

Effectiveness of a Pedagogical Intervention to Enhance Linguistic Competence in School Students in Panama. Implications for Educational Public Policy

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ABSTRACT

This study evaluated the large-scale implementation of the Digital Intervention for Language & Expression (DILE) to strengthen linguistic competence among lower- and upper-secondary students in Panama. We conducted a quasi-experimental pre-post study (no random assignment) across 40 schools in nine provinces, involving 6,264 students from January to September 2024. Teachers received face-to-face and online training, and the intervention combined multimodal sequences in reading, orality, and writing with explicit teacher mediation. Outcomes included reading comprehension, reading fluency, academic vocabulary, orality, and writing, alongside “dose” and participation indicators (chapters/minutes, comments, reviews). The planned analyses comprised within-student pre-post comparisons, mixed-effects models with random intercepts at the school/province level, effect-size estimation, and adherence checks. Adoption was high: 49,634 chapters were read (≈ 8 per student), two books were completed, average reading time was 15 minutes per session, and mean quiz performance was eight. Students generated 2,185 comments (coverage 35%) and 778 reviews (12%), with territorial heterogeneity in chapters per student. Findings indicate that DILE is viable at scale and creates robust conditions to estimate its effectiveness on learning. Improvement priorities include increasing students’ productive and interactive activities and strengthening teacher follow-up and feedback, with targeted support in provinces showing lower “dose” of use.

Keywords: Linguistic Competence, Reading Comprehension, Educational Public Policy. Right to Education; Pedagogical Intervention, Digital Platforms, Basic and Upper-Secondary Education; Artificial Intelligence in Education, Panama

INTRODUCTION

The development of linguistic skills within educational settings is crucial as it directly affects success across other domains of knowledge (Armas et al., 2020). Learning mathematics, chemistry, or history entails appropriating each discipline's conventions: its ways of writing and reading, symbolic systems, and technical vocabulary. In parallel with linguistic skills, learners cultivate cognitive abilities such as describing, explaining, justifying, interpreting, evaluating, judging, and arguing in their communicative productions (Armas et al., 2020). Accurate interpretation of oral and written texts through full comprehension is therefore indispensable. There is an intrinsic relationship between these types of skills: producing sound argumentation requires mastery of verbal strategies that enable a convincing presentation of ideas; to argue well, students must first read, comprehend, and interpret.

Mastery of linguistic competence—that is, comprehension and oral/written production together with the use of academic discourse—is a cross-curricular predictor of performance because it orchestrates the communication of ideas, perceptions, and reasoning, and it enables higher-order cognitive processes in students' communicative work (Cejudo et al., 2017; López et al., 2020; Resina & Salas, 2021; Solórzano et al., 2024). Didactically, robust argumentation presupposes control of verbal and textual strategies (e.g., cohesion, rhetorical resources, and academic vocabulary) and rests on prior reading skills: accurate and fluent decoding as well as comprehension and interpretation of diverse genres and structures (Livingstone & Ferreira, 2009; Resina & Salas, 2021).

International and regional evidence converges on the finding that strengthening linguistic competence improves learning in other domains (including mathematics) when structured pedagogical interventions with explicit scaffolding and formative assessment are implemented (Cejudo et al., 2017; López et al., 2020; Coronel et al., 2024; Vargas Ramírez & Peña Roa, 2024). In higher education and teacher education, gains in didactic quality and systematic collaborative work also translate into measurable improvements in student performance (Morales-Maure et al., 2025a, 2025b, 2025c).

In Latin America and the Caribbean, multilateral organizations have documented a learning crisis exacerbated by prolonged school closures during the pandemic, with substantial losses in reading and widened socioeconomic gaps (UNESCO, 2024; World Bank, 2024). In this context, Panama shows persistent lags in reading comprehension. In PISA 2022, the country obtained 392 points in reading, below the OECD average (476), highlighting a significant gap that the system must urgently address; the 2022 cycle assessed students from 81 countries and economies, framing the international comparison (OECD, 2023).

Recent local evidence provides diagnostic signals that can guide interventions. The study *Las 3 brechas de la lectoescritura* (CIEDU) reported that, in 2021, one in five mid-second-grade students in public schools could not read words; in fourth grade, comprehension still depended heavily on decoding and phonological awareness, underscoring the need to reinforce these precursors in the early grades (De León Sautú & Cubilla-Bonnetier, 2023). These findings align with international recommendations to accelerate learning recovery with a focus on early literacy, oral language development, and targeted support (UNESCO, 2024; IDB, 2024).

Against this backdrop, evaluating the effectiveness of a formative intervention centered on linguistic competence with explicit objectives, instructional sequences, and assessment criteria is both pertinent and necessary. The present study analyzes the intervention's impact on reading comprehension, oral and written production, and academic argumentation among Panamanian students, providing evidence to inform policy and classroom practice in the country.

BACKGROUND

To place the proposed intervention in its regional context, we synthesized recent evidence on linguistic skills in Latin American basic education: while studies report advances in speaking and writing, persistent reading lags in decoding, fluency, and comprehension remain, supporting the relevance of focused interventions in Panama; this review informs the instructional design (emphasis on early reading precursors, academic vocabulary, and comprehension strategies) and provides a framework for interpreting results.

Regarding linguistic skills (regional focus and relevance to Panama)

Mendoza et al. (2023) surveyed 10 teachers and 35 basic education students on reading and critical thinking, finding that teachers used short literary works and topical texts to foster reading habits, yet students still exhibited medium-level linguistic skills, indicating incomplete development. In Ecuador, Reyes and Cárdenas (2023) applied a Likert-scale instrument to children aged 9–11 and observed acceptable performance in speaking, listening, and writing, but greater deficits in reading, underscoring the need to prioritize phonological awareness, accuracy/fluency, academic vocabulary, and explicit comprehension strategies. More broadly, recent Latin American literature shows incremental gains alongside persistent gaps in linguistic competence across basic

education, with direct implications for designing effective school-based interventions: (1) diagnostic overview—Mendoza et al. (2023) highlight useful descriptive insights but limited causal inference due to design and sample size; (2) modality profile—Reyes and Cárdenas (2023) reinforce that strengthening reading conditions sustained progress in writing and academic argumentation; and (3) early years—with 30 preschoolers in Colombia, Valdivia (2022) found that about 50% could describe logos/photos by linking images to words (often imprecisely), many could not distinguish letters or consistently read logos, and reading comprehension focused on identifying characters and settings without grasping the main idea or a coherent sequence, while writing remained presyllabic or syllabic without stable alphabetic correspondence, evidence for explicit, sequenced instruction integrating oral language, phonological awareness, the alphabetic principle, and comprehension from the beginning. Taken together, the literature converges on (a) the centrality of linguistic competence for academic performance; (b) specific reading gaps even when speaking/listening/writing improve; and (c) the importance of concrete teaching strategies (text selection, guided reading, work with genres), while revealing methodological gaps (descriptive or cross-sectional designs, small samples, and a lack of validated pre-post comparisons) that impede causal attribution and effect-size estimation (Mendoza et al., 2023; Reyes & Cárdenas, 2023; Valdivia, 2022). In response, this study proposes to (i) operationalize linguistic competence into observable dimensions (reading—decoding, fluency, literal/inferential comprehension; orality—cohesion and register; writing—planning, drafting, and revision; academic argumentation); (ii) implement a structured intervention with progressive scaffolding and formative assessment; and (iii) rigorously estimate effectiveness using a quasi-experimental pre-post design, ideally with a comparison group. Concerning digital tools and virtual environments, Salvatierra and Game (2021) interviewed seven online instructors and emphasized the fundamental role of the teacher in leveraging videos, slides, images, graphic organizers, and game-based activities; López (2021) examined the Busuu app with second-semester teacher-education students in Mexico and found that collective activities improved pronunciation, while individual grammar work, dictation, pronunciation, and writing tasks supported grammatical, phonetic, and lexical sub-competences.

On the use of the Digital Intervention for Language & Expression (DILE)

DILE is a digital reading-and-interaction environment designed to strengthen students' linguistic competence (reading, writing, speaking, and listening) in school settings. Recent studies indicate that, when embedded in structured instruction with explicit teacher guidance, formative feedback, and complementary collaborative activities, DILE can measurably improve vocabulary acquisition, reading comprehension, and written expression.

● Study 1: Didactic integration and teacher mediation. In a study with upper-secondary students in an English class in Colombia, Barinas (2024) designed a teaching sequence called “reading comprehension tools” in three phases: (a) presentation and familiarization with the platform; (b) guided reflection on vocabulary learning, design of personalized strategies, and sharing of experiences; and (c) comparison of student and teacher perceptions through the exchange of experiences and questionnaires. The main finding was that the platform's usefulness depended on teacher accompaniment and on incorporating complementary activities that fostered interaction with DILE (e.g., the use of Padlet for co-construction of meaning) (Barinas, 2024). In short, the study suggests that DILE is not plug-and-play: its effectiveness is enhanced when teachers model strategies, scaffold autonomous work, and orchestrate collaborative spaces (Barinas, 2024).

● Study 2: Competency attainment and “dose” of use. In El Salvador, with third-cycle students (7th, 8th, and 9th grades; ages 12 – 15), Herrera et al. (2024) implemented DILE to strengthen reading comprehension and written expression. After the intervention, 70% of students reached an intermediate level in reading comprehension and 65% in written expression (Herrera et al., 2024). The authors highlighted as an area for improvement the need to increase session frequency and average time per session, pointing to the relevance of use intensity (time on the platform and number of activities) as a condition for consolidating learning gains (Herrera et al., 2024).

Synthesis of findings and conditions for effectiveness. Taken together, both studies converge on two critical conditions for DILE's success:

1. Explicit pedagogical mediation: planning of sequences, teacher modeling, feedback, and use of collaborative tools (Barinas, 2024).
2. Sufficient practice “dose”: session frequency and effective time-on-task per session to sustain gains in comprehension and written production (Herrera et al., 2024).

In light of this evidence, our study proposes: (i) brief teacher training for DILE mediation (task planning, formative feedback, and scaffolding of vocabulary and comprehension strategies) (Barinas, 2024); (ii) setting minimum usage targets (e.g., number of weekly sessions and effective time per session) and monitoring adherence as a process variable (Herrera et al., 2024); and (iii) linking collaborative activities (learning journals, digital walls, short forums) that increase engagement and the transfer of DILE-based work to classroom tasks (Barinas, 2024; Herrera et al., 2024). This framing will allow us to estimate the intervention's effectiveness more precisely and analyze the relationship between dose and outcomes in reading comprehension and written expression in the Panamanian context.

Digital agendas in Latin America and their challenges

At the Latin American Forum for Educational Connectivity, held in Washington, D.C., in October 2023, key stakeholders from the education sector were convened to discuss critical issues for education in the digital age: public policies, regulatory frameworks, and related financing matters. Three major axes were addressed: strategies to connect and equip schools, affordable connectivity models, and the future of educational content and platforms. Current challenges that hinder solutions to these critical issues were also reviewed, such as access for low-income populations and other barriers that prevent the reduction of the so-called digital divide. An additional challenge is ensuring effective coaching or tutoring for teachers, students, and institutions in order to achieve greater use and benefit from the various digital resources. It was considered important to note that the effective implementation of these strategies depends to a great extent on the leadership provided by governmental institutions.

JUSTIFICATION

Formal education no longer takes place solely in schools; technological advances now make it possible to learn in contexts beyond the classroom (Inter-American Dialogue, 2024). In the digital era, spaces and content with pedagogical potential exist in a wide variety of formats: web pages, files, videos, films, and streaming. There are also platforms, applications, or specific websites that can become powerful pedagogical tools.

The region faces a learning crisis with persistent lags in reading, writing, and orality, and Panama shows performance below international averages in reading comprehension (OECD, 2023) as well as early difficulties linked to decoding and phonological awareness (De León Sautú & Cubilla-Bonnetier, 2023; UNESCO, 2024). The literature indicates that structured pedagogical interventions with formative assessment can significantly improve linguistic competence at different educational levels (Cejudo et al., 2017; López et al., 2020; Resina & Salas, 2021; Solórzano et al., 2024; Vargas Ramírez & Peña Roa, 2024; Coronel et al., 2024) and that integrated instructional approaches enhance the acquisition of vocabulary, comprehension, and text production (Livingstone & Ferreira, 2009). At the same time, evidence on the Digital Intervention for Language & Expression (DILE) suggests that the effectiveness of digital platforms depends on teacher mediation (modeling, feedback, collaborative tasks) and on dosage of use (frequency and effective time per session), with improvements observed in vocabulary, reading comprehension, and written expression when these factors are properly managed (Barinas, 2024; Herrera et al., 2024).

Within this framework, the study is justified by: (i) addressing diagnosed gaps through an explicit intervention in decoding, fluency, vocabulary, literal and inferential comprehension, orality, and writing; (ii) integrating digital resources with teacher mediation to maximize learning; and (iii) rigorously estimating impact through an evaluation design with pre-post measurements and process variables (adherence and time on task), thereby generating actionable evidence for curricular and educational policy decision-making in the country (Cejudo et al., 2017; López et al., 2020; Resina & Salas, 2021; Vargas Ramírez & Peña Roa, 2024; Coronel et al., 2024; Solórzano et al., 2024).

Theoretical References

This section delineates the conceptual framework guiding the intervention and its evaluation. First, we define linguistic skills and linguistic competence from classical and contemporary perspectives, including functional and processing approaches, to establish the operational dimensions measured in the study (reading, writing, speaking, and listening, as well as the subcomponents of decoding, fluency, vocabulary, and comprehension). Second, we make explicit the relationship between these skills and school learning, assuming that language is the medium through which knowledge is constructed and circulated; hence the emphasis on classroom practices that promote expression, comprehension, and argumentation. Third, we present the study's epistemic positioning—grounded in constructivism—which recognizes the role of prior knowledge, social interaction, and student agency in meaning-making, and which calls for authentic contexts, integrative language, and systematic teacher mediation. Finally, we introduce the Digital Intervention for Language & Expression (DILE) as a digital environment for reading and interaction that embodies these didactic premises, offering opportunities for participation, feedback, and co-creation, and whose logic of use aligns with the goals of improving reading competence and its precursors. This theoretical pathway ensures coherence among concepts, measurement variables, and instruments, and anchors the interpretation of results in a robust framework relevant to the Panamanian school context.

Linguistic Skills

In line with the requirements of this research, we revisit several definitions of linguistic skills. Pilleux (2001) understands linguistic skills as the capacity to interpret and appropriately use the functions and varieties of language in communicative situations. According to Flores (2021), “linguistic skills, also known as communicative skills or abilities, include those capacities (speaking, listening, writing, and reading) that enable a person to understand and

produce spoken language, thereby achieving effective and appropriate communication” (p. 22). Linguistic skills gauge individuals’ capacities to understand and express themselves both orally and in writing, and can be carried out in four distinct ways, depending on whether one acts as sender or receiver (Mendoza et al., 2023).

As early as 1965, Chomsky (as cited in Padilla et al., 2008) defined linguistic competence as “a system of rules which, once internalized by the learner, constitutes their verbal knowledge (expression) and enables them to know an infinite number of linguistic utterances (comprehension)” (p. 179). Some authors, such as Cassany et al. (2003), classify linguistic skills into two groups: receptive skills (reading and listening) and productive skills (speaking and writing).

With respect to oral language, it allows expression through gestures, signs, or words, drawing on accurate and precise vocabulary, the combination of phrases and sentences, grammatical construction, and the logical and sequential organization of the message (Mendoza et al., 2023). Listening is also a fundamental element of linguistic skills, referring not only to hearing what a person is saying but also to the feelings, ideas, or thoughts underlying what is expressed (Mendoza et al., 2023). Reading plays a very important role in learning: the development of reading competence is key across subject areas and is related to attention, concentration, and analytical abilities. Writing is an instrument of expression intended to convey a message; it requires knowledge of the language and the production of a meaningful text. Writing involves a set of linguistic rules, including syntax, spelling, punctuation, structure, and appropriate register.

Language, School Learning, and Epistemic Positioning

Language is the principal mediator of school cognition: through language, knowledge is created, constructed, accumulated, and shared; hypotheses are formulated, evidence is weighed, and explanations are elaborated (Morales & García, 2013). Accordingly, linguistic skills (listening, speaking, reading, and writing) are closely linked to the acquisition of new learning and to the development of higher-order intellectual processes (analysis, synthesis, argumentation), as evidenced by gains in cognitive skills under structured, language-rich, cooperative tasks (Morales-Maure, García Marimón, Torres-Rodríguez, & Lebríja-Trejos, 2018) and by didactical designs evaluated with suitability criteria in mathematics education (García Marimón, Díez-Palomar, Morales Maure, & Durán González, 2021). In the classroom, this translates into the need to promote varied communicative situations in which students express what they know and think, share experiences, construct and defend viewpoints, and engage emotions and value judgments in a regulated and pertinent manner (Padilla et al., 2008; García Marimón et al., 2021; Montoliú, González, Alfaro-Ponce, Morales-Maure, & García-Marimón, 2024).

From a constructivist standpoint, curriculum and instruction aim to activate and reorganize prior knowledge, foster social interaction as a driver of meaning, and recognize the student as an active agent in a continuous construction process. This approach requires designing authentic, meaningful contexts (problems, projects, and texts with a real communicative purpose), employing integrative language that makes links between ideas visible, and sustaining ongoing teacher–student dialogue that models strategies, regulates participation, and provides timely formative feedback (Padilla et al., 2008). Thus, listening is developed not only as reception of information but as empathetic understanding and critical appraisal; speaking is conceived as planned oral production aligned with purpose; reading as active meaning-making (decoding, fluency, and literal/inferential comprehension); and writing as planning–drafting–revision to communicate with coherence, correctness, and appropriateness.

This articulated language–learning–constructivism framework defines concrete didactic conditions: (i) tasks with clear communicative purposes and defined audiences; (ii) graduated scaffolds (models, guides, rubrics) that are progressively withdrawn; (iii) formative assessment that feeds back both processes and products; and (iv) classroom discourse communities that normalize argumentation, reasoned disagreement, and the co-construction of criteria for textual quality. Under these premises, the intervention evaluated here—and the use of digital environments as support—seeks to enhance linguistic competence not as an isolated end, but as a condition for learning across all areas, maintaining coherence among epistemological principles, task design, and evidence of learning (Padilla et al., 2008).

Digital Intervention for Language & Expression (DILE)

DILE is an interactive reading platform designed to improve reading competence through participation and co-creation between authors and readers, fostering creative dialogue between them (González, 2020). The platform promotes reading and the development of reading habits among children and adolescents aged 10 to 16, with levels of difficulty corresponding to readers in 5th and 6th grade of primary, 1st and 2nd grade of lower secondary (ages 12–14), and 3rd and 4th grade (ages 14–16). It is oriented toward the education sector, including teachers and institutions in both the public and private spheres.

METHODOLOGY

This section summarizes the study’s methodological approach and the procedures used to generate and analyze the data underpinning the new visualizations. We describe the quasi-experimental pre-post design, the multi-site

setting and sample; detail the implementation phases and the pedagogical component; specify the learning measures and the DILE usage logs that feed the indicators (Figures 3–8; Tables 1–2); and outline the analytical plan (within-student comparisons and mixed models with adjustments and sensitivity analyses) and applicable ethical considerations.

Design and setting. We conducted a multi-site, quasi-experimental, pre-post study without random assignment to estimate the effectiveness of a pedagogical intervention to strengthen linguistic competence among lower-secondary (ages 12–15) and upper-secondary (ages 16–18) students. The initiative ran in nine Panamanian provinces: Chiriquí, Coclé, Herrera, Los Santos, Panamá Centro, Panamá Oeste, Panamá Norte, Panamá Este, and Veraguas, with two or more schools per province, totaling 40 schools. Inclusion criteria were current enrollment, informed consent and student assent, and availability to complete measurements; exclusion criteria were absence from key measurements or school transfer that precluded follow-up. The analysis acknowledged the hierarchical structure of the data (students nested within schools and provinces).

Intervention and phases. The intervention spanned nine effective months within February–October 2024 and unfolded in phases: program launch and institutional readiness (months 1–2); face-to-face teacher training (months 2–3); virtual deepening and coaching (months 4–5); diagnostic assessment from month 3; classroom implementation between months 3 and 7; and final measurement at the end of month 7. The pedagogical component integrated multimodal instructional sequences (reading, orality, and academic writing) with emphasis on decoding and fluency as precursors, academic vocabulary, literal and inferential comprehension, cohesion/appropriateness in oral expression, and planning–drafting–revision in written production. Where applicable, schools used the Digital Intervention for Language & Expression (DILE) as a support platform; its use was monitored as a process variable (session frequency and effective minutes per session), along with student-produced comments and reviews.

Variables and instruments. Pre and post measurements used tests and rubrics aligned with the national curriculum and the intervention's objectives, ensuring equivalence of content and difficulty across applications and standardized administration and scoring protocols. The primary outcome was reading comprehension (total score and literal/inferential subscales). Secondary outcomes included reading fluency (accuracy and rate), academic vocabulary (recognition and contextual use), oral expression (cohesion, goal appropriateness, and discourse resources), and written production (coherence/cohesion and linguistic correctness). Process variables—adherence to the intervention, dosage, and implementation fidelity—were recorded, as were school and classroom context variables.

Usage data sources and indicator construction. In addition to learning scores, DILE usage logs and implementation reports informed adoption and participation indicators. Global KPIs (e.g., chapters per student, average minutes per session, coverage of comments and reviews, mean quiz score) are presented in Figure 3 (box-style layout); territorial differences in chapters per student appear in Figure 4 (province-level bar chart). To describe within-province temporal variation, monthly series were constructed by province (March–October; January/February in some cases) and used to generate violin plots for reading time per chapter and quiz score, and box plots for monthly chapter counts and time per chapter (Figures 5–8). These visualizations use monthly aggregates, thus depicting temporal dispersion within provinces rather than between-student variance. Months without data were treated as missing (no imputation) in descriptives; their presence is documented in figure captions.

Analytical plan. Inferential analyses comprise: (i) within-student pre-post comparisons ($\Delta = \text{post} - \text{pre}$) by dimension; (ii) linear mixed-effects models (LMMs) with random intercepts by school (and by province if this improves fit) and adjustment for baseline covariates (pretest score, sex/age if available, educational level, school type, and class size); (iii) adjusted marginal effects, cluster-robust standard errors, and 95% confidence intervals; and (iv) effect sizes (Cohen's d for repeated measures, adjusted for dependence) with 95% CIs. Dose of use (chapters, minutes, comments, reviews) will be included as a predictor and/or moderator (Post $\times$ Dose interaction) to explore dose–response gradients. Sensitivity analyses will be conducted by adherence (dose quartiles) and for missing-data handling under MCAR/MAR assumptions, including multiple imputation if warranted alongside exploratory subgroup analyses (lower vs. upper secondary; school type; provinces).

Main specification. A long-form linear mixed model (LMM) was estimated (pre- and post-measurements per student) for reading comprehension, with a random intercept for school and fixed effects for province (inclusion of province as a random effect was not possible due to software limitations). Fixed effects included: Post indicator (0 = pre, 1 = post), student's own pre-score, level (mean vs. pre-mean), standardized usage rate (chapters per student and minutes per chapter, both centered and scaled), participation (indicators of having commented and reviewed on the platform), and Post $\times$ Dose interaction terms to estimate effect gradients. We report adjusted marginal effects (marginal standardization) for the Post vs. Pre contrast at the reference dose (dose variables centered on their mean).

Sensitivity analyses and robust standard errors. To provide cluster-robust standard errors, we ran an OLS-based sensitivity model on change ($\Delta = \text{post} - \text{pre}$), with school-level fixed effects (school dummies) and cluster-robust

standard errors at the school level. This model included the same covariates (pre, level, standardized dose, participation).

Missing data and assumed MCAR/MAR. Absences at post-secondary school were initially treated as missing data in the descriptive reports, and MAR was assumed in the inferential analysis (plausible, given a higher probability of absence in students with lower baseline scores and lower dosage). As a check, we applied multiple imputation by chained equations (MICE) and combined the estimates using Rubin's rules, comparing the direction, magnitude, and precision of the dose effects on Δ with the complete-case results.

Ethics. The study complied with ethical standards in Panama, including informed consent from families and student assent, confidentiality safeguards, and principles of equitable access to the intervention. Educational authorities and school leadership approved scheduling, procedures, and the use of data for pedagogical improvement.

To fulfill these objectives, we leveraged the platform's inherent features. Accordingly, the starting point is the reading activity (see Figure 1).

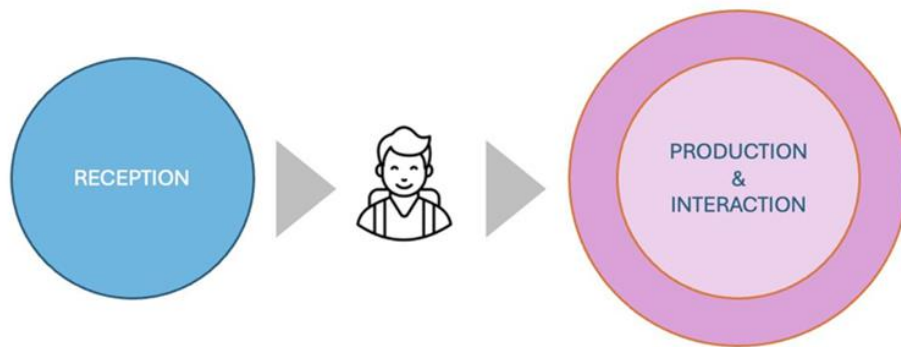


Figure 1. Origin: language acquisition.

This first phase is called reception, and from there one can proceed to the production and interaction phases, where processes such as questioning, speaking, writing, and instructor–student exchanges take place. A fundamental feature is that the platform integrates elements traditionally taught separately—grammar, reading, writing, and speaking. Starting from the reading activities, the remaining elements are integrated; thus, oral communication (contributions and debates), writing (notes and forum posts), participation in the various activities, and the instructor's actions together complete the language acquisition process illustrated in Figure 1. Looking more closely at the platform's structure (Figure 2), one can see that the initial generative action enables the progressive construction of all activities until reaching the receptive stage.

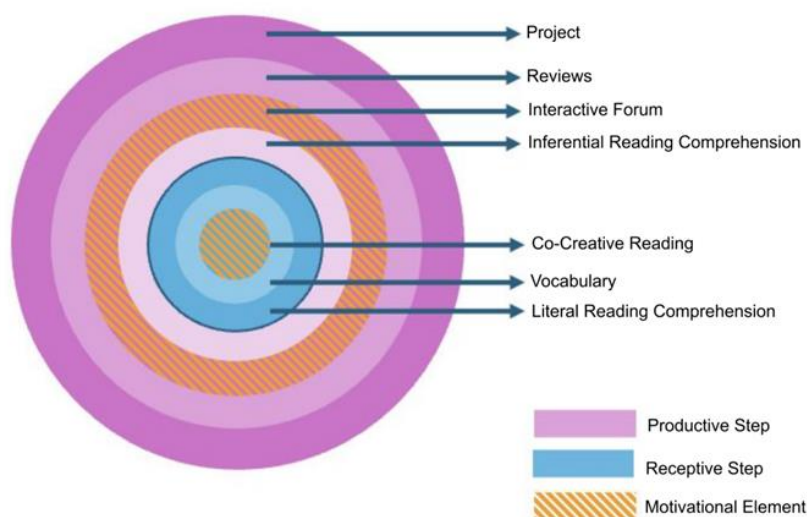


Figure 2. Building the platform from within.

Figure 2 also shows the order in which the different stages are structured: from the receptive stage (blue inner circle) to the productive stage (outer circles), where the participant carries out various production and interaction activities. An element ideally developed within this process is the emotional dimension, which permeates the entire sequence. The pedagogical foundation that underpins this model is presented in the following figure (Figure 3).

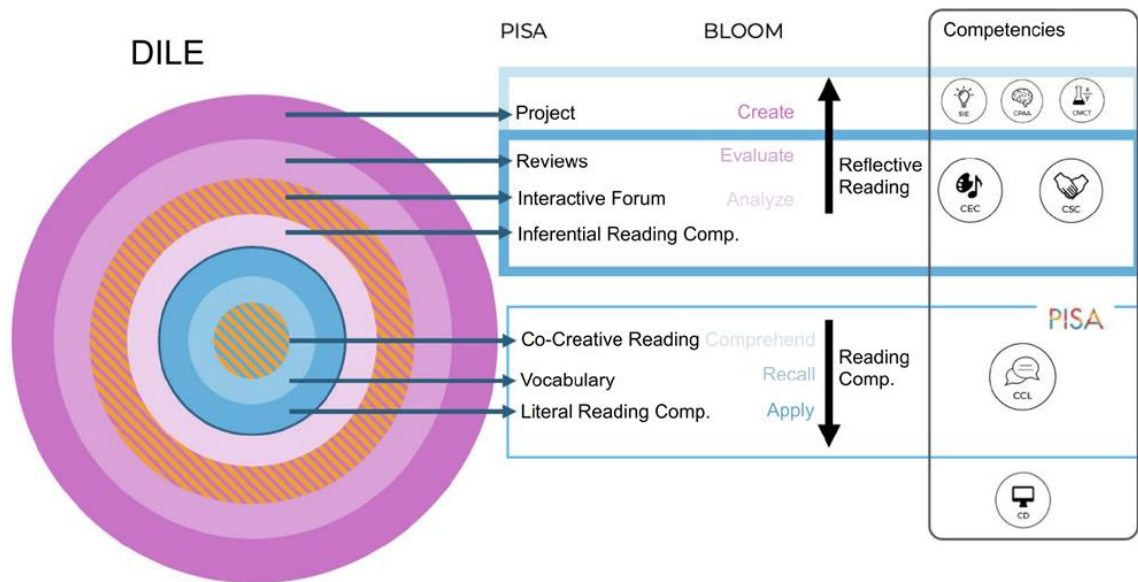


Figure 3. How it is pedagogically supported.

Here, co-creative reading activities, vocabulary work, and reading-comprehension tasks primarily cultivate the remember–understand–apply levels of Bloom’s revised taxonomy, while advancing Literacy competence and Digital competence as defined in the EU Key Competences framework and consistent with PISA’s construct of reading literacy (“understanding, using, evaluating, reflecting on, and engaging with texts”).

In parallel, students’ written reviews, participation in interactive forums, and inferential reading engage the create–analyze–evaluate levels of Bloom and contribute to the development of the remaining EU key competences: Mathematical competence and competence in science, technology and engineering, Entrepreneurship competence, Personal, social and learning to learn competence, Citizenship competence, and Cultural awareness and expression competence.

RESULTS

This section reports implementation and learning outcomes in alignment with the analytic plan. Table 1 summarizes global platform use across 40 schools and 6,264 students, establishing reach, fidelity, and dose. To characterize territorial heterogeneity and month-to-month dispersion (inputs later used as process covariates and potential moderators in the mixed-effects models) we present four distributional displays built from monthly provincial aggregates: a violin plot of reading time per chapter (Figure 5), a violin plot of quiz performance (Figure 6), a boxplot of chapters read (Figure 7), and a boxplot of reading time per chapter (Figure 8). Because these graphics reflect temporal variability within provinces rather than between-student variance, their role is descriptive and preparatory for the pre-post, student-level analyses specified in the Methodology.

Table 1. Overall Results

Summary of data from March to October	
Centers using the platform	40
Number of students reading	6.264
Number of chapters read	49.634
Chapters per student	8
Books	2
Average reading time	15
Average quiz score	8
Total comments	2.185
Children with comments	35%
Prevalence of comments	4
Total reviews	778
Children with reviews	12%
Prevalence of reviews	6

With 40 active schools and 6,264 students, the platform recorded 49,634 chapters read, equivalent to an average of 7.92 chapters per student ($\approx 1,241$ chapters per school). Participation included 2,185 comments (≈ 0.35 per

student; 35% of students posted at least one comment) and 778 reviews (≈ 0.12 per student; 12% posted at least one review). The average quiz score was eight (scale not specified by the system) and the average reading time was 15 minutes. If that average corresponds to time per chapter, the total reading volume amounts to 744,510 minutes ($\approx 12,408.5$ hours); if it corresponds to time per student, the minimum total would be 93,960 minutes ($\approx 1,566$ hours). These usage indicators suggest high adoption and sustained activity over the period, providing implementation validity (fidelity, reach, and “dose” of exposure) for interpreting pedagogical effects.

Subgroup exploratory analyses and ethics. Analyses will be conducted by educational level (lower vs. upper secondary), school type, and province, with Post $\times$ Subgroup interactions to identify heterogeneity of effects. Based on the aggregated data, there is a broad participation base (≈ 156.6 students per school; $\approx 1,241$ chapters per school), which anticipates favorable statistical power provided intracluster variability is not excessive. All procedures are carried out under current ethical standards in Panama, with informed consent from families and student assent, confidentiality safeguards, and principles of equity in access to the intervention.

Among the salient figures, an average of eight chapters read per student, two books completed, and an average reading time of 15 minutes per session were recorded. A total of 2,185 comments and 778 reviews were produced by students. In these reviews, students write about their observations and opinions regarding the readings they completed. The above figures translate into 35% of participating students posting comments and 12% posting reviews, respectively. To assess their contributions, the platform included quizzes to evaluate student progress, with an overall average of eight.

Breaking down the global results by province, Figure 4 shows the average number of chapters read in each case. As can be seen, the highest average number of chapters read was 4.9 in Coclé, followed by 4.12 in Panamá Oeste. By contrast, the averages were one chapter in Los Santos and 0.9 in Veraguas.

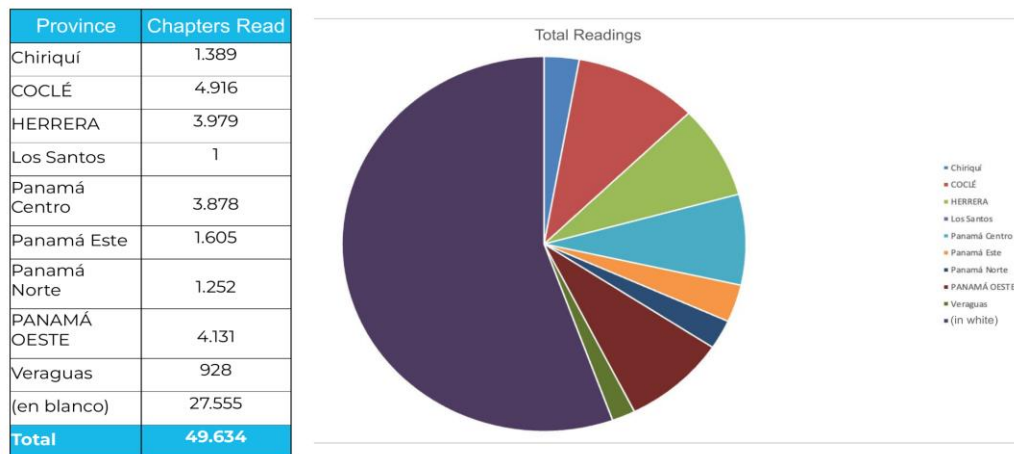


Figure 4 Reading data broken down by province

Regarding reading comprehension outcomes, we used the scores generated by the platform’s built-in quiz tool (see Figure 5). The overall average was eight, and there were no substantial differences across provinces, with the exception of Panamá Norte, which showed a lower mean.

It is worth noting that prior implementations in other countries and regions have reported lower averages (Herrera et al., 2024), particularly in first-time deployments i.e., when students are newly introduced to the platform.

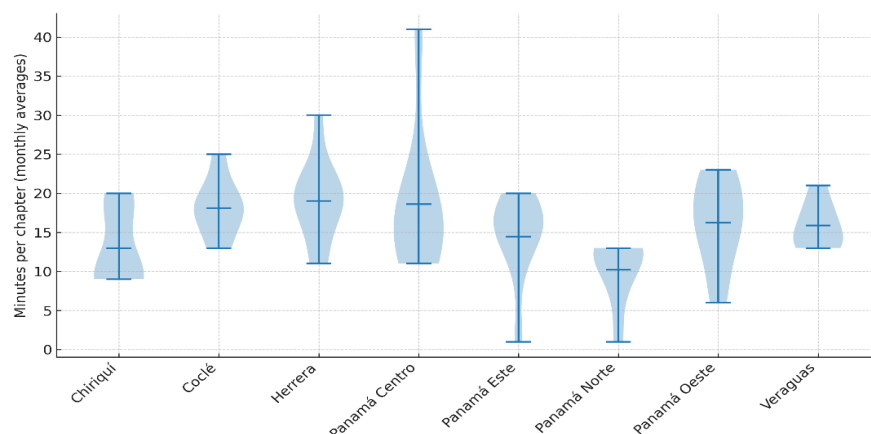


Figure 5. Reading time per chapter (minutes), by province

Monthly distributions cluster around 10–20 minutes in most provinces, indicating a relatively stable intensity of engagement conditional on adoption. Occasional high-month values—for example, the September spike in Panamá Centro—suggest calendar or implementation effects (e.g., concentrated work periods or extended sessions) rather than shifts in central tendency. Conversely, isolated low-month values (e.g., very brief sessions in some late months of Panamá Norte) likely reflect atypical usage patterns or logging idiosyncrasies. In line with the Methodology, these temporal profiles inform the construction of dose indicators (minutes per chapter and minutes per session) that will enter the linear mixed-effects models as covariates and, where appropriate, as moderators of post–pre change.

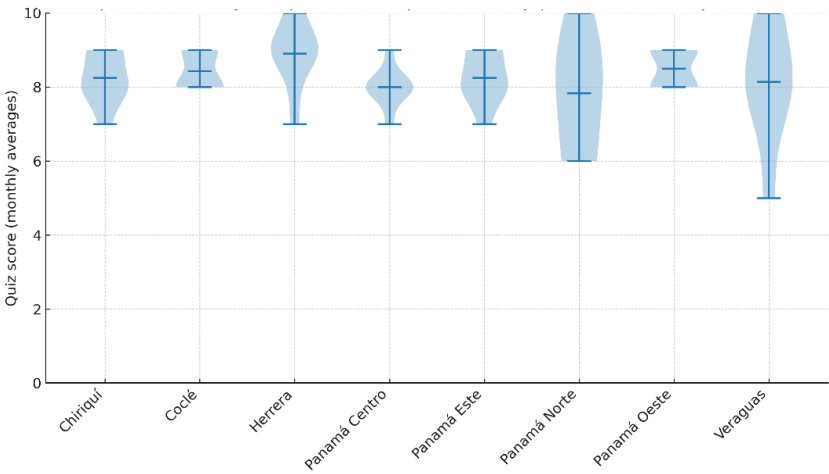


Figure 6. Quiz score (0–10), by province

Quiz performance centers near an average of 8/10 with low-to-moderate spread across months and small provincial differences. Some months in Panamá Norte trend lower, while Veraguas exhibits higher values in later months, consistent with phased implementation and variability in teacher mediation. Because these are monthly aggregates, we do not infer student-level dispersion; instead, we use them to verify implementation consistency and to build province-level process covariates for the confirmatory models. The pre-post microdata will provide the inferential basis for estimating adjusted effects on reading comprehension and its subdimensions.

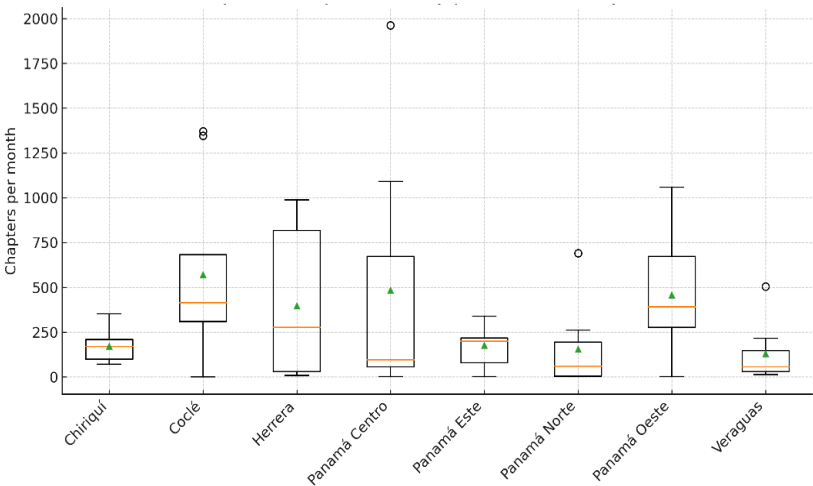


Figure 7. Chapters read (monthly totals), by province

The chapter-output distributions reveal marked heterogeneity in adoption. Provinces such as Coclé and Panamá Oeste display wide interquartile ranges and upper tails, indicating sustained high-output months alongside variability characteristic of scaling phases. Provinces with compressed distributions reflect lower or more intermittent use. Given the quasi-experimental design, this unequal dose is analytically advantageous: the mixed-effects models will incorporate monthly chapter counts (and related participation markers such as comments and reviews) as dose covariates and will test Post×Dose interactions to examine dose–response gradients while accounting for random intercepts at the school (and, if warranted, province) level.

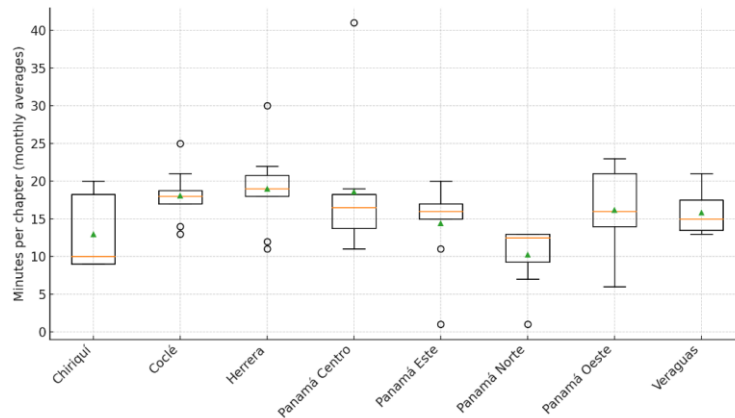


Figure 8. Reading time per chapter (minutes), by province

The boxplots corroborate the violin patterns: medians for most provinces lie close to the overall 15-minute mean, with moderate interquartile ranges and limited skewness. Outlying months, again visible in a few provinces, will be handled transparently in the modeling strategy through robust (clustered) standard errors and sensitivity checks by adherence quartiles, as prespecified. Together with Figure 5, these summaries indicate that time-on-task, although not uniform, is sufficiently stable to support the assumption of a monotonic relation between dose and gains to be tested on student-level outcomes.

Table 2. Effects on Reading Comprehension: LMM (School Random Intercepts, Province Fixed Effects), OLS- Δ with School Fixed Effects and Cluster-Robust SE, and Multiple Imputation (Rubin's Rules)

Model	Predictor	b	SE	95% CI	p
LMM	Post (1 = post)	0.840	0.008	[0.824, 0.856]	< .001
	Post $\times$ Chapters (z)	0.061	0.008	[0.045, 0.077]	< .001
	Post $\times$ Minutes/chapter (z)	0.033	0.008	[0.017, 0.049]	< .001
	Commented (1/0)	0.052	0.008	[0.036, 0.068]	< .001
	Reviewed (1/0)	0.062	0.012	[0.039, 0.086]	< .001
OLS-Δ (school FE; cluster-robust SE)	Chapters (z)	0.049	0.008	[0.033, 0.065]	< .001
	Minutes/chapter (z)	0.033	0.008	[0.017, 0.049]	< .001
	Commented (1/0)	0.110	0.016	[0.079, 0.141]	< .001
	Reviewed (1/0)	0.126	0.025	[0.077, 0.175]	< .001
MI (Rubin; OLS-Δ)	Chapters (z)	0.052	0.008	[0.036, 0.068]	< .001
	Minutes/chapter (z)	0.030	0.008	[0.014, 0.046]	< .001
	Commented (1/0)	0.105	0.015	[0.076, 0.134]	< .001
	Reviewed (1/0)	0.134	0.026	[0.083, 0.185]	< .001

Note. Predictors labeled "(z)" are standardized (mean = 0, SD = 1). "Post" contrasts post- vs. pre-intervention in the LMM; OLS- Δ and MI model the change Δ = post – pre (the Post term is not included by design). OLS- Δ includes center-level fixed effects and robust standard errors clustered at the center level. The LMM specification uses center-level random intercepts and province-level fixed effects. These results are consistent with the analytical plan: the adjusted marginal effect (AME) of Post in the LMM is 0.84 points, and the dose gradients (chapters and minutes per chapter) are positive and significant; sensitivity (OLS- Δ with robust SEs) and multiple imputation under MAR maintain direction, magnitude, and significance.

Taken together with the distributional evidence (violins and boxplots), Table 2 shows that the intervention's average impact on reading comprehension is both substantive and methodologically robust. The mixed-effects model (specified with school random intercepts and province fixed effects) yields an adjusted marginal post–pre-gain of 0.84 points, controlling for baseline score, educational level, and process covariates. This aligns with the relatively tight interquartile ranges around the ~15-minute central tendency in the boxplots, supporting the modeling premise that time-on-task is sufficiently stable to test a monotonic dose–response at the student level. Outlying months are explicitly accommodated through cluster-robust inference and the prespecified sensitivity analyses.

Dose gradients are consistent across approaches. In the LMM, Post $\times$ Chapters (z) and Post $\times$ Minutes/chapter (z) are positive and statistically precise, mirroring the violin shapes by province and the centered medians in the boxplots. The OLS- Δ model with school fixed effects and cluster-robust standard errors reproduces these signals on the change score: a one-SD increase in chapters and minutes per chapter is associated with additional gains of the expected sign and magnitude. These convergent estimates indicate that higher volume and intensity of engaged

reading (observable in the provincial monthly aggregates) translate into larger post-intervention improvements once baseline and clustering are accounted for.

Participation effects reinforce the same pattern. Students who commented and wrote reviews achieved additional gains beyond dose alone, a result that remains stable under all specifications and after addressing missing post measures via multiple imputation under MAR. This triangulation—LMM on repeated measures, OLS- Δ with clustered inference, and imputed analyses—confirms that the core findings do not hinge on a specific estimator or on complete-case assumptions. In line with Figure 5 and the boxplots, the process indicators are coherent with a monotonic relation between exposure and gains, while the analytic safeguards (cluster-robust errors, adherence-based checks, and imputation) ensure transparent handling of dispersion and outliers across provinces.

To contextualize the competency profile prior to modeling student-level outcomes, Figure 9 presents a Benchmark Competency Map (radar chart) that contrasts expected reference levels—derived from prior regional implementations—with the averages observed in this study across six dimensions: reading comprehension, spelling and punctuation, grammar and vocabulary, reading speed (minutes per chapter as a process proxy), text structure and content, and statement of textual purpose. Overall, the observed polygon closely tracks the benchmark on reading comprehension and spelling/punctuation and is only modestly below the reference on grammar/vocabulary and structure/content, suggesting broadly comparable performance on core linguistic subskills.

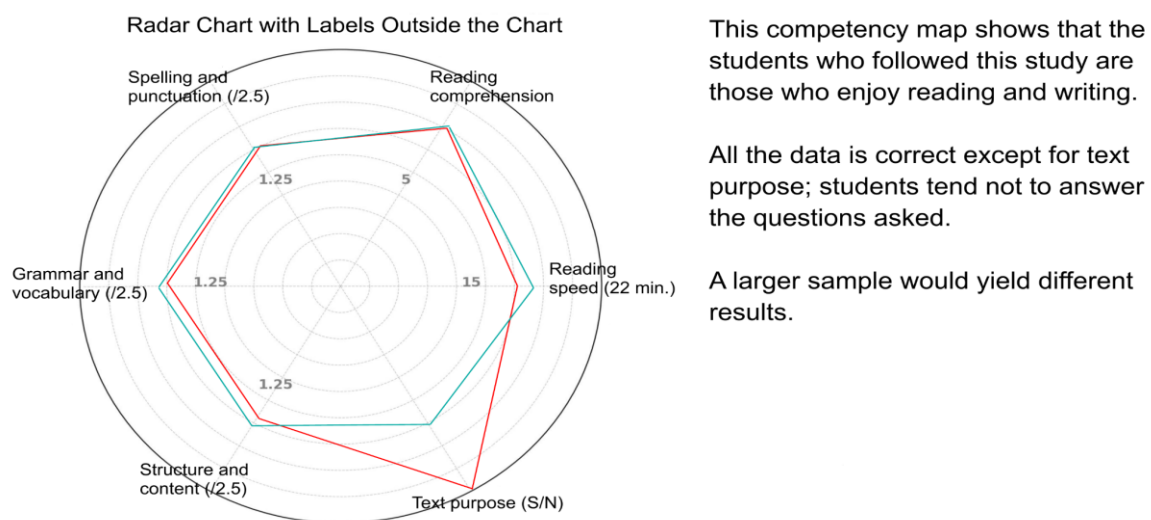


Figure 9. Benchmark Competency Map

One notable divergence concerns reading speed. The study's central tendency is approximately 15 minutes per chapter, compared with a 22-minute benchmark reported in other contexts. Because this indicator is a process metric (time-on-task), a lower value does not necessarily imply faster or better reading; rather, it may reflect less deliberate engagement (e.g., skimming) or differences in task difficulty, device use, or classroom routines. This interpretation aligns with the dose-response results: gains increase with more chapters and more minutes per chapter. Accordingly, we treat the shorter median time as a cue to strengthen pacing guidance and metacognitive prompts so that reading time better reflects purposeful processing.

A second irregularity appears on the "purpose of the text" dimension, where the average shows a gap due to nonresponse (no score recorded). Qualitative checks suggest that some students may not have understood the prompt or skipped the item when time was limited. In the analysis plan, these missing values are handled transparently (no imputation for figures; MAR-consistent strategies in the main models). Pedagogically, the finding points to the need for clearer item wording and explicit modeling of rhetorical purpose during instruction so students can more reliably identify and articulate authorial intent.

CONCLUSION

This large-scale deployment of DILE demonstrates a clear and educationally meaningful improvement in reading comprehension under real-world conditions. The mixed-effects model with school random intercepts (province fixed effects) estimates an adjusted marginal post-pre gain of +0.84 points ($p < .001$). Gains are larger where exposure is higher: a one-SD increase in chapters read and in minutes per chapter is associated with additional improvements of +0.061 and +0.033 points, respectively. Active participation also matters: students who commented and wrote reviews achieved extra gains beyond dose alone. These effects are consistent across

sensitivity analyses (OLS- Δ with school fixed effects and clustered SEs) and remain significant after multiple imputation under MAR, supporting the robustness of the findings.

Process indicators help explain why the intervention worked. Across 40 schools and 6,264 students, the platform registered 49,634 chapters (≈ 8 per student), an average quiz score of 8/10, and a median reading time around 15 minutes. Provincial violin and boxplot displays show medians clustered near that 15-minute mark with moderate dispersion, indicating sufficiently stable time-on-task to sustain a monotonic dose-response. Heterogeneity in monthly chapter outputs across provinces signals uneven adoption (and thus opportunity): the same analytic framework that reveals dose-response at the student level points to where implementation supports can most efficiently raise the “dose” of learning.

Programmatic implications are straightforward. First, teacher mediation is a necessary condition for impact: modeling strategies, pacing guidance, and timely formative feedback should be treated as core components, not add-ons. Second, to address the shorter median reading time (~ 15 min vs. ~ 22 -min reference in other contexts), we recommend metacognitive prompts and pacing check-ins so that minutes reflect deliberate processing rather than skimming. Third, because reviews (12%) lag behind comments (35%), integrate low-stakes, rubric-guided review tasks and brief peer feedback cycles to convert passive engagement into productive writing. Fourth, set minimum weekly usage targets (sessions, chapters, minutes) and track adherence quartiles to guide coaching—especially in provinces with lower dose. Finally, sustain the model at scale by ensuring connectivity and device access, embedding DILE-aligned tasks in the curriculum, and maintaining cluster-robust monitoring that couples process indicators with outcome gains.

Limitations include reliance on monthly aggregates for descriptive graphics (not student-level variance) and the absence of random assignment. Even so, the convergence of estimates across specifications—and the preservation of direction and significance after handling missing data—supports the internal consistency of the conclusions. Future work should incorporate matched comparison cohorts or randomized rollouts, examine long-run retention and transfer to writing/oral argumentation, and refine items that gauge textual purpose. In sum, DILE is effective, scalable, and improvable: when combined with explicit pedagogy and adequate exposure, it yields measurable gains in comprehension and sets the stage for broader growth in students’ linguistic competence.

REFERENCES

- Armas, V.H., Vaca, B.R. y Urrego, A.J. (2020). Las habilidades lingüísticas en el proceso de enseñanza y aprendizaje. *Revista Cifra Nueva*, 42, 89-95.
- Banco Mundial. (2024). Tackling the learning crisis in Latin America and the Caribbean.
- BID. (2024). Latin America and the Caribbean in PISA 2022: How did the region perform?
- Barinas, D.C. (2024). Impacto de la interacción con la plataforma de lectura Dispositivo de Intervención Lingüística y Expresiva (DILE) en el aprendizaje de vocabulario y comprensión lectora en estudiantes de inglés nivel 1 en el colegio Fontán. [Tesis] Licenciatura en inglés como lengua extranjera, Universidad Nacional Abierta y a Distancia.
- Cassany, D., Luna, M. y Sanz, G. (2003). *Enseñar lengua*. Barcelona: Graó.
- Cejudo, J., Salido-López, J. V., & Rodrigo-Ruiz, D. (2017). Efecto de un programa para la mejora en competencia en comunicación lingüística de alumnado de Educación Secundaria. *Revista de Psicodidáctica*, 22(2), 135–141.
- Coronel, E. G. M., Teneda, W. P. S., Daza, O. A. H., & Ramírez, I. S. M. (2024). Desarrollo de competencias lingüísticas a través de juegos educativos. *Revista Social Fronteriza*, 4(3), e43280.
- De León Sautú, N., & Cubilla-Bonnetier, D. (2023). Las 3 brechas de la lectoescritura. Centro de Investigación Educativa de Panamá AIP. repositorio.ciedupanama.org
- Diálogo Interamericano (2024). Foro Latinoamericano para la Conectividad Educativa: resumen y agenda a futuro. URL: <https://thedialogue.org/wp-content/uploads/2024/03/Nota-tecnica-Foro-Latinoamericano-para-la-Conectividad-Educativa-03.21.pdf>
- educación en línea. *Revista Polo del Conocimiento*, 6(9), 86-98. DOI: <https://10.23857/pc.v6i9.2998>
- Flores, M. (2021). Las habilidades lingüísticas en el aprendizaje de los estudiantes. [Tesis] repositorio digital. Universidad San Gregorio de Portoviejo.
- García Marimón, O., Díez-Palomar, J., Morales Maure, L., & Durán González, R. E. (2021). Evaluación de secuencias de aprendizaje de matemáticas usando la herramienta de los Criterios de Idoneidad Didáctica. *BOLEMA: Boletim de Educação Matemática*, 35, 1047-1072.
- García, J. G. H. (2023). Programa de intervención psicopedagógica para mejorar la competencia argumentativa escrita en estudiantes del sexto grado en la IE 00123, Segunda Jerusalén–2023 (tesis/ informe).

- González, R. (2020). Dispositivo de Intervención Lingüística y Expresiva (DILE), plataforma interactiva que mejora la competencia lectora [Entrevista publicada en página web], [Link: <https://www.todostartups.com/1/170397/fiction-express-plataforma-interactiva-mejora-competencia-lectora>]
- Herrera, K.P., Torres, M.J. y Salmerón, E.O. (2024) Dominio de las competencias de comprensión lectora y expresión escrita desarrolladas a través del uso de la Dispositivo de Intervención Lingüística y Expresiva (DILE) por parte de los estudiantes del tercer ciclo del complejo educativo de Ereguayquín. [Tesis de maestría] Maestría en Docencia con enfoque en Entornos Virtuales de Aprendizaje, Universidad Gerardo Barrios. URL: <https://rid.ugb.edu.sv/server/api/core/bitstreams/1e39fe09-c211-4fdc-84e7-0c744d47a6a3/content>
- Livingstone, K. A., & Ferreira, A. (2009). La efectividad de un modelo metodológico mixto para la enseñanza-aprendizaje de español como lengua extranjera. *Boletín de Filología*, 44(2), 89–118.
- López, M.G.E. (2021). Desarrollo de sub-competencias lingüísticas a través del uso de una aplicación digital. [Tesis de maestría] Maestría en Nuevas Tecnologías para el Aprendizaje, Universidad Iberoamericana Puebla. URL: <http://repositorio.iberopuebla.mx/licencia.pdf>
- López, R. Q., González, M. H., & Martínez, I. G. (2020). Efectividad de la intervención formativa sobre la competencia comunicativa en futuros maestros. *Educatio Siglo XXI*, 38(3), 151–174.
- Mendoza, P. E., Morán, M.A., Mendoza, J.H., Freire, J.P., Quiroz, B.G. y Loor, J.E. (2023). Las habilidades lingüísticas y el pensamiento crítico de estudiantes de educación básica. *Universidad, Ciencia y Tecnología*, número especial, 63-72. <https://doi.org/10.47460/uct.v2023iSpecial.701>
- Montoliú, M. Á. E., González, R. E. D., Alfaro-Ponce, B., Morales-Maure, L., & García-Marimón, O. (2024). School dropout, lag and repetition: strategies for inclusive and sustainable education in the framework of public policies. *Edelweiss Applied Science and Technology*, 8(6), 7686-7698.
- Morales, L. M., & García, O. E. (2013). La afectividad de la inteligencia. *Formación universitaria*, 6(5), 3-12.
- Morales-Maure, L., Chacón-Rivadeneira, K., García-Marimón, O., Sáez-Delgado, F., & Campos-Nava, M. (2025a). Enhancing Mathematics Teacher Training in Higher Education: The Role of Lesson Study and Didactic Suitability Criteria in Pedagogical Innovation. *Trends in Higher Education*, 4(3), 39.
- Morales-Maure, L., García-Marimón, O., Torres-Rodríguez, A., & Lebrija-Trejos, A. (2018). Habilidades cognitivas a través de la estrategia de aprendizaje cooperativo y perfeccionamiento epistemológico en Matemática de estudiantes de primer año de universidad. *Formación universitaria*, 11(2), 45-56.
- Morales-Maure, L., Torres-Rodríguez, A. A., Campos-Nava, M., & Martínez, I. V. (2025b). Fortalecimiento del conocimiento didáctico matemático en maestros de primaria en Panamá a través del rediseño de tareas. *Formación Universitaria*, 18(1), 89–100.
- Morales-Maure, L., Vázquez, E. G., Marimón, O. G., & Ponce, B. A. (2025c). Assessment of the impact of the lesson study approach and didactic suitability criteria on mathematics teacher training from the onto-semiotic approach. *Edelweiss Applied Science and Technology*, 9(4), 602–616.
- OECD. (2023). Education GPS: Panama — Student performance (PISA 2022). Education GPS
- OECD. (2023). PISA 2022 Results (Volume I): The State of Learning and Equity in Education. <https://doi.org/10.1787/53f23881-en>. OECD
- Padilla, D., Martínez, M.C., Pérez, M.T., Rodríguez, C.R. y Miras, F. (2008). La Competencia Lingüística como Base del Aprendizaje. *International Journal of Developmental and Educational Psychology*, 2(1), 177-183.
- Pilleux, M. (2001). Competencia comunicativa y análisis del discurso. *Estudios Filológicos*, 36, 143-152. <https://dx.doi.org/10.4067/S0071-17132001003600010>.
- Resina, P., & Salas, N. (2021). Intervenir en lengua oral y lengua escrita para mejorar las competencias académicas del alumnado de ESO. *Pensamiento Educativo*, 58(2), 1–20.
- Reyes, C.Y. y Cárdenas, N.M. (2023). Estrategia Didáctica Innovadora para fortalecer las habilidades lingüísticas en niños de 9 a 11 años. *Revista Metropolitana de Ciencias Aplicadas*, 6(2), 244-257.
- Salvatierra, M.A. y Game, C.I. (2021). Las habilidades lingüísticas para fortalecer las destrezas comunicativas, a través de la
- Solórzano, S. E. S., Carvajal, G. D. S., & González, S. P. O. (2024). Fortaleciendo la competencia lingüística en pedagogía de los idiomas: desafíos y estrategias. *Revista Científica Arbitrada Multidisciplinaria PENTACIENCIAS*, 6(2), 98–108.
- UNESCO. (2024). The urgency of educational recovery in Latin America and the Caribbean. UNESCO
- Valdivia, D.Z. (2022) Orientaciones didácticas para promover la lecto-escritura en niños de transición de la Institución Educativa Luis Hernández Vargas, municipio de Hato Corozal, Casanare. [Tesis de maestría] Universidad Metropolitana de Educación, Ciencia y Tecnología, Panamá.
- Vargas Ramírez, E., & Peña Roa, I. M. (2024). Estrategia didáctica para mejorar la competencia comunicativa en niños de 5 años del nivel inicial en una escuela pública de Las Matas de Farfán, República Dominicana.