	129	0.19
Public	Non-GMA	Bilingual Groups	72	0.11
Public	GMA	CINDEA	2 247	3.36
Public	Non-GMA	CINDEA	6 127	9.16
Public	GMA	CONED	415	0.62
Public	Non-GMA	CONED	245	0.37
Public	GMA	Experimental Bilingual	1 376	2.06
Public	Non-GMA	Experimental Bilingual	786	1.18
Public	GMA	Humanistic	31	0.05
Public	Non-GMA	Humanistic	78	0.12
Public	GMA	IPEC	415	0.62
Public	Non-GMA	IPEC	751	1.12
Public	GMA	Prison	42	0.06
Private	GMA	Private	3 124	4.67
Private	Non-GMA	Private	876	1.31
Public	GMA	Scientific	79	0.12
Public	Non-GMA	Scientific	118	0.18
Private	GMA	Semi-private	870	1.30
Private	Non-GMA	Semi-private	145	0.22
Public	GMA	Technical	8 598	12.85
Public	Non-GMA	Technical	5 972	8.93
Public	GMA	Virtual	429	0.64
Public	Non-GMA	Virtual	55	0.08
		Total	66 886	100

Note: CINDEA, CONED, and IPEC serve as adult education programs aimed at non-traditional students seeking secondary education.
Source: Compiled by the authors based on PELEx data, 2025.

3.3. Measurement Instrument

As established by Araya et al. (2022), the language proficiency test PDL (for its acronym in Spanish) was developed by PELEx in collaboration with the Ministry of Public Education

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(MEP) to assess English language proficiency nationwide. The PDL consists of two separate sections: reading comprehension and listening comprehension, each comprising 50 multiple-choice items. The test is aligned with the Common European Framework of Reference for languages (CEFR) and reports results in CEFR levels (A1 to C1). The reading section measures students' ability to identify main ideas, specific details, infer meaning, and interpret tone or purpose across various text types (e.g., emails, articles, short narratives). The listening section evaluates skills such as identifying key information, understanding gist, and making inferences from audio recordings featuring different accents and formats (dialogues, announcements, interviews). Scores are computed as the average of the 50 items in each section, with higher scores indicating greater proficiency.

The test was administered online under standardized conditions in schools, during regular class hours, and supervised by trained school staff. It was delivered through a secure platform and followed uniform technical protocols across institutions to ensure consistent administration.

3.4. Statistical Method and Model Specification

This cross-sectional study employed multiple regression with moderation analysis to investigate the relationship between high school type, region, and their interaction on English proficiency scores. Moderation analysis explores whether the relationship between an independent variable (e.g., high school type) and a dependent variable (e.g., proficiency scores) changes across levels of a third variable (e.g., region) (Hayes, 2017). This approach is particularly relevant for understanding contextual disparities in education, such as how geographic location modifies the effect of school type on proficiency outcomes in the Costa Rican context. The significance level was set at $p < 0.05$. All analyses were performed in R, version 4.4.2 (*Pile of Leaves*) between August and December 2024.

The regression model is specified as follows:

$$Overall\ Score = \beta_0 + \beta_1 (High\ School\ Type) + \beta_2 (Region) + \beta_3 (High\ School\ Type \times Region) + \in$$

Where:

- Overall Score: The predicted overall proficiency score, as a function of high school type, region, and their interaction.
- β_0 : The intercept, representing the average predicted score for private schools in GMA regions.

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- β_1: The main effect of high school type, indicating how public school scores differ from private school scores, holding region constant (GMA regions).
- β_2 : The main effect of region, indicating how Non-GMA scores differ from GMA scores, holding school type constant (private schools).
- β_3: The interaction effect, capturing whether the difference between public and private school scores depends on the region.
- $\in$: The error term, accounting for unexplained variance.

Due to the high correlation between school type (public vs. private) and school type (e.g. Academic, Experimental Bilingual, Technical, Private), the two variables could not be included in the same model without introducing severe multicollinearity (VIF > 10). To address this issue, two separate models were constructed:

- Model 1: Focused on students in public and private schools, excluding bilingual types (Experimental Bilingual and Bilingual Groups). This ensured a clear comparison of performance between typical public and private schools, avoiding potential confounding effects from bilingual programs, which emphasize intensive foreign language instruction and differ substantially in their curricular focus.
- Model 2: Examined students in bilingual types (Experimental Bilingual and Bilingual Groups) to compare their performance with private school students. This model explores how bilingual programs, designed to enhance foreign language proficiency, align with or diverge from private schools, which often enjoy greater access to resources and academic support.

3.5. Model Assumptions

Before proceeding with statistical analyses, several assumptions for multiple regression analyses were inspected for both models. First, the dataset was examined for potential outliers and missing values. Using Cook's distance and Mahalanobis tests, it was confirmed that no multivariate outliers were present, and the data contained no missing values. Second, linearity was assessed using residual plots. The flat, horizontal reference lines confirmed that the linearity assumption was met. Third, as for the reliability of the measure, Araya (2021) reported that the measure has a strong internal reliability (Cronbach's alpha, α = .96). Fourth, though low levels of multicollinearity were detected, they do not violate the assumption since the Variance Inflation Factors (VIF) values are below 5 (Hair et al., 2010). Finally,

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heteroscedasticity and non-normality of residuals were detected using the Breusch-Pagan test ($p < .001$) and Shapiro-Wilk test ($p < .001$), respectively. To address these issues, robust standard errors were computed using the Huber-White sandwich estimator (HC1) in R. This adjustment ensures valid statistical inference despite the presence of heteroscedasticity and deviations from normality in the residuals (Long & Ervin, 2000).

4. Results

Research Question 1: Among typical public and private high school students (excluding public bilingual schools), how do school type and region interact to influence English proficiency?

A multiple regression analysis of English language proficiency test scores, using the Huber-White sandwich estimator, revealed that all predictors—high school type, region, and their interaction—were statistically significant ($p < .001$ for predictors, and $p = .006$ for interaction, Table 3). Together, these predictors explained 26% of the variance in test scores ($R^2 = 0.26$)— an acceptable R^2 within social science research (Ozili, 2023).

Table 3
Costa Rica: Regression Coefficients in Private vs. Public High Schools (excluding Bilingual types), 2025

Type	Estimate	SE	t-value	p-value
Intercept	38.72	0.12	314.03	$p < .001$
Type Public	-12.72	0.13	-97.27	$p < .001$
Region Non-GMA	-3.09	0.29	-10.57	$p < .001$
Type Public: Region Non-GMA	-0.82	0.30	-2.74	$p = .006$

Source: Compiled by the authors based on PELEx data, 2025.

In GMA areas, public school students scored, on average, 13 points lower than their peers in private schools, underscoring the consistent advantage of private education in urbanized regions with better resources. Estimated marginal means (Table 4) indicate that private school students in GMA regions achieved a predicted score of 38.72, compared to 26.00 for public school students.

Table 4
Costa Rica: Estimated Marginal Means in Private vs. Public High Schools (excluding Bilingual types), 2025

Type	Region	Mean	SE	95% CI
Private	GMA	38.72	0.11	[38.50, 38.94]
Public	GMA	26.00	0.04	[25.92, 26.08]
Private	Non-GMA	35.62	0.22	[35.19, 36.06]
Public	Non-GMA	22.09	0.04	[22.01, 22.17]

Note. SE= Standard Error of the Mean, 95% CI = 95% Confidence Interval
Source: Compiled by the authors based on PELEx data, 2025.

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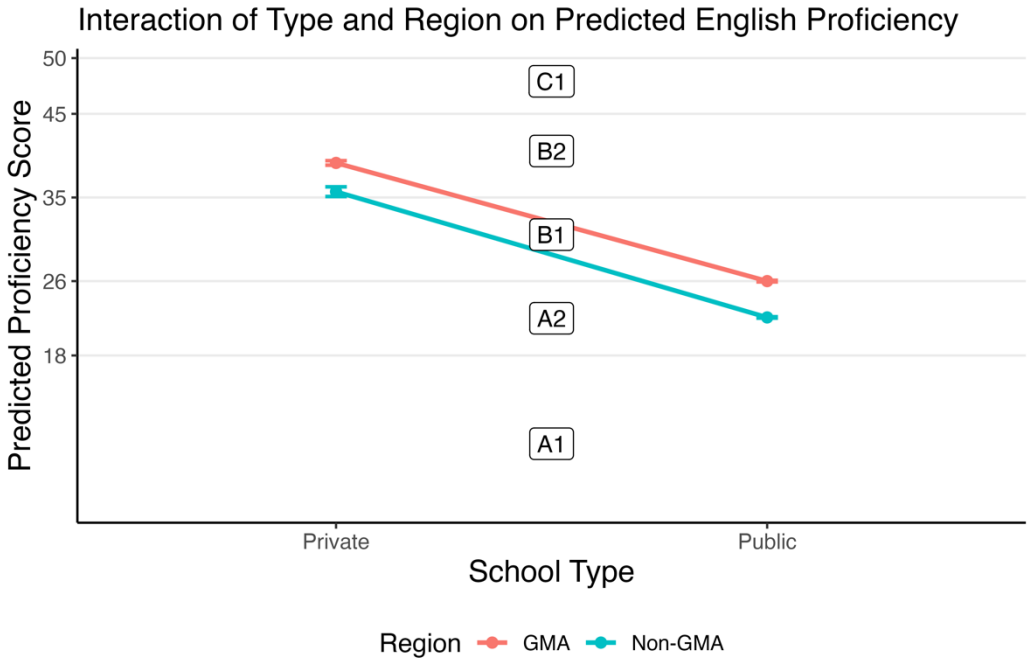
Among private school students, those from Non-GMA regions scored 3 points lower than their counterparts in GMA areas. Specifically, private school students in GMA regions had a predicted score of 38.72, while their peers in Non-GMA regions scored 35.62. This trend suggests that even private education is impacted by regional disparities.

Notably, the interaction effect revealed that the public-private school gap in test scores was exacerbated in Non-GMA regions, indicating that the combination of limited resources and public schooling creates a compounding disadvantage for students in rural areas. Public school students in Non-GMA regions achieved the lowest predicted scores, with an estimated marginal mean of 22.09, compared to 35.62 (13.5-point difference) for their private school peers.

The interaction (β_3) between high school type and region, as shown in Figure 1, highlights pronounced disparities in English language proficiency test scores. Private schools consistently—reaching a B2 level—outperform public schools, but the gap widens significantly in Non-GMA regions. Public school students in Non-GMA regions experience the greatest disadvantage, achieving the lowest predicted scores, scoring on average an A2 level.

Figure 1
Costa Rica: Predicted English Proficiency: Public vs. Private Schools Across Regions (Excluding Bilingual Types), 2025



Note: The lines above and below each point represent the 95% confidence intervals for the predicted proficiency scores. "Public" in this figure excludes students enrolled in the Bilingual types.
Source: Compiled by the authors based on PELEx data, 2025.

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This suggests that regional disparities in resources and opportunities disproportionately affect public schools, compounding the disadvantage for students in less-resourced areas. Meanwhile, private schools appear to mitigate some of the negative effects of region, with less dramatic score declines in Non-GMA areas.

In this analysis, students from Experimental Bilingual high schools and high schools with Bilingual Groups were excluded from the public high school type, as their intensive foreign language focus is expected to produce significantly different performance patterns compared to other public school types. Their results will be discussed next.

Research Question 2: Among students enrolled in bilingual high school types (Experimental Bilingual and Bilingual Groups), how does their performance compare to private school students, and how does this relationship vary by region?

By isolating students from Experimental Bilingual high schools and high schools with Bilingual Groups, a multiple regression analysis of English language proficiency test scores, using the Huber-White sandwich estimator, revealed that all predictors—high school type, region, and their interaction—were statistically significant ($p < .001$ for region and interaction; $p = .001$ for type of high school, Table 5). Together, these predictors explained 9% of the variance in test scores ($R^2 = .09$).

Table 5
Costa Rica: Regression Coefficients in Private vs. Public Bilingual High Schools, 2025

Type	Estimate	SE	t-value	p-value
Intercept	38.72	0.12	313.96	$p < .001$
Type Public Bilingual	-0.70	0.22	-3.19	$p = .001$
Region Non-GMA	-3.09	0.29	-10.57	$p < .001$
Type Public Bilingual: Region Non-GMA	-3.89	0.45	-8.71	$p < .001$

Source: Compiled by the authors based on PELEx data, 2025.

In GMA regions, students from Experimental Bilingual high schools and Bilingual Groups scored, on average, 0.70 points lower than their peers in private schools—a small difference, nearly equating their scores with those of students in private high schools, both performing at the B2 band. Estimated marginal means (Table 6) indicate that students in private schools in GMA regions achieved a predicted score of 38.72, compared to 38.02 for students in Experimental Bilingual high schools and Bilingual Groups.

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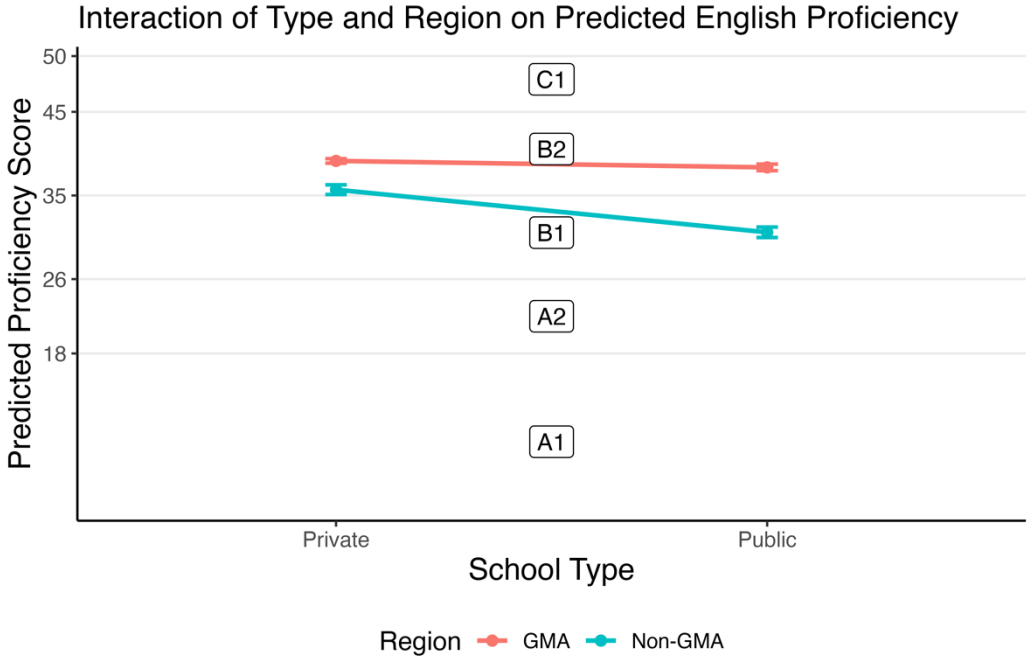
Table 6
Costa Rica: Estimated Marginal Means in Private vs. Public Bilingual High School Types, 2025

Type	Region	Mean	SE	95% CI
Private	GMA	38.72	0.12	[38.48, 38.96]
Public Bilingual	GMA	38.02	0.20	[37.63, 38.42]
Private	Non-GMA	35.62	0.24	[35.15, 36.10]
Public Bilingual	Non-GMA	31.04	0.27	[30.52, 31.56]

Note. SE= Standard Error of the Mean, 95% CI = 95% Confidence Interval
Source: Compiled by the authors based on PELEx data, 2025.

The interaction effect (β_3), as shown in Figure 2, demonstrated that the small gap between Experimental Bilingual high schools and Bilingual Groups in GMA regions was magnified in Non-GMA regions, suggesting that students in these rural areas experience a compounded disadvantage compared to their counterparts in GMA regions. Specifically, students in Experimental Bilingual high schools and Bilingual Groups in Non-GMA regions had a predicted score of 31.04, compared to 35.62 (4.6-point difference) for private school students in the same region. This widening gap highlights the significant resource disparities that persist in Non-GMA areas, even among schools with intensive foreign language programs.

Figure 2
Costa Rica: Impact of Bilingual Types on Predicted English Proficiency Across Regions, 2025



Note: The lines above and below each point represent the 95% confidence intervals for the predicted proficiency scores. "Public" in this figure only includes students enrolled in the Bilingual types.
Source: Compiled by the authors based on PELEx data, 2025.

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While concerning, students from Experimental Bilingual high schools and Bilingual Groups in Non-GMA areas scored, on average, 7.7 points lower than their peers in private schools in GMA regions (placing them one CEFR band below, at a B1 level). Notably, this gap is smaller than the 16.6-point disparity observed between other public schools in Non-GMA areas and private schools in GMA regions (placing them two CEFR bands below, Figure 1), underscoring the relative success of bilingual programs in mitigating resource-related disadvantages in rural areas.

5. Conclusions

This study examined how high school type and region interact to influence English language proficiency in Costa Rican students, focusing separately on typical public and private schools and bilingual types. The findings provide critical insights into structural inequities and the effectiveness of bilingual programs, informing practical strategies to improve educational outcomes.

Research Question 1: Public vs. Private Schools (Excluding Bilingual Types)

The interaction between high school type and region revealed that public school students in Non-GMA areas face the greatest disadvantage, scoring significantly lower than their private school peers in the same regions. Specifically, public school students in Non-GMA areas achieved a predicted score of 22.09, compared to 35.62 for private school students, reflecting a 13.5-point gap. This disparity illustrates the compounding challenges of rural resource limitations and public schooling. In GMA regions, the gap between public and private schools narrowed to 13 points, with public schools achieving a predicted score of 26.00 and private schools 38.72. These findings align with prior research on the urban-rural divide in resource accessibility (Alogiliy, 2024; Dong, 2024; INEC, 2019; Iwaniec, 2015; 2020; Lamb, 2012; Ma et al., 2022; 2023; Muttaqin et al., 2022; Shin & So, 2018; Xu & Jin, 2024).

Research Question 2: Experimental Bilingual High Schools and Bilingual Groups

In bilingual schools, the interaction effect demonstrated a different dynamic. In GMA regions, students in Experimental Bilingual high schools and Bilingual Groups performed nearly on par with private school students, scoring 38.02 and 38.72, respectively—a negligible difference of 0.70 points. However, in Non-GMA regions, this gap widened significantly. Bilingual school students in Non-GMA areas scored 31.04, while private school students scored

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35.62, a 4.6-point difference. While this disparity is smaller than the 13.5-point gap observed among typical public schools, it highlights the persistent disadvantage faced by rural students, even in specialized programs designed to enhance language proficiency. The success of Experimental Bilingual schools and Bilingual Groups in narrowing the public-private gap in GMA regions demonstrates the promise of targeted curricular approaches. However, the widening gap in rural Non-GMA regions underscores the challenge of replicating this success under resource constraints.

These findings draw attention to critical priorities for policy and practice in Costa Rican bilingual education. First, the pronounced disparities in English proficiency between public and private schools in Non-GMA regions highlight the urgent need for targeted investment in rural education. Addressing these inequities requires prioritizing resources such as teacher training, language-specific materials, and extracurricular programs tailored to improve proficiency outcomes for rural students (Tucker-Drob & Bates, 2016). Second, the relative success of Experimental Bilingual schools and Bilingual Groups in reducing the public-private performance gap in GMA regions suggests that scaling such programs to underserved Non-GMA areas may help bridge regional disparities. However, successful implementation depends on addressing the unique challenges of rural schools, including limited infrastructure, recruitment of qualified teachers, and sustained financial and technical support. Finally, these findings advocate for a broader, system-wide approach to equitable bilingual education. Policymakers must focus on creating consistent monitoring mechanisms to evaluate program effectiveness and ensure that interventions align with the specific needs of both urban and rural schools. Engaging local stakeholders, including educators and communities, is essential to designing contextually relevant and sustainable solutions, as seen in Chile, Peru, and Uruguay (Centro Ceibal, n.d.; Gobierno de Chile, 2014; Ministerio de Educación Perú, 2016).

Several limitations should be considered. First, this study focused exclusively on high school students and did not include individual-level socioeconomic data such as parental education or household income, which are known to influence language proficiency. However, the distinction between Greater Metropolitan Area (GMA) and Non-GMA regions was used as a proxy for socioeconomic disparities, given well-documented differences in infrastructure, access to resources, and educational opportunity across these geographic zones. Still, region alone cannot capture the full complexity of SES. Second, while the dataset provides a comprehensive national snapshot, it also reflects the asymmetry of Costa Rica's secondary system, where approximately 7% of students attend private schools (Alfaro, 2023). Although

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this smaller private school subsample (n ≈ 5,000) is sufficiently large for stable estimation, the imbalance warrants cautious interpretation of public–private comparisons. Third, longitudinal analyses are needed to evaluate the sustained effects of school type and region on language outcomes. Future research should also examine other school types within the public system to assess how they compare to bilingual programs and private schools across both urban and rural areas.

To summarize, this study examines the promise and challenge of bilingual education in Costa Rica by exploring how school type and regional disparities influence English language proficiency. Bilingual programs demonstrate promise in narrowing the public-private gap in urban GMA regions, but the challenge remains to understand and address the persistent disadvantages faced by public school students in rural Non-GMA areas. These findings highlight the structural inequities within Costa Rica's education system and stress the importance of tailored solutions that consider the unique needs of both urban and rural schools.

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