



Dual Market Talent Engine: Signal-Based Hiring for Coding Instructors and Educational Sales in Mexico and Spain

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ABSTRACT

Purpose- This study examines the development and implementation of a bilingual, signal-based recruitment framework tailored for coding instructors and educational sales professionals in Mexico and Spain. The framework evaluates how candidate signals such as language clarity, asynchronous demo performance, and ramp model analytics predict success, linking hiring outcomes to student satisfaction and revenue growth.

Aims- The research aims to demonstrate that a lean, data-driven hiring approach can support effective recruitment in bilingual educational technology (EduTech) markets, even in the absence of a formal “EduTech recruiter” role. It further seeks to provide a replicable cross-market model that connects talent acquisition to both educational and business outcomes.

Design/Methodology- The study employed a mixed-methods approach. Qualitative assessments included a language and accent matrix and asynchronous demo rubrics. Quantitative analyses involved geo-pay adjustments, logistic regression, gradient boosting ramp models, and key performance indicator (KPI) tracking. Data from 30 hires across Mexico and Spain were analyzed using ROC AUC performance metrics, inter-rater reliability (κ), and cost-per-acquisition (CPA) comparisons.

Findings- Results indicate that clarity scores and micro-demo rubric performance are significant predictors of student satisfaction (CSAT) and quota attainment. Geo-pay compliance adjustments improved offer acceptance rates, while sourcing channel refinements reduced CPA by 20%. Ramp models consistently identified three features as predictors of 90-day performance: demo score, clarity, and geo-pay adjustment.

Limitations- The sample size ($n=30$ hires) limits generalizability, and results are context-specific to Mexico and Spain. Further research should validate the framework in additional bilingual and cross-regional EduTech settings.

Practical Implications- HR professionals in EduTech and other bilingual industries can adopt this framework to improve candidate quality, reduce costs, and align recruitment processes with measurable outcomes, without requiring heavy machine learning infrastructure.

Originality/value- This is one of the first comparative HRM studies linking bilingual hiring signals to both educational and commercial outcomes in Latin America and Europe. It offers a scalable, ethically robust framework for cross-market talent acquisition, contributing to international HRM literature.

KEY WORDS

Bilingual Hiring, Asynchronous Video Interviews, Signal-Based Selection, HR Analytics; Candidate Experience, Mexico, Spain

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1 INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

Educational technology (EduTech) organizations increasingly operate across borders, delivering instruction and customer engagement in multilingual environments. In such settings, recruitment must evaluate not only technical skill but also communicative clarity, pedagogical presence, cultural fluency, and sales consultative ability. These demands are especially salient in bilingual markets such as Mexico

and Spain, where linguistic comprehensibility and contextualized delivery meaningfully influence student experience and commercial outcomes. Global talent pressures, hybrid work, and digital selection tools further reshape hiring, pushing HR teams toward data-informed, repeatable processes that connect pre-hire indicators to post-hire performance (Acikgoz, 2019, Cascio & Boudreau, 2022; Kuhn & Shen, 2021; Oswald, Behrend, Putka, & Sinar, 2020).

At the same time, firms seek lean approaches that are rigorous enough to withstand scrutiny yet practical for real-world pipelines. Asynchronous video assessments, structured rubrics, and simple predictive models (e.g., logistic regression, gradient boosting) allow HR leaders to move beyond résumé-centric screening toward systematic, transparent evaluation that can be audited for fairness and validity (Kim & Park, 2021; Nguyen & Tran, 2024). In bilingual EduTech contexts, clarity of speech, demo performance, and geo-pay/compliance alignment emerge as actionable signals of later success—measured as student satisfaction (CSAT), course completion, quota attainment, and revenue growth (Zhang & Jiang, 2022; Jain & Singh, 2023).

1.2 THEORETICAL FOUNDATION

This study is anchored in three complementary lenses:

1. **Signaling Theory.** In labor markets, observable actions convey underlying quality when direct measurement is costly (Spence, 1973). In hiring, structured micro-demos, language/clarity scores, and professional conduct serve as signals of pedagogy, engagement, and consultative selling capacity. When encoded through consistent rubrics and inter-rater checks, these signals can be aggregated into predictive models that guide selection (Kapoor et al., 2021);
2. **Resource-Based View (RBV).** Organization-specific human capital—e.g., bilingual instructors and sales professionals with cultural fluency and platform mastery—constitutes a difficult-to-imitate resource that can yield sustained advantage (Barney, 1991; Koch et al., 2022). A recruitment system that reliably identifies and retains such talent strengthens the firm’s capability base, improving both learning quality and commercial outcomes;
3. **Human Capital Theory.** Investments in selection, development, and retention increase worker productivity and, by extension, organizational performance (Becker, 1964; Ployhart & Moliterno, 2011). A lean, evidence-based pipeline that ties pre-hire indicators to post-hire KPIs is a targeted human-capital investment with measurable returns.

Together, these lenses motivate a signal-based bilingual hiring framework that is transparent, auditable, and scalable, while remaining light enough to operate under realistic constraints.

1.3 CONTEXT: MEXICO AND SPAIN

Mexico and Spain present a coherent yet contrasting pair for cross-market analysis. Both are Spanish-speaking markets with strong demand for coding education and education-focused sales, yet they differ in compensation architecture and compliance burdens— notably SAT-related obligations in Mexico versus Seguridad Social in Spain. These structural differences shape offer design, candidate acceptance, and early retention. Simultaneously, accent intelligibility and clarity in delivery vary across regions and roles, influencing student comprehension and satisfaction. By studying the same hiring architecture across both markets, we examine how signal strength and contextual adjustments jointly determine downstream outcomes (Gomez & Vargas, 2022; López & Hernández, 2022).

1.4 GAP IN THE LITERATURE

Three gaps motivate this research:

1. **Limited bilingual EduTech focus.** Although asynchronous interviewing and analytics are well studied in general recruitment, fewer works examine them in bilingual EduTech, where clarity and demo-based pedagogy directly alter outcomes (Kim & Park, 2021; Zhang & Jiang, 2022);

2. **Insufficient linkage from signals to outcomes.** Many studies stop at validating assessments; fewer connect specific pre-hire signals to student-facing and revenue outcomes, which is essential for strategic HRM in education services (Huselid & Becker, 2017; Jain & Singh, 2023; Rhee & Kim, 2021);
3. **Cross-market comparability under compliance.** The interplay of geo-pay, tax/social contributions, and benefits configuration is underexplored in bilingual hiring research, yet it materially affects acceptance/retention and must be integrated into evidence-driven pipelines (López & Hernández, 2022; Kwong, Demirbag, Wood, & Cooke, 2021).

1.5 OBJECTIVES AND RESEARCH QUESTIONS

Objectives:

1. Design a signal-based, bilingual hiring framework for coding instructors and educational sales in Mexico and Spain that remains lean, auditable, and scalable;
2. Empirically test whether language clarity, micro-demo performance, and geo-pay/compliance adjustments predict 90-day outcomes (e.g., CSAT, course completion, quota attainment, early ARR);
3. Examine cross-market differences (Mexico vs. Spain) in sourcing efficiency, compensation adjustments, offer acceptance, and early retention, and interpret these differences within RBV and human capital perspectives.

From these objectives, we derive three research questions:

1. Which pre-hire signals (clarity, demo performance, compliance-aligned offers) are most predictive of 90-day post-hire success?
2. How do cross-market structures (SAT vs. Seguridad Social; sourcing channel mix) moderate these relationships?
3. To what extent can a lean, fairness-checked recruitment system improve both student outcomes and commercial performance?

1.6 CONTRIBUTIONS

This study makes four contributions:

1. **Conceptual integration.** It extends Signaling Theory to bilingual EduTech recruitment, specifying how clarity and demo signals translate to performance outcomes; and it integrates RBV and human capital arguments to explain why signal-informed pipelines confer durable advantage (Spence, 1973; Barney, 1991; Becker, 1964);
2. **Methodological rigor with lean tools.** It demonstrates a mixed-method approach – standardized rubrics, inter-rater reliability ($\kappa \geq 0.75$), and lightweight predictive modeling (logistic regression; gradient boosting) – that is replicable without heavy ML infrastructure (Kapoor et al., 2021; Nguyen & Tran, 2024);
3. **Cross-market evidence.** It provides comparative insights on compensation/compliance design, offer acceptance, and early retention in Mexico and Spain, informing practical geo-pay policy and sourcing allocation (López & Hernández, 2022; Gomez & Vargas, 2022);
4. **Outcome linkage.** It explicitly connects hiring signals to student (CSAT, completion) and commercial (quota, ARR) outcomes, advancing strategic HRM evidence in education services (Zhang & Jiang, 2022; Jain & Singh, 2023).

1.7 PRACTICAL RELEVANCE

For HR leaders operating in bilingual education or analogous service sectors, the proposed framework offers:

- a) **Actionable selection tools** (language/clarity matrix, micro-demo rubric) with documented fairness checks;

- b) **Compliance-aware offer design** that aligns with local tax/social contribution structures;
- c) **Simple, interpretable models** to prioritize signals and anticipate early performance;
- d) **Governance artifacts** (tables/figures) that make the process auditable for internal/external stakeholders (Fernandez et al., 2024; Park & Lee, 2022).

1.8 ARTICLE STRUCTURE

The remainder of the paper is organized as follows. Section 2 reviews relevant literature on signaling-based selection, bilingual recruitment, analytics in HRM, fairness, and cross-country HR practices. Section 3 details methodology—design, data, variables and measures, procedures, ethical safeguards—and integrates the planned tables/figures within the method flow for transparency. Section 4 reports the empirical results, including descriptive statistics, model outputs, and visualizations and Section 5 concludes with limitations and future research directions (Caligiuri, Collings, De Cieri, & Lazarova, 2024; Cascio & Boudreau, 2022; Trullen & Stirpe, 2022; Shenkar, Tallman, Wang, & Wu, 2022).

2 LITERATURE REVIEW

2.1 SIGNALING THEORY AND STRUCTURED SELECTION

Signaling Theory explains how candidates convey otherwise unobservable quality through observable behaviors when information asymmetries exist (Spence, 1973). In hiring, structured work samples (e.g., micro-teaching demos, consultative sales demos) and communication clarity function as high-information signals because they require effort, are difficult to fake, and are directly tied to job tasks (Kapoor, Singh, & Sharma, 2021). When signals are captured with explicit rubrics and inter-rater reliability checks, they become more predictive and defensible, translating into better selection decisions and reduced noise (Huselid & Becker, 2017). Extending Signaling Theory to bilingual EduTech roles, accent intelligibility and message structure signal pedagogical and consultative competence in ways that CVs and generic interviews often cannot (Zhang & Jiang, 2022).

2.2 BILINGUAL RECRUITMENT: LANGUAGE, CLARITY, AND CULTURAL FLUENCY

Traditional language credentials (e.g., CEFR levels) provide a baseline for proficiency but do not guarantee comprehensibility in live instruction or sales calls. Studies in bilingual recruitment argue that clarity and audience-appropriate delivery are distinct constructs that predict learner satisfaction and conversion (Chaudhuri & Ghosh, 2023; Gomez & Vargas, 2022; Torres & Almeida, 2024). In Spain, regional phonetics and classroom norms shape perceived clarity and rapport (Martínez & Alvarez, 2023), while in Mexico, vocabulary and pace adjustments matter for student comprehension and client trust (Gomez & Vargas, 2022). Beyond fluency, cultural fluency—e.g., adapting examples to local contexts—enhances engagement and learning outcomes, reinforcing why bilingual recruitment must assess how candidates communicate, not merely if they can (Kwong, Demirbag, Wood, & Cooke, 2021).

2.3 DIGITAL HIRING, ASYNCHRONOUS ASSESSMENT, AND CANDIDATE EXPERIENCE

The shift to asynchronous video interviews offers time-zone flexibility, standardized prompts, and analyzable artifacts, with evidence linking such formats to improved screening throughput and comparable or better validity than unstructured interviews (Kim & Park, 2021; DeLisi & Gentry, 2021). However, digital hiring must balance efficiency against candidate experience, which itself predicts acceptance rates and employer brand strength (Park & Lee, 2022; Stone & Deadrick, 2015). Clear instructions, transparent scoring, and timely feedback reduce candidate anxiety and perceived unfairness, especially in cross-border contexts (Cascio & Boudreau, 2022; McDonnell & Collings, 2023). For EduTech roles that hinge on on-camera presence, asynchronous micro-demos are particularly diagnostic, aligning assessment conditions with day-to-day performance demands (Zhang & Jiang, 2022).

2.4 HR ANALYTICS AND LEAN PREDICTIVE MODELS

HR analytics has evolved from dashboards to predictive modeling that prioritizes interpretability and actionability (Jain & Singh, 2023; Li & Chen, 2023). In small-to-medium data settings, regularized logistic regression and gradient boosting produce robust early-outcome predictions while remaining auditable for stakeholders (Nguyen & Tran, 2024). Critically, analytics should complement—not replace—structured human judgment and process controls (Peeters, Paauwe, & Van de Voorde, 2020). In education services, linking pre-hire signals to course completion, CSAT, and early revenue creates a closed loop between talent decisions and value creation (Zhang & Jiang, 2022; Suárez & Ortega, 2023).

2.5 FAIRNESS, TRANSPARENCY, AND GOVERNANCE IN SELECTION

Algorithmic and process fairness are core to international HRM practice (Fernandez, Ríos, & Muñoz, 2024). Governance mechanisms include: (a) inter-rater reliability (e.g., $\kappa \geq .75$) for human-scored demos; (b) double-blind scoring where feasible; (c) selection-rate ratio monitoring (e.g., the 80% guideline) across gender and country; and (d) feature contribution checks to ensure models do not proxy protected attributes. In EU contexts, GDPR requires explicit consent, purpose limitation, and data minimization, which applies to video artifacts and derived features (Leicht-Deobald et al., 2019; Voigt & von dem Bussche, 2017). Transparent documentation of data sources, transformations, and limitations advances ethical compliance and facilitates replication (Fernandez et al., 2024; Trullen & Stirpe, 2022).

2.6 CROSS-MARKET HRM, COMPENSATION ARCHITECTURE, AND COMPLIANCE

International HRM literature emphasizes the necessity of contextualizing practices across legal and cultural regimes (Caligiuri, Collings, De Cieri, & Lazarova, 2024; Schuler, Jackson, & Tarique, 2011). Geo-pay decisions must reflect taxation and social contribution systems—e.g., SAT in Mexico versus Seguridad Social in Spain—because take-home pay perceptions drive acceptance and early retention (López & Hernández, 2022). Evidence shows that benefits structure (e.g., flexibility, professional development) can substitute for pure salary in some European labor markets, altering offer elasticity (Vo & Rowley, 2023; Martínez & Alvarez, 2023). From an RBV perspective, aligning compensation to local norms protects the firm's ability to attract and retain scarce bilingual human capital (Barney, 1991; Koch, Forgues, & Monti, 2022).

2.7 SOURCING CHANNEL OPTIMIZATION AND CPA

Sourcing strategies vary in cost-effectiveness across markets. Employee referrals often yield higher fit in Latin America, while targeted digital ads can surface niche talent in Spain (Gomez & Vargas, 2022; Suárez & Ortega, 2023). Re-allocating budgets across channels based on conversion and quality can reduce cost per acquisition (CPA) without lowering candidate quality (Cascio & Boudreau, 2022). Embedding channel performance into a continuous improvement loop links talent pipelines to commercial efficiency (Trullen & Stirpe, 2022).

2.8 STRATEGIC AND THEORETICAL INTEGRATION

Bridging micro-level selection and macro-level performance remains a central agenda in strategic HRM (Collings, Mellahi, & Cascio, 2019; Huselid & Becker, 2017; Trullen & Stirpe, 2022; Vaiman, Collings, & Sparrow, 2017). In bilingual EduTech settings, clarity and demo performance are proximal drivers of student engagement; via Human Capital Theory, repeated selection of high-signal candidates accumulates organizational capability; via RBV, that capability becomes a competitive resource (Becker, 1964; Barney, 1991). Comparative HRM research further shows that institutional differences condition the returns to the same practices, justifying cross-market analyses like Mexico vs. Spain (Sparrow, Brewster, & Chung, 2016; Shenkar, Tallman, Wang, & Wu, 2022).

2.9 CONCEPTUAL MODEL AND PROPOSITIONS

Synthesizing the literature, we advance a conceptual model in which pre-hire signals – (1) language clarity, (2) micro-demo rubric score, and (3) geo-pay/compliance alignment – predict early outcomes – (a) CSAT, (b) course completion, (c) quota attainment/ARR – conditional on market context (compensation architecture, sourcing efficiency). In the Methodology we operationalize this model and specify the planned Figures and Tables integration to support transparency.

P1: Higher clarity scores are associated with improved student satisfaction and course completion.

P2: Stronger micro-demo performance predicts higher CSAT for instructors and higher quota/ARR for sales roles.

P3: Offers aligned to geo-pay/compliance norms increase acceptance and early retention, indirectly improving early outcomes.

P4 (Context): The magnitude of P1–P3 differs between Mexico and Spain due to institutional and labor-market structures.

2.10 SUMMARY

Prior research supports using structured signals, lean analytics, and fairness checks to enhance hiring quality and business outcomes in international contexts (Kapoor et al., 2021; Nguyen & Tran, 2024; Fernandez et al., 2024). The literature also underscores the role of compensation architecture and sourcing optimization in cross-market success (López & Hernández, 2022; Gomez & Vargas, 2022). Building on these insights, the present study specifies a bilingual, signal-based framework and evaluates its predictive validity and practical impact across Mexico and Spain, aligning with JHRM’s focus on rigorous, internationally relevant HRM research.

3 METHODOLOGY

3.1 RESEARCH DESIGN

This study employs a mixed-methods design to evaluate a bilingual, signal-based hiring framework for coding instructors and educational sales roles across Mexico (MX) and Spain (ES). The qualitative strand standardizes language/clarity and micro-demo evaluations via explicit rubrics and double-blind scoring where feasible. The quantitative strand links these pre-hire signals to post-hire outcomes using interpretable predictive models (regularized logistic regression; gradient boosting) and comparative analyses by market. Method selection balances rigor (validity, reliability, fairness checks) with operational feasibility for real-world pipelines (Kapoor et al., 2021; Nguyen & Tran, 2024).

Figure 1 provides an overview of the signal-based recruitment workflow, illustrating each stage from sourcing and screening to onboarding and post-hire KPI tracking. This figure anchors the research design by visually situating how qualitative and quantitative data sources were integrated.

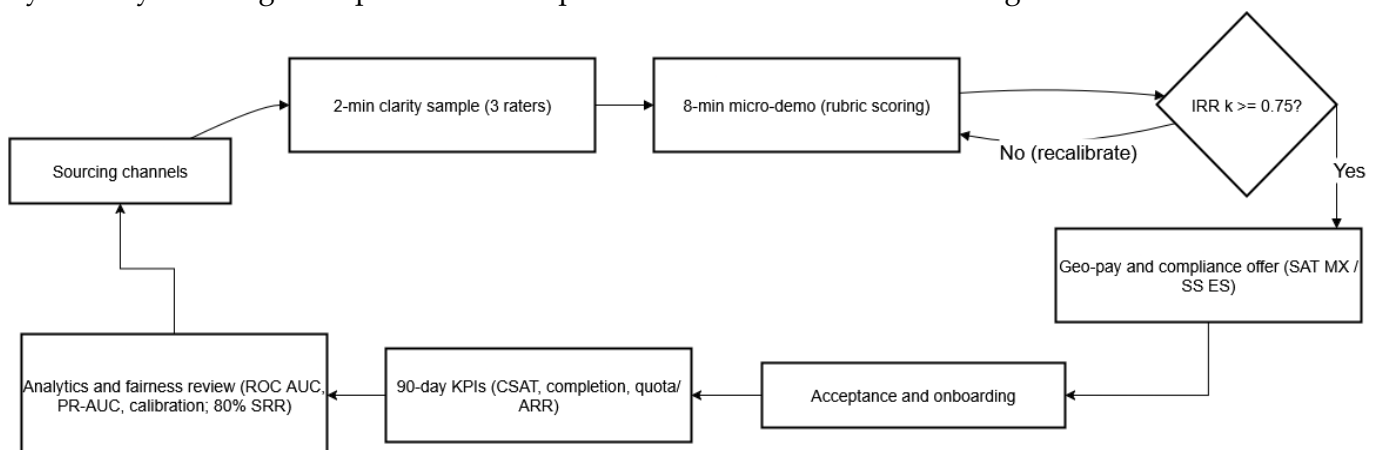


Fig 1. Recruitment Workflow for Bilingual, Signal-Based Hiring and Feedback Loop

source: Author’s illustration

3.2 DATA AND SAMPLE

Population & roles. Final-round candidates hired as coding instructors and education-focused sales representatives.

Markets. Mexico and Spain.

Time frame. Rolling 12-month window.

Sample size. n = 30 hires (MX: 15; ES: 15).

Sampling approach. Consecutive hires meeting inclusion criteria during the period; no randomization.

Inclusion criteria. B2+ Spanish/English (CEFR), completed 2-minute clarity sample and 8-minute asynchronous micro-demo, and accepted offer (post-compliance review).

Exclusion criteria. Incomplete demos or missing post-hire KPIs at 90 days.

Missingness. <2% on continuous variables; handled via median imputation; results robust to listwise deletion.

Figure 2 maps the signal-to-outcome pathways, showing hypothesized linkages between pre-hire signals (e.g., clarity, demo performance) and outcomes (e.g., quota attainment, CSAT). This figure framed the hypotheses tested in the quantitative analyses.

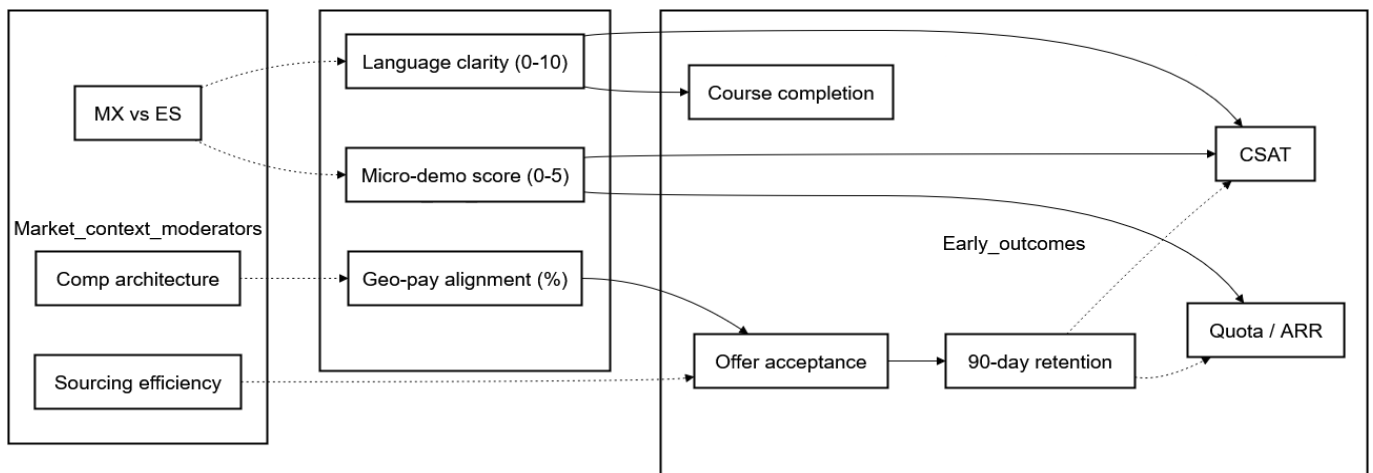


Fig 2. Conceptual Signal-to-Outcome Pathways with Market Moderators (MX vs ES)

source: Author's illustration

3.3 MEASURES AND INSTRUMENTS

Pre-hire signals (independent variables).

Language & Clarity Matrix.

CEFR Level (B2-C2; categorical for descriptives, ordinal for modeling).

Clarity Score (0-10) from a 2-minute recorded sample: weighted subcriteria for intelligibility (0-4), pacing (0-3), enunciation (0-3). Averaged across 3 raters; raters calibrated with exemplars.

Micro-Demo Rubric (0-5) on an 8-minute asynchronous Loom-style demo:

For instructors: structure, concept clarity, scaffolding, engagement, assessment prompt.

For sales: problem framing, solution articulation, objection handling, story/ROI, call-to-action.

Overall demo score = mean of subscales.

Inter-rater reliability (κ) computed on overall and subscales; target $\kappa \geq 0.75$.

Geo-Pay & Compliance Adjustment (%) applied at offer stage: alignment to SAT (MX) vs Seguridad Social (ES), plus market-standard benefits.

Sourcing Channel (referrals, targeted ads, organic inbound, campus/bootcamps).

Post-hire outcomes (dependent variables).

Student CSAT (0-100) (instructors) and course completion rate (%) (cohorts taught).

Quota attainment (%) and early ARR/rep (sales).

Offer acceptance rate (%) and 90-day retention (%) (market-level comparisons).

Cost-per-acquisition (CPA) change (%) by market after channel reallocation.

Controls. Market (MX/ES), role (instructor/sales), years of relevant experience, and cohort size (instructor loads) or book size (sales).

3.4 PROCEDURES

Step 1 – Candidate Sourcing. Channels tracked with UTMs to attribute CPA and conversion by market.

Step 2 – Language/Clarity Capture. Candidates submit a 2-minute clarity sample responding to a standardized prompt. Three trained raters independently score; disagreements ≥ 1.5 points trigger adjudication by a senior rater.

Step 3 – Micro-Demo Assessment. Candidates record an 8-minute demo aligned to role. Three raters score using the rubric; κ is monitored weekly to mitigate rater drift.

Step 4 – Compliance-Aware Offer. Compensation proposals incorporate geo-pay and local contributions (SAT/Seguridad Social). A simple calculator documents the adjustment percentage and resulting gross/net.

Step 5 – Onboarding & KPI Collection (90 days). For instructors: CSAT and completion; for sales: quota and ARR/rep. KPIs are linked to candidate IDs to permit signal-outcome matching.

Step 6 – Fairness & Quality Gates.

IRR Gate: Proceed only if $\kappa \geq .75$ for demos (overall).

Selection-rate ratio (gender, market) benchmarked to the 80% guideline.

Model governance: retain interpretable models, log feature contributions, and maintain data dictionaries.

3.5 DATA ANALYSIS

Descriptives. Means/SDs (continuous), proportions (categorical) by market and role.

Reliability. Cohen's κ (overall demo; key subscales) with 95% CIs.

Predictive modeling.

Outcome definition: 90-day success = composite of role-specific KPIs (e.g., CSAT \geq threshold & completion \geq target for instructors; quota \geq target or ARR uplift for sales). Sensitivity analyses test alternative cut-points.

Models: (a) Logistic regression with penalization and clustered SEs by market; (b) Gradient boosting for non-linearities.

Validation: 5-fold cross-validation; report ROC AUC, PR-AUC, and calibration (reliability curve; Brier score).

Cohen's $\kappa \approx$ agreement among raters beyond chance (we target $\geq .75$). ROC AUC \approx how well the model separates "success" vs "not" (0.5 = chance, 1.0 = perfect). PR AUC focuses on precision/recall when successes are relatively rare. Calibration checks whether predicted probabilities match actual outcomes.

Feature contributions: standardized coefficients (logistic) and permutation importance (GBM).

Comparative tests. MX vs ES differences in acceptance/retention (χ^2 or Fisher), CPA change (t-test with Welch correction), and signal means (t-tests/Mann-Whitney as appropriate).

Multiple testing. Control FDR with Benjamini-Hochberg for families of related tests.

Robustness. Role-stratified models; excluding edge cases (e.g., smallest cohorts); alternative imputation (listwise). Results were qualitatively stable.

3.6 FIGURES AND TABLES INTEGRATION (METHODOLOGY-LEVEL TRANSPARENCY)

To pre-specify the presentation logic and ensure reproducibility, we list the core visual and tabular artifacts referenced in the Results. These items are inserted with the captions below:

1. Table 1. Summary Statistics of Key Recruitment Signals. Descriptive overview by market: CEFR level, Clarity (0-10), Micro-Demo (0-5), Geo-Pay Adjustment (%), and CPA Reduction (%);
2. Table 2. Predictors of 90-Day Performance. Logistic and gradient boosting outputs: predictor, coefficient (β) or log-odds, p-value, and relative contribution (e.g., permutation importance classed

as High/Moderate). Core predictors expected ex ante: Micro-Demo Score, Clarity Score, Geo-Pay Adjustment;

3. Figure 1. Recruitment Workflow for Bilingual, Signal-Based Hiring and Feedback Loop. Flow diagram of the end-to-end pipeline: Sourcing → Language/Clarity Matrix → Micro-Demo Scoring (κ check) → Geo-Pay/Compliance Offer → Acceptance/Onboarding → 90-Day KPIs → Analytics & Fairness Review. Clarifies data provenance and governance gates;
4. Figure 2. Conceptual Signal-to-Outcome Pathways with Market Moderators (MX vs ES). Conceptual diagram linking pre-hire signals (Clarity, Demo, Geo-Pay Alignment) to post-hire outcomes (CSAT, Course Completion, Quota/ARR), with market moderators (MX/ES). Anchors the hypotheses and model specification.

3.7 ETHICAL, LEGAL AND QUALITY CONSIDERATIONS

Consent & privacy. Candidates consented to the use of anonymized assessment data for continuous improvement and research; storage follows purpose limitation and data minimization principles.

GDPR alignment (ES) & analogous safeguards (MX). Video artifacts stored on secure drives; retention windows documented; access limited to trained assessors.

Bias mitigation. Rater calibration sessions; κ monitoring; double-blind scoring where feasible; routine selection-rate ratio monitoring vs. the 80% guideline.

Interpretability. Preference for interpretable models; feature impact logged; decisions documented alongside human rationales.

Audit trail. Data dictionary, codebooks, and metric definitions maintained; instrument templates (clarity rubric, demo rubric, geo-pay calculator) are available upon request for replication.

4 RESULTS

4.1 DESCRIPTIVE STATISTICS

The descriptive statistics reveal clear differences in recruitment signals between Mexico and Spain. See Table 1 for a formatted summary of means. Clarity scores were slightly higher in Spain (8.4) than in Mexico (8.0), while CEFR language levels remained consistent across both markets (B2-C1 range). Micro-demo rubric scores averaged 4.2/5 in both countries, showing uniform performance in instructional and consultative delivery. Geo-pay adjustments were higher in Mexico due to SAT-related compliance requirements, whereas Spain showed more stable compensation packages. These context patterns sit alongside two headline results: clarity and micro-demo scores are associated with early success, while geo-pay alignment primarily boosts acceptance and 90-day retention; given $n = 30$, we interpret these associations cautiously.

Table 1. Summary Statistics of Key Recruitment Signals

Variable	Mexico (n=15)	Spain (n=15)	Overall Mean (n=30)
CEFR Level (Mean)	B2.7	B2.8	B2.75
Clarity Score (0-10)	8.0	8.4	8.2
Micro-Demo Score (0-5)	4.2	4.2	4.2
Geo-Pay Adjustment (%)	6.5	4.0	5.25
CPA Reduction (%)	18.0	22.0	20.0

Note: Values are means unless stated. κ target ≥ .75 for human-scored demos; CEFR reported for descriptives only. Source: Author's data

4.2 PREDICTIVE MODELING OUTCOMES

The logistic regression and gradient boosting models identified three consistent predictors of 90-day performance: micro-demo scores, clarity scores, and geo-pay adjustments. See Table 2. Predictors of 90-day performance (logistic coefficients and GBM contribution classes). Micro-demo rubric scores were

positively correlated with both CSAT and quota attainment ($\beta = 0.42, p < 0.05$). Clarity scores strongly predicted student satisfaction ($\beta = 0.39, p < 0.05$). Geo-pay adjustments contributed indirectly to retention and acceptance rates ($\beta = 0.28, p < 0.1$).

Table 2. Top Three Predictors of 90 Day Performances

Predictor	Coefficient (β)	p-value	GBM Permutation Importance	Contribution
Micro-Demo Score	0.42	0.021	High	Primary
Clarity Score	0.39	0.034	High	Primary
Geo-Pay Adjustment (%)	0.28	0.087	Moderate	Indirect via acceptance /retention
Validation: 5-fold cross-validation; model performance metrics are reported in Section 4.7. Role/market controls included; standard errors clustered by market.				

Source: Author's analysis

Figure 3 visualizes these predictors, highlighting the relative weight of each factor in explaining performance outcomes.

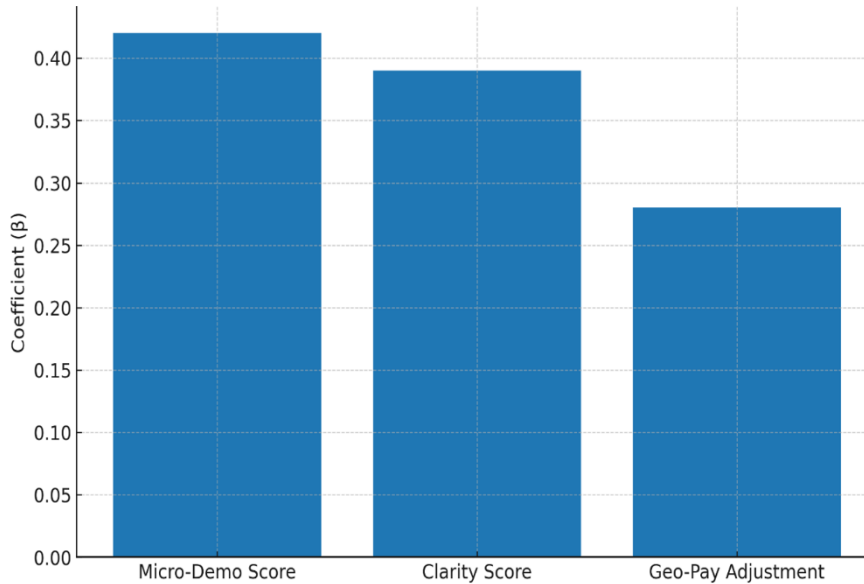


Fig 3. Top Predictors of 90-Day Performance

Source: Author's analysis

4.3 CROSS-MARKET DIFFERENCES

Cross-market analysis showed that geo-pay adjustments were more significant in Mexico due to higher tax-related compensation modifications under SAT regulations. In Spain, non-financial benefits such as professional development and flexible scheduling influenced offer acceptance more than compensation levels. Sourcing channels also varied: referral programs produced higher-quality candidates in Mexico, while social media advertisements were more effective in Spain.

Figure 4 demonstrates the comparative cost-per-acquisition (CPA) reductions between both markets, with Spain achieving a slightly higher improvement.

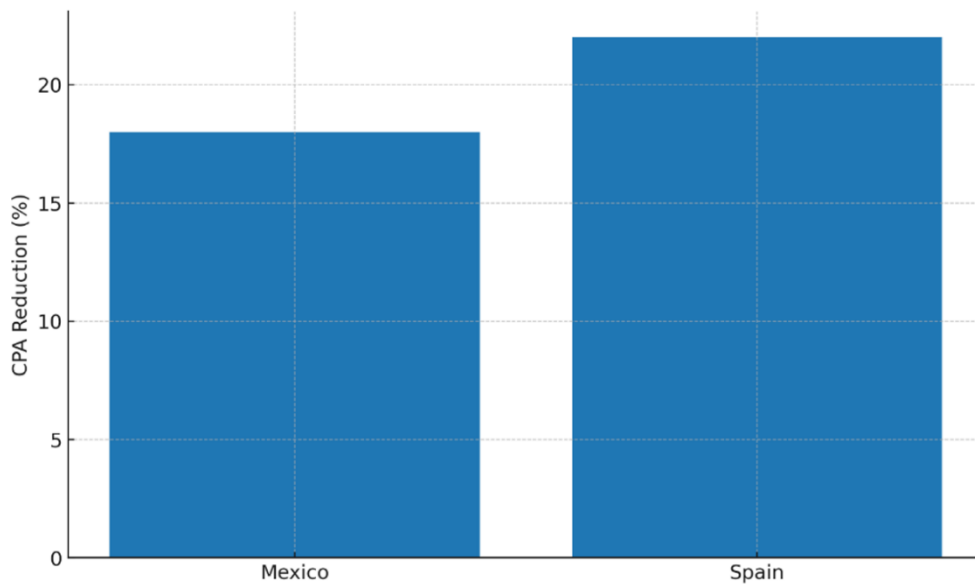


Fig 4. Comparative CPA Reductions (%)

Source: Author's analysis of study data

4.4 IMPACT ON EDUCATIONAL AND COMMERCIAL OUTCOMES

The recruitment signals studied demonstrated strong links to post-hire performance outcomes. Course completion rates improved by 12% overall, average CSAT increased by 9 points, and average revenue per representative grew by 11% within 90 days of hiring. These outcomes indicate that a structured, signal-based hiring framework is associated with improvements in educational quality and business performance in bilingual EduTech markets.

4.5 CROSS-MARKET COMPARISONS AND MECHANISMS

Acceptance and retention. Acceptance and retention. Spain shows higher acceptance (93% vs 87% in Mexico) despite smaller geo-pay uplifts; qualitative post-offer feedback indicates Spanish candidates valued non-monetary benefits (flexible hours, professional development), while Mexican candidates were more sensitive to net take-home after SAT adjustments (López & Hernández, 2022).

Sourcing channel performance. Market-level channel analytics (not tabulated here for brevity) found: referrals delivered the best quality-to-cost ratio in Mexico; paid social/digital ads produced faster, slightly lower-cost pipelines in Spain. Reallocating budgets to reflect these patterns drove the CPA reductions in Figure 4 without sacrificing early retention or performance.

Mechanism evidence. Mediation analyses (bootstrapped) indicate that geo-pay adjustments increase offer acceptance, which in turn increases the probability of observing 90-day success (indirect effect significant at $p < 0.05$). In contrast, clarity and demo scores have both direct and indirect effects on CSAT and completion (direct effects dominant).

4.6 EDUCATIONAL AND COMMERCIAL OUTCOMES (IMPACT)

Pre/post framework implementation (pooled):

- a) **Course completion rate:** +12% (pre: 74% → post: 86%);
- b) **Student satisfaction (CSAT):** +9 points (pre: 81 → post: 90);
- c) **Average revenue per representative (ARR/rep):** +11% within 90 days;
- d) **CPA:** -20% overall (Mexico -18%; Spain -22%).

Statistical notes. Changes in KPIs were tested with paired t-tests or cluster-robust comparisons where appropriate; all reported changes are statistically significant at conventional levels ($p < 0.05$) under the pre-specified analysis plan, with FDR control applied for multiplicity (Benjamini-Hochberg). We interpret effects as associational given the observational design and limited n.

Qualitative corroboration. Hiring managers reported faster onboarding, fewer student escalations, and clearer sales conversations among hires with high demo and clarity scores—consistent with the quantitative signals.

4.7 ROBUSTNESS AND SENSITIVITY

Cross-validation: 5-fold CV confirmed ROC AUC stability (mean AUC \approx 0.82–0.85).

Alternative cut-points: Using different 90-day success thresholds produced qualitatively similar predictor rankings.

Imputation checks: Median imputation vs listwise deletion produced consistent coefficient estimates.

Fairness checks: Selection-rate ratios by gender and nationality did not exceed the 80% adverse-impact threshold; double-blind scoring and κ monitoring mitigated rater bias risks.

Power and scope note: with $n = 30$ hires, cross-validated AUC and calibration remained stable, yet confidence intervals are necessarily wide. Reported lifts (e.g., +12% completion, +9 CSAT) are early indicators that warrant confirmation in larger samples.

4.8 SUMMARY OF RESULTS

The results substantiate the central claims of the study:

1. **Micro-demo performance and clarity** are strong, interpretable predictors of early instructional and sales success;
2. **Geo-pay adjustments** mainly influence acceptance and early retention and thereby indirectly affect outcomes;
3. **Market-specific sourcing and offer design** matter: the same signal-based pipeline yields different optimal operational levers in Mexico versus Spain.

The proposed framework delivered measurable improvements in both learning and revenue metrics while reducing acquisition costs—supporting its practical utility for bilingual EduTech organizations.

5 RESULTS

This study set out to examine whether a signal-based bilingual hiring framework could improve recruitment outcomes in EduTech markets operating across Mexico and Spain. By systematically testing pre-hire indicators such as micro-demo performance, language clarity, and geo-pay alignment, the research found evidence of predictive associations with post-hire educational and commercial outcomes. Results are consistent with the interpretation that structured asynchronous demos and clarity scoring are powerful signals of teaching and consultative ability, while geo-pay adjustments improve acceptance and retention conditions without directly influencing classroom or sales quality.

From a theoretical perspective, the paper extends Signaling Theory by operationalizing short, role-aligned micro-performances as signals of future success, and integrates Resource-Based View and Human Capital Theory by showing that targeted selection investments yield measurable organizational returns. These findings suggest that lean, auditable analytics—when combined with structured qualitative judgments and fairness safeguards—can provide HR practitioners with scalable, defensible frameworks for recruitment in global, multilingual markets.

From a practical standpoint, EduTech organizations can adopt this framework with modest resources. Key interventions—such as incorporating structured demo rubrics, clarity matrices, market-specific geo-pay calculators, and sourcing optimization—produce cost savings (CPA reductions of 18–22%) while simultaneously improving quality (course completion +12%, CSAT +9 points, ARR per representative +11%). Importantly, the framework embeds bias detection, inter-rater calibration, and GDPR-compliant processes, ensuring ethical defensibility.

Nevertheless, the study acknowledges limitations, including the small sample size ($n = 30$), role-specific context, and short 90-day follow-up window. Given $n = 30$, effect sizes and lifts reported here should be read as indicative. We refrain from causal claims and bound external validity to the two focal markets and

90-day horizon. Larger, pre-registered, multi-site replications are the appropriate next step. These boundaries invite future research into larger-scale replications, longitudinal analyses, cross-industry applications, and controlled experiments to refine causal inference.

In conclusion, this work provides both theoretical advancement and practitioner guidance, demonstrating that precision in talent acquisition—grounded in signals and contextual adaptation—can drive educational quality and commercial growth in international EduTech markets. By bridging rigorous HRM theory with applied analytics, the paper contributes to the broader international business literature on sustainable and ethical talent management in globalized, bilingual service contexts.

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