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Digital Transformation in Ecuadorian Higher Education: Evaluating the Effectiveness of Technology-Enhanced Learning Platforms for English Language Instruction

Transformación digital en la educación superior ecuatoriana: evaluación de la eficacia de las plataformas de aprendizaje potenciadas con tecnología para la enseñanza del inglés

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ABSTRACT

This study evaluates the effectiveness of technology-enhanced learning (TEL) platforms for English language instruction at Unidad Educativa Salinas in Ecuador. Using a mixed-methods design, the study examined 30 Level A2 English learners over one academic semester, combining quantitative pre-test/post-test assessments with qualitative interviews. Pre-test scores averaged 54.2 (SD=8.67), while post-test scores increased significantly to 72.5 (SD=7.34), representing a mean gain of 18.3 points ($t(29)=10.95$, $p<.001$) with a large effect size ($d=2.01$). Qualitative analysis of 12 student interviews and 3 teacher interviews identified key themes including increased engagement, appreciation for personalized learning opportunities, and preference for blended approaches combining digital platforms with classroom instruction. Findings indicate that TEL platforms, when strategically integrated with face-to-face instruction and supported by professional development, substantially improve English language proficiency. Results suggest that Ecuadorian institutions should prioritize blended learning approaches, ensure equitable technology access, and provide comprehensive teacher training to maximize TEL effectiveness while addressing contextual challenges including limited internet infrastructure.

Keywords: technology-enhanced learning, english language teaching, mixed-methods research, ecuadorian higher education, blended learning

RESUMEN

Este estudio evalúa la efectividad de plataformas de aprendizaje mejorado por tecnología (TEL) para la instrucción del idioma inglés en la Unidad Educativa Salinas en Ecuador. Utilizando un diseño mixto, el estudio examinó 30 estudiantes de inglés nivel A2 durante un semestre académico, combinando evaluaciones cuantitativas de pre-test/post-test con entrevistas

cualitativas. Las puntuaciones de pre-test promediaron 54.2 (SD=8.67), mientras que las puntuaciones de post-test aumentaron significativamente a 72.5 (SD=7.34), representando una ganancia media de 18.3 puntos (t(29)=10.95, p<.001) con un tamaño de efecto grande (d=2.01). El análisis cualitativo de 12 entrevistas con estudiantes y 3 con maestros identificó temas clave incluyendo mayor engagement, apreciación por oportunidades de aprendizaje personalizado y preferencia por enfoques mixtos que combinan plataformas digitales con instrucción en aula. Los hallazgos indican que las plataformas TEL, cuando se integran estratégicamente con instrucción presencial y se apoyan con desarrollo profesional, mejoran sustancialmente la proficiencia en inglés. Los resultados sugieren que las instituciones ecuatorianas deben priorizar enfoques de aprendizaje mixto, asegurar acceso equitativo a tecnología y proporcionar capacitación docente integral.

Palabras clave: aprendizaje mejorado por tecnología, enseñanza del idioma inglés, investigación mixta, educación superior ecuatoriana, aprendizaje mixto

INTRODUCTION

Digital transformation in higher education has become imperative as educational institutions worldwide adapt to the demands of increasingly digitalized societies (Baigabylov et al., 2025; Mondragon-Estrada et al., 2023). This transformation extends beyond mere technology adoption; it fundamentally restructures how institutions teach, learn, and create value (Mondragon-Estrada et al., 2023). The COVID-19 pandemic accelerated this process, compelling institutions to implement remote teaching modalities and revealing both the potential and challenges of technology integration (Mondragon-Estrada et al., 2023). Successfully navigating digital transformation requires attention to multiple dimensions simultaneously: technological infrastructure, faculty preparation, pedagogical design, and equitable access for diverse learners (Choi-Lundberg et al., 2023).

In Ecuador, higher education faces distinctive opportunities and challenges within this digital transformation landscape. Ecuadorian institutions, particularly public universities serving the majority of students, operate with constrained resources that limit investment in cutting-edge technology and comprehensive professional development (López-Goyez et al., 2025). Internet connectivity varies significantly across regions, with rural institutions experiencing particular challenges. Despite these constraints, Ecuadorian educators demonstrate significant initiative and interest in implementing innovative digital solutions (López-Goyez et al., 2025). English language instruction represents a particularly important domain for technology integration in Ecuador, as English proficiency has become essential for professional competitiveness in global markets (Duque & Garzón, 2024).

Technology-enhanced learning (TEL) platforms offer promising solutions for improving English language instruction. When designed according to sound pedagogical principles, these platforms enable access to authentic language input, facilitate interactive communication practice, provide personalized feedback, and create opportunities for collaborative learning (Hwang & Chang, 2025). Effective TEL implementation requires alignment among platform design, pedagogical principles, teacher preparation, and learner characteristics (Orozco-Messana et al., 2020). Research demonstrates that technology alone does not improve learning; rather, strategic integration of digital tools with classroom instruction maximizes effectiveness (Kee, Kuys, & Zhang, 2025).

This study addresses a significant gap in the literature by evaluating the effectiveness of technology-enhanced learning platforms for English language instruction within the specific context of Ecuadorian secondary education. The research question guiding this investigation is: How effective are technology-enhanced learning platforms for improving English language proficiency among Level A2 learners at Unidad Educativa Salinas in Ecuador? Specific objectives include: (1) to measure changes in English language proficiency through quantitative pre-test and

post-test assessments; (2) to understand student experiences and perceptions of technology-enhanced learning through qualitative interviews; (3) to identify factors supporting effectiveness and barriers to implementation; and (4) to generate recommendations for technology integration in Ecuadorian educational contexts. Findings from this study contribute to understanding how TEL can be effectively implemented in resource-limited contexts while promoting educational equity and improving language learning outcomes.

Theoretical Framework and Literature Review

Digital Transformation in Higher Education

Digital transformation in higher education represents a fundamental shift in how educational institutions operate, teach, and learn in the contemporary world. This transformation extends beyond the mere adoption of technology; it encompasses a comprehensive restructuring of educational processes, institutional strategies, and organizational cultures (Baigabylov et al., 2025). The digital transformation movement emerged from the recognition that traditional educational models are insufficient for preparing students in an increasingly digitalized society, where technological competence and digital literacy have become essential skills for professional success. The concept of digital transformation in higher education can be understood as the integration of digital technologies throughout all aspects of the educational institution, fundamentally changing how value is created, delivered, and captured (Mondragon-Estrada et al., 2023). This transformation encompasses not only the technological infrastructure but also the pedagogical approaches, institutional policies, and human resources management. According to Baigabylov et al. (2025), identifying risks in the digital transformation of higher education is crucial for successful implementation. These risks include technological obsolescence, inadequate faculty training, resistance to change, and the potential widening of the digital divide among students from different socioeconomic backgrounds. The digital transformation of higher education has been accelerated by global events, particularly the COVID-19 pandemic, which forced institutions to rapidly adopt remote teaching and learning modalities. Mondragon-Estrada et al. (2023) examined how professors' experiences during emergency remote teaching revealed both challenges and opportunities for fostering sustainable digital transformation. Their research highlighted that while the transition was often chaotic and underprepared, it provided valuable insights into the necessity of comprehensive institutional planning for digital integration. This experience demonstrated that digital transformation requires not only technological infrastructure but also adequate pedagogical support, professional development, and institutional commitment. The effectiveness of digital transformation in higher education depends on several key factors. First, institutional leadership must demonstrate clear commitment and vision for digital integration. Second, faculty members require comprehensive training and support to effectively utilize digital tools. Third, students need adequate digital literacy instruction to maximize the benefits of technology-enhanced learning. Fourth, institutions must ensure equitable access to

technology and internet connectivity for all students. Orozco-Messana et al. (2020) emphasized that sustainable higher education development through technology-enhanced learning requires a holistic approach that considers pedagogical, technical, and organizational dimensions simultaneously. Furthermore, the digital transformation process must be contextualized within each institution's specific circumstances, resources, and educational goals. One-size-fits-all approaches to digital transformation often fail because they do not account for institutional culture, existing infrastructure, student populations, and regional economic conditions. Choi-Lundberg et al. (2023) conducted a systematic review of digital innovations in technology-enhanced learning designs in higher education, revealing that successful implementations shared common characteristics: clear pedagogical rationale, adequate technical support, faculty training programs, and ongoing evaluation of effectiveness. These elements are essential for ensuring that digital transformation leads to improved learning outcomes rather than merely adding technology without meaningful educational benefit. The implications of digital transformation for higher education are profound and multifaceted. Institutions that successfully navigate this transformation can enhance student engagement, improve accessibility for diverse learners, enable more personalized learning experiences, and better prepare graduates for digitalized workplaces. However, without careful planning and implementation, digital transformation can exacerbate existing inequalities, create additional burdens for faculty, and result in technology adoption without corresponding pedagogical improvements. Therefore, understanding the theoretical foundations and practical implications of digital transformation is essential for educational leaders and researchers working to improve higher education in the twenty-first century.

Technology-Enhanced Learning (TEL)

Technology-Enhanced Learning (TEL) represents a strategic approach to integrating technology into educational processes with the explicit goal of enhancing student learning outcomes and educational effectiveness. Unlike simple technology adoption, TEL is grounded in sound pedagogical principles and research-based practices that ensure technology serves clear educational objectives (Choi-Lundberg et al., 2023). TEL encompasses a wide range of technologies and approaches, including learning management systems, digital assessment platforms, virtual and augmented reality applications, artificial intelligence-driven tutoring systems, and collaborative online tools. The theoretical foundations of TEL draw from multiple educational paradigms, including constructivism, social learning theory, and self-determination theory. Hwang and Chang (2025) developed a self-determination theory-based digital gaming approach to enhance EFL learners' competence in applying professional English, demonstrating how theoretical frameworks can guide the design of effective technology-enhanced learning experiences. Their research showed that when digital tools are designed with attention to learners' intrinsic motivation, autonomy, and competence development, they produce significantly better

learning outcomes than technology implemented without theoretical grounding. One particularly valuable framework for understanding TEL implementation is the Pedagogy-Space-Technology (PST) framework. Kee, Kuys, and Zhang (2025) utilized this framework to develop an architecture for synchronous hybrid peer learning, demonstrating how thoughtful integration of pedagogical principles, physical and virtual learning spaces, and appropriate technologies can create powerful learning environments. This framework helps educators move beyond thinking of technology as a standalone tool and instead consider how pedagogy, space, and technology must be carefully aligned to support learning objectives. The scope of TEL applications is extensive. Digital assessment platforms represent one important category of TEL tools. Slade et al. (2024) conducted a pedagogical evaluation of an institution's digital assessment platform, integrating pedagogical, technical, and contextual factors. Their research revealed that successful digital assessment requires not only technical functionality but also careful consideration of how assessment tools align with learning objectives, support meaningful feedback, and promote authentic learning. The integration of these multiple dimensions is what distinguishes TEL from mere technology adoption. Personalization and adaptivity are increasingly important dimensions of contemporary TEL. P.T.S., Chacko, and Kumar (2025) conducted a systematic review of personalized and gamified e-learning for neurodivergent learners, highlighting how TEL can be designed to meet the diverse needs of student populations. Their research emphasizes that one-size-fits-all approaches to digital learning are insufficient; rather, technology should enable customization of learning pathways, pacing, and presentation modes to accommodate individual differences. This perspective aligns with broader trends toward learner-centred education where technology enables greater individualization of the learning experience. Another emerging dimension of TEL involves the use of artificial intelligence and machine learning to optimize learning environments and support educators. Liu et al. (2025) analyzed the application and optimization of digital situated teaching in university finance courses from a constructivist perspective using machine learning algorithms. Their findings demonstrate that AI-driven analytics can provide valuable insights into student learning patterns, identify at-risk students early, and enable educators to make evidence-based adjustments to instructional approaches. However, they also emphasize that technology must remain in service of pedagogical goals rather than driving educational decisions independently. The evaluation and quality assurance of TEL systems is critical for ensuring their effectiveness. Zhang et al. (2025) developed an approach to evaluating the quality of digital education resources based on learners' online reviews through topic modeling and opinion mining. This research demonstrates innovative methods for gathering and analyzing learner feedback about digital resources, providing valuable data for continuous improvement of TEL systems. Additionally, Simbeck et al. (2024) conducted a systematic review of online learning for first language spelling education, identifying effective practices and critical success factors for TEL implementation in specific subject domains.

Effectiveness of Digital Platforms in Language Teaching

The effectiveness of digital platforms in language teaching has become a central concern for educators and researchers seeking to improve English language instruction outcomes. Language learning represents a particularly suitable domain for TEL applications because digital platforms can provide authentic language input, enable interactive communication practice, offer individualized feedback, and create opportunities for collaborative learning with peers and native speakers (Duque & Garzón, 2024). Research increasingly demonstrates that when digital platforms are designed with attention to language acquisition principles and learner needs, they can significantly enhance learning outcomes compared to traditional classroom instruction alone. Digital platforms for language teaching encompass a diverse range of tools and approaches. Learning management systems enable delivery of language content, assignment submission, and assessment. Specialized language learning applications provide vocabulary drills, grammar exercises, and pronunciation practice. Video platforms facilitate exposure to authentic language input and cultural content. Virtual classrooms enable synchronous interaction and communication practice. Artificial intelligence-driven systems provide adaptive learning pathways that adjust to individual learner proficiency levels. Each of these tools can contribute to language learning when implemented thoughtfully (Kimsesiz, 2023). Kimsesiz's examination of digitalized self-directed language learning practices of tertiary level EFL learners in Türkiye revealed that self-directed digital learning can be highly effective when learners possess adequate digital literacy, motivation, and metacognitive skills. The role of motivation and engagement in digital language learning platforms is particularly significant. Hwang and Chang (2025) found that self-determination theory-based design principles—specifically addressing learners' autonomy, competence, and relatedness—substantially improved EFL learners' engagement with digital platforms and their achievement in applying professional English. Their research demonstrates that simply providing technology is insufficient; platforms must be designed to support learner autonomy, create experiences of competence and progress, and foster meaningful relationships among learners. When these psychological needs are addressed through platform design, learners demonstrate greater motivation, persistence, and ultimate achievement. Interactive and collaborative features represent another critical dimension of effective digital language platforms. Kee, Kuys, and Zhang (2025) explored how synchronous hybrid peer learning architectures using the Pedagogy-Space-Technology framework can enhance language learning through structured peer interaction mediated by technology. Their research suggests that digital platforms are most effective when they facilitate meaningful interaction and collaboration rather than serving purely as content delivery mechanisms. Platforms that enable students to communicate, provide feedback to peers, and collaborate on authentic language tasks leverage social learning principles and create more engaging learning environments. The integration of emerging technologies such as artificial intelligence and virtual reality holds significant promise for language teaching. Mili (2025)

discussed the natural learning revolution enabled by AI-enhanced open learning platforms, noting how artificial intelligence can personalize learning pathways, provide immediate corrective feedback, and adapt content difficulty to learner proficiency levels. Virtual reality and immersive technologies can create authentic, contextualized language learning scenarios that simulate real-world communication situations (Li et al., 2025). These immersive environments enable learners to practice language in realistic contexts with reduced anxiety, potentially improving transfer of language skills to authentic communication situations. However, the mere availability of technologically advanced platforms does not guarantee effectiveness. Üretmen Karaoğlu and Doğan (2025) examined EFL teachers' insights on incorporating artificial intelligence in language education, revealing that successful integration of AI in language teaching requires careful attention to pedagogical principles, teacher preparation, and thoughtful consideration of what AI can and cannot effectively accomplish. While AI can automate certain aspects of language instruction (such as providing feedback on grammar accuracy), human teachers remain essential for addressing complex aspects of language development, fostering intercultural communication competence, and providing mentoring and motivation. Research on digital platform effectiveness also highlights the importance of assessment design and feedback mechanisms. Slade et al. (2024) examined how digital assessment platforms can be designed to support pedagogical goals, noting that assessment tools must provide meaningful feedback that supports learning rather than merely measuring performance. In language teaching specifically, digital platforms should provide corrective feedback on language accuracy, explain underlying language rules, and offer opportunities for practice and revision. Additionally, platforms should assess not only discrete language skills (vocabulary, grammar) but also integrated language abilities (reading comprehension, written expression) and pragmatic competence in authentic communication contexts. The effectiveness of digital platforms for language teaching is ultimately contingent upon alignment among pedagogical principles, platform design, teacher preparation, and learner characteristics. Orozco-Messana et al. (2020) argued that sustainable development through technology-enhanced learning requires consideration of multiple dimensions simultaneously. For language teaching specifically, this means ensuring that digital platforms support communicative language teaching principles, enable authentic interaction and language use, provide opportunities for meaningful feedback and revision, accommodate diverse learner needs and proficiency levels, and are supported by teachers who understand both language acquisition principles and effective use of technology. 0

Specific Context of Ecuadorian Higher Education

Ecuadorian higher education operates within a distinct institutional, social, economic, and political context that shapes the possibilities and challenges for digital transformation and technology-enhanced learning. Ecuador, as a developing nation in Latin America, faces unique circumstances that differ significantly from contexts where much of the TEL research has been

conducted (primarily in developed nations and emerging economies in Asia). Understanding these contextual factors is essential for designing and implementing effective digital transformation initiatives that are responsive to Ecuadorian educational realities and needs (López-Goyez et al., 2025). The landscape of higher education in Ecuador includes a mix of public and private institutions, with varying levels of technological infrastructure, faculty qualifications, and resources. Public universities, which serve the majority of Ecuador's higher education students, often operate with constrained budgets that limit their ability to invest in cutting-edge technology and comprehensive faculty development programs. This resource constraint represents a significant challenge for digital transformation, as meaningful technology integration requires not only hardware and software but also ongoing technical support, professional development, and maintenance. Additionally, the quality and reliability of internet connectivity vary significantly across Ecuador, with urban institutions generally having better access than those in rural or remote regions (López-Goyez et al., 2025). Despite these challenges, Ecuador has demonstrated commitment to developing its higher education system and increasing its technological capacity. The government's National Plan for Good Living and subsequent educational policies have emphasized the importance of technological integration and digital literacy for students. Several Ecuadorian institutions have begun implementing technology-enhanced learning initiatives, including the development of virtual learning environments, adoption of learning management systems, and creation of digital content repositories. López-Goyez et al. (2025) examined Intelligent Tutoring Systems in Higher Education in Ecuador, identifying both challenges and opportunities within the Ecuadorian context. Their research revealed that while technical barriers exist, there is significant interest and initiative among Ecuadorian educators to implement innovative digital solutions. The teaching of English in Ecuadorian higher education represents a particularly important domain for digital transformation. English language proficiency has become increasingly essential for Ecuadorian professionals seeking to participate in global economic and academic communities. However, English language instruction in Ecuador has traditionally relied on conventional classroom-based approaches, often limited by factors such as large class sizes, insufficient native English speakers, and limited access to authentic English language materials and interactions. Technology-enhanced learning platforms offer potential solutions to these limitations by enabling access to authentic English input, facilitating interaction with English speakers worldwide, providing individualized practice opportunities, and enabling assessment of communicative competence (Duque & Garzón, 2024). Lema et al. (2025) investigated the effective use of digital tools to enhance teaching and learning in the Ecuadorian context specifically. Their research demonstrated that digital tools, when implemented appropriately with attention to local contexts and needs, can significantly improve both teaching and learning outcomes. Importantly, their findings highlight that effective digital tool use requires not merely access to technology but also systematic training for educators, institutional support

structures, and pedagogical approaches that align technology use with clear learning objectives. The research suggests that successful digital transformation in Ecuador requires building on existing strengths within Ecuadorian institutions while addressing contextual challenges. The role of faculty preparation and professional development is particularly critical in the Ecuadorian context. Many faculty members in Ecuadorian higher education institutions completed their initial teacher preparation before digital technologies became prevalent in education and may lack experience with technology-enhanced teaching approaches. Comprehensive professional development programs are needed to help faculty understand pedagogical applications of technology, develop skills in using digital tools effectively, and cultivate confidence in technology-enhanced instruction. Research by Mondragon-Estrada et al. (2023) on faculty experiences during emergency remote teaching revealed valuable lessons applicable to the Ecuadorian context: faculty members can successfully adopt new technologies when provided with adequate support and clear pedagogical guidance, but improvised technology adoption without systematic planning often results in suboptimal learning experiences. Furthermore, the Ecuadorian context requires attention to questions of equity and access. Digital transformation initiatives must ensure that technology-enhanced learning does not widen existing inequalities but rather serves to expand educational opportunities for students from disadvantaged backgrounds. This requires attention to questions such as: Do all students have adequate access to technology and internet connectivity? Are digital platforms designed to be accessible to students with disabilities? Do pedagogical approaches accommodate diverse learning styles and prior educational experiences? Are there adequate support mechanisms for students struggling with technology use or lacking digital literacy skills? Addressing these equity concerns is essential for ensuring that digital transformation in Ecuadorian higher education benefits all students rather than privileging those already advantaged. The globalization of higher education and the increasing importance of English language proficiency create opportunities for Ecuador to leverage technology-enhanced learning in language instruction. International collaboration through digital platforms can connect Ecuadorian students with classmates and native speakers worldwide, providing authentic communication practice and cultural exchange opportunities. Virtual exchange programs, online tutoring with native speakers, and access to world-class digital language learning resources all become possible through technology. However, realizing these opportunities requires not only technological capacity but also institutional policies that support international collaboration, faculty training in facilitating global virtual learning experiences, and careful attention to ensuring that such initiatives serve pedagogical objectives and support meaningful learning rather than merely showcasing technology adoption.

METHODOLOGY

Research Design

This study employs a mixed-methods research design, combining quantitative and qualitative approaches to comprehensively evaluate the effectiveness of technology-enhanced learning platforms for English language instruction at Unidad Educativa Salinas. According to Creswell and Creswell (2017), mixed-methods research design integrates both numerical and narrative data to provide a more complete understanding of research phenomena than either approach alone. The quantitative component utilizes pre-test and post-test measurements to assess changes in students' English language proficiency, while the qualitative component incorporates student and teacher interviews and observations to capture students' experiences, perceptions, and engagement with technology-enhanced learning platforms.

The research design follows an explanatory sequential approach, where quantitative findings are explored and explained through qualitative data collection. This design is particularly appropriate for evaluating technology-enhanced learning effectiveness because it allows researchers to measure concrete learning outcomes while simultaneously understanding the contextual factors, pedagogical processes, and student experiences that influence these outcomes (Choi-Lundberg et al., 2023). The study was conducted over a complete academic semester, providing sufficient time for students to become familiar with technology-enhanced learning platforms and demonstrate measurable progress in English language proficiency.

The research design incorporates systematic observation of classroom practice, formal assessment of language proficiency, and structured interviews with participants. This triangulation of data sources—quantitative test scores, classroom observations, student interviews, and teacher insights—strengthens the validity and reliability of findings by allowing researchers to verify findings across multiple data sources and methods. According to Richards and Renandya (2002), comprehensive evaluation of language teaching effectiveness requires multiple forms of evidence rather than reliance on single assessment measures.

The ethical considerations inherent in this research were carefully addressed. Informed consent was obtained from all student participants and their parents or guardians, with particular attention to ensuring that participation was voluntary and that students understood their rights to withdraw from the study at any time without consequence. Institutional approval was obtained from Unidad Educativa Salinas administration. All data was handled confidentially, with student identities protected with codes rather than names in analysis and reporting. The research was conducted in accordance with established ethical guidelines for educational research involving human subjects.

Population and Sample

The population for this study comprises all English language learners in Level A2 courses at Unidad Educativa Salinas, an educational institution located in Salinas, Ecuador. Level A2 represents the elementary level of the Common European Framework of Reference for Languages (CEFR), indicating that participants have basic English language proficiency and can understand frequently used expressions and communicate about familiar topics. The target population includes students enrolled in ninth and tenth grade courses at Unidad Educativa Salinas during the 2025 academic year, totaling 50 students across all Level A2 English courses.

The sample consists of 30 students from the total population of 50 Level A2 English learners at Unidad Educativa Salinas, comprising both ninth-grade and tenth-grade students. This sample size is appropriate for a mixed-methods study in an educational setting and allows for robust quantitative analysis while maintaining the depth of qualitative investigation necessary to understand student experiences and engagement with technology-enhanced learning platforms. The sample of 30 students provides sufficient statistical power for meaningful analysis while remaining manageable for comprehensive qualitative data collection and analysis. According to Creswell and Creswell (2017), mixed-methods research requires larger sample sizes than purely qualitative research to enable both quantitative analysis and qualitative exploration of phenomena.

Participant selection followed a purposive sampling approach. Of the 50 students enrolled in Level A2 courses at Unidad Educativa Salinas, 30 students who met the inclusion criteria (active enrollment in Level A2, regular attendance, and willingness to participate) were selected to participate in the study. This approach ensures that the sample consists entirely of learners at the appropriate proficiency level (A2) studying English in a formal educational context and allows for meaningful representation across both grade levels and gender distribution within the institution.

RESULTS

Quantitative Findings

The quantitative analysis of pre-test and post-test English language proficiency assessments revealed significant improvements in students' language abilities following exposure to technology-enhanced learning platforms. The sample consisted of 30 students from the total population of 50 Level A2 learners at Unidad Educativa Salinas (n=30; 60% participation rate). Descriptive statistics for pre-test and post-test scores are presented in Table 1.

The pre-test assessment yielded a mean score of 54.2 (SD = 8.67), with scores ranging from 38 to 68 points out of a possible 100. The post-test assessment, administered after one complete academic semester of technology-enhanced learning integration, yielded a mean score of 72.5 (SD = 7.34), with scores ranging from 52 to 89 points. This represents a mean gain of 18.3 points (SD = 9.12) across the sample. The paired samples t-test revealed that this difference was

statistically significant, $t(29) = 10.95$, $p < .001$, indicating that students demonstrated substantial improvement in English language proficiency over the course of the study period.

Effect size calculations (Cohen's $d = 2.01$) demonstrated not only statistical significance but also practical significance, suggesting that the magnitude of improvement was substantial and educationally meaningful. According to Cohen's guidelines, effect sizes greater than 0.8 are considered large; the effect size obtained in this study ($d = 2.01$) substantially exceeds this threshold, indicating that the implementation of technology-enhanced learning platforms produced a meaningful improvement in student language proficiency.

Analysis of variance (ANOVA) examining potential differences in gains between ninth-grade students (n=16) and tenth-grade students (n=14) revealed no significant differences in learning gains, $F(1,28) = 1.24$, $p = .276$. Ninth-grade students demonstrated a mean gain of 17.8 points (SD = 9.45), while tenth-grade students demonstrated a mean gain of 18.9 points (SD = 8.78), suggesting that the effectiveness of technology-enhanced learning was consistent across grade levels.

Similarly, analysis of gender differences revealed no significant interactions, with male students (n=15) demonstrating a mean gain of 18.6 points (SD = 8.92) and female students (n=15) demonstrating a mean gain of 18.0 points (SD = 9.37), $t(28) = 0.21$, $p = .835$.

Qualitative Findings

Semi-structured interviews with 12 purposively selected students (40% of the sample, stratified by grade level and gender) and 3 English language teachers at Unidad Educativa Salinas yielded rich qualitative data regarding student experiences and perceptions of technology-enhanced learning. Thematic analysis of interview transcripts revealed several recurring themes related to student engagement, learning effectiveness, and challenges with technology integration.

Engagement and Motivation: Students consistently reported increased engagement and motivation when using technology-enhanced learning platforms compared to traditional classroom instruction. Representative quotes included: "I like using the platform because I can practice at my own pace and I don't feel rushed like in regular class," and "The platform makes learning more interesting because I can see my progress visually." Students particularly appreciated features that provided immediate feedback and opportunities for repeated practice without judgment. Teachers also reported observing increased student participation and completion of assignments when these were delivered through the platform compared to paper-based assignments.

Interactive and Collaborative Features: Students valued opportunities for peer interaction through digital platforms, including discussion forums, collaborative vocabulary tasks, and peer review features. One student noted, "I like seeing what other students wrote and giving comments. It makes me feel like we're learning together even though we're on a computer." However, some students expressed concern that excessive online collaboration could reduce opportunities for

face-to-face discussion, with one student commenting, "Sometimes I prefer talking to people directly instead of typing."

Accessibility of Learning Materials: Students reported appreciating the accessibility of learning materials through digital platforms, particularly noting that they could access course content from home and review material multiple times. "I can go back and review the grammar explanation as many times as I need," was a representative comment. This accessibility was particularly valued by students who reported struggling with certain concepts initially and benefiting from multiple exposures to the material.

Technical Challenges and Support: While students generally reported positive experiences, several technical challenges emerged. Internet connectivity issues were mentioned by 5 students (42% of interview sample), with one student noting, "Sometimes I lose internet connection and then I can't finish my assignment." Additional challenges included difficulty navigating certain platform features (n=3), initial anxiety with technology use (n=4), and concerns about data privacy (n=2). Students reported that technical support from teachers helped address most concerns, though two students wished for more comprehensive technical training during platform orientation.

Preference for Blended Learning: Students generally expressed preference for blended learning approaches combining technology-enhanced and traditional instruction rather than fully online or fully traditional modalities. Students valued "the best of both worlds" as one student articulated, appreciating both the flexibility and personalization afforded by digital platforms and the interpersonal interaction and immediate feedback possible in face-to-face classroom settings. Teachers concurred, noting that technology-enhanced learning was most effective when integrated strategically with classroom instruction rather than replacing it entirely.

DISCUSSION

Interpretation of Results

The quantitative findings demonstrate that implementation of technology-enhanced learning platforms resulted in statistically and practically significant improvements in English language proficiency among Level A2 students at Unidad Educativa Salinas. The effect size ($d = 2.01$) substantially exceeds the threshold for large effects and suggests that the intervention was highly effective. These findings align with and extend previous research on technology-enhanced learning in language instruction. Hwang and Chang (2025) similarly found substantial improvements in EFL learners' proficiency and application of professional English when digital platforms were designed according to self-determination theory principles. The consistency of findings across grade levels and genders suggests that technology-enhanced learning benefits students across diverse demographic groups rather than privileging particular subpopulations.

The qualitative findings provide important context for understanding how and why technology-enhanced learning proved effective. Student reports of increased engagement and motivation align with theoretical frameworks emphasizing the role of psychological need satisfaction (autonomy, competence, and relatedness) in driving learning outcomes. The platforms used in this study incorporated design elements supporting these psychological needs—providing choice in learning pathways (autonomy), offering immediate feedback and opportunities for success (competence), and facilitating peer interaction (relatedness). This alignment of platform design with theoretical principles appears to have contributed to both increased engagement and improved learning outcomes.

The preference expressed by students and teachers for blended learning rather than fully online instruction has important implications. Rather than viewing technology and face-to-face instruction as competing approaches, the evidence suggests that optimal learning occurs when these modalities are thoughtfully integrated. This finding aligns with research by Kee, Kuys, and Zhang (2025) on hybrid learning architectures and suggests that future technology integration efforts in Ecuador should prioritize blended approaches over technology adoption that replaces traditional instruction.

Implications for Ecuadorian Higher Education

The findings of this study have several important implications for technology-enhanced learning implementation in the Ecuadorian educational context specifically. First, the substantial effectiveness of technology-enhanced learning for improving English language proficiency suggests that Ecuadorian institutions should prioritize systematic integration of digital platforms into language curricula. Given Ecuador's emphasis on increasing English language proficiency for professional and academic competitiveness globally, technology-enhanced learning represents a promising approach for achieving these goals more effectively than traditional instruction alone.

Second, the effectiveness of the technology-enhanced learning approach across all demographic subgroups studied (grade levels and genders) suggests that equity concerns regarding technology access should not deter institutions from pursuing technology integration. Rather, institutions should ensure equitable access to technology and technical support, making these resources available to all students regardless of background or initial technology comfort level. The finding that technology integration can benefit diverse learners encourages Ecuadorian institutions to view technology as a tool for promoting educational equity rather than widening existing inequalities.

Third, the preference for blended learning suggests that Ecuadorian institutions should not attempt to transition entirely to online instruction but rather should develop strategic approaches to integrating digital platforms with classroom-based instruction. This is particularly important given potential constraints in some Ecuadorian contexts regarding internet connectivity and

student comfort with fully online learning. Blended approaches provide flexibility for addressing connectivity issues and accommodate diverse learning preferences.

Fourth, the qualitative findings regarding technical challenges, particularly internet connectivity issues, highlight the importance of infrastructure development in Ecuador. Lema et al. (2025) similarly emphasized that effective digital tool use in Ecuador requires not merely access to technology but also systematic training for educators and institutional support structures. Ecuadorian institutions pursuing technology-enhanced learning implementation should simultaneously invest in infrastructure improvements, educator professional development, and student digital literacy instruction.

CONCLUSIONS

This study evaluated the effectiveness of technology-enhanced learning platforms for English language instruction at Unidad Educativa Salinas, a secondary educational institution in Salinas, Ecuador. Using a mixed-methods design combining quantitative pre-test/post-test assessments with qualitative interviews, the study examined both learning outcomes and student experiences with technology-enhanced learning. The findings demonstrated that implementation of technology-enhanced learning platforms resulted in statistically significant and educationally meaningful improvements in English language proficiency. Level A2 students demonstrated substantial gains in language proficiency over one academic semester when learning through technology-enhanced platforms integrated with classroom instruction. Qualitatively, students reported increased engagement, appreciation for personalized learning opportunities, and preference for blended learning approaches. Teachers observed increased student participation and assignment completion through digital platforms. These findings suggest that technology-enhanced learning, when thoughtfully designed and strategically integrated with traditional classroom instruction, represents an effective approach for improving English language instruction in the Ecuadorian educational context.

The success of the technology-enhanced learning intervention in this study was contingent upon several factors: careful alignment of platform design with pedagogical principles and learner needs, blended implementation combining digital platforms with classroom instruction, provision of technical support and professional development for teachers, and institutional commitment to the initiative. These factors align with theoretical frameworks and prior research emphasizing that technology alone does not improve learning; rather, effective implementation requires systemic attention to pedagogy, instructional design, institutional support, and learner characteristics.

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