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Research Article

The efficacy of a web-based methodology on English teachers' digital competence in Colombia

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ABSTRACT

Digital competency is becoming a priority in teachers' professional development. This article assessed the efficacy of a web-based methodology on English teachers' digital competence through a 200-hour course. This didactic methodology consists of eight learning moments that alternate between online and offline instruction and are based on solid theoretical foundations. The results of the six areas and 22 competencies of the DigCompEdu framework are compared between an entry and exit test in a group of 47 English teachers who were part of the web-based didactic design implementation. Data analysis was conducted using the statistical software R version 4.2.2. The Likert package version 1.3.5 and the ggplot2 package version 3.4.0 were used to generate graphs and descriptive statistics. The Stats package version 4.2.2 was used to perform the Kruskal-Wallis and Wilcoxon comparison tests. This analysis demonstrated that the effects of the designed methodology on teachers' digital competence development are highly significant. Teacher-learners advanced in areas of the DigCompEdu related to students' digital competence. The areas with fewer improvements were where teacher-learners scored higher in the pre-test. "Self-regulated learning," "accessibility and inclusion," and "communication and collaboration" competencies reached the highest difference when comparing the pre- and post-tests. Teachers struggle more with learning during offline moments. The Web-based methodology becomes an innovative proposal for training English teachers to incorporate technology to develop language skills.

Keywords: information and communication technology, English language teaching, teacher digital competence, teachers' professional development

INTRODUCTION

The European framework for teaching digital competence (DigCompEdu) (Redecker & Punie, 2017) and the common framework for teaching digital competence (TDC) (INTEF, 2017) are the most used at the Spanish level, and they are the first and most widely supported by experts (Cabero-Almenara et al., 2021). A recent statistical descriptive study using this framework indicates that 70% of surveyed university academics from countries (Argentina, Brazil, Colombia, Chile, Perú, Mexico, and Portugal) have an average intermediate level of competence (Santos et al., 2023). Other conducted studies, using different instruments, also place teachers in Colombia at an intermediate level of digital competence (Paz et al., 2022; Roa et al., 2021; Tobar-Gomez, 2027; Torres-Flórez & Diaz-Betancourt, 2021).

There are different aims in assessing teachers' digital competence: To identify gaps that may lead to the formulation of teachers' training programs (Fernández-Batanero, 2021; Revuelta-Domínguez et al., 2022), to enhance teacher training programs, and improve research (Basantes-Andrade et al., 2022; Basilotta-Gómez-Pablos et al., 2022), and to favor inclusion and equity (de Soriano et al., 2024; Méndez & Méndez, 2023). Few research studies seek to formulate concrete didactic strategies or methodological proposals to augment TDC. The current inquiry intends to go beyond the description of the advantages of the use of technology and teachers' professional development, to determine the effectiveness of a web-based didactic design (WBDD) on English TDC.

Many methodological designs and models have been formulated to affect TDC in different fields. The TPACK model (Mishra & Koehler, 2006) and SAMR model (Puentedura, 2014) appear as base models that established the incorporation of technology into education. The first model conceives this integration as the congruence of three components: pedagogical knowledge, technological knowledge, and content knowledge. An educator should be able to combine these components into a pedagogical and technological knowledge of content. It is not sufficient to be able to teach the content of a subject in the classroom, but also to be able to do it with a didactic purpose. The second model informs how educators adopt and adapt technology to support learning. Substitution is the primary step in educators changing activities in the physical classroom, such as reading from a printed copy to a digital version in a PDF. Augmentation implies the incorporation of digital enhancements to traditional practices like quizzes. Tools like Kahoot and Quizizz accomplish the primary aim of testing but also allow immediate feedback and electronic praising to correct answers. Modification is the process of redesigning tasks, like a "find someone who …" activity, that is typically done with pen and paper in the classroom, for an interactive activity using WhatsApp or any other chat tool to capture the answers to the questions in the worksheet. Finally, redefinition is the step where technology allows the creation of new tasks that were previously inconceivable, such as interacting through a video conference with students from different latitudes. The first two steps are part of the "transformation" process, and the other two are part of "enhancement."

These two models constitute a path that describes technological integration into education without concrete didactic designs that demonstrate, through a trajectory, the integration of existing pedagogical theories and approaches with technology to enhance learning. However, the TPACK and SAMR Models serve as the foundation for formulating the web-based learning didactic design (WBLDD), considering the involvement of the three components in the first model and the transition to integrate technology from substitution to redefinition in the second. Besides, the DigCompEdu Framework serve as an assessment tool and as a guide that establishes clear objectives in online instruction by targeting all the actors involved (educators' professional competences, educators' pedagogical competences, and learners' competences)

Camacho-Vásquez et al. (2024) systematically reviewed the literature where pedagogical and didactic models are organized according to their purposes: Incorporation of technology into education (Celik, 2021; Chaipidech et al., 2022; Dorner & Kumar, 2016; Hosseini et al., 2021; Imankulova et al., 2022; Jahnke et al, 2017; Lee & James, 2018; Nikitina, 2021; Zagouras et al., 2022), models to develop innovation and creativity (Agéli et al., 2019; Songkram & Chootongchai, 2020), models of acceptance or motivation to technology (Cabero-Almenara et al., 2018; De Brabander & Glastra, 2021; Shelton, 2028; Tabatabaee et al., 2018), models for integrating technology to language teaching (Drugova et al., 2021; Salem, 2019; Vázquez-Cano et al., 2016; Wu, 2018; Yeh & Tseng, 2019), models for developing TDC (Dell'Aquila, 2022; Esteve et al., 2018; Pak et al., 2021; Pinto-Santos et al., 2022; Rodrigues, 2020; Zimmer & Matthews, 2022).

Recent studies focused on enhancing EFL teachers' digital competence based on SAMR Model for the design of teaching digital resources (Tseng & Lin, 2025). The results provide guidelines for the development of curriculum in teacher education and future English instruction. Similar results were obtained by Gallego Joya et al. (2025) when analyzing a corpus of fourteen studies that aimed to design digital competence training courses. These authors suggest considering conceptual, procedural and attitudinal aspects in future training designs. Both studies found the TPACK and the DigCompEdu as valid framework that can be adapted to different educational contexts.

The literature review and a preliminary study result were used to formulate the WBDD and its implementation. This initial study was conducted in 299 English teachers from Colombia and intended to

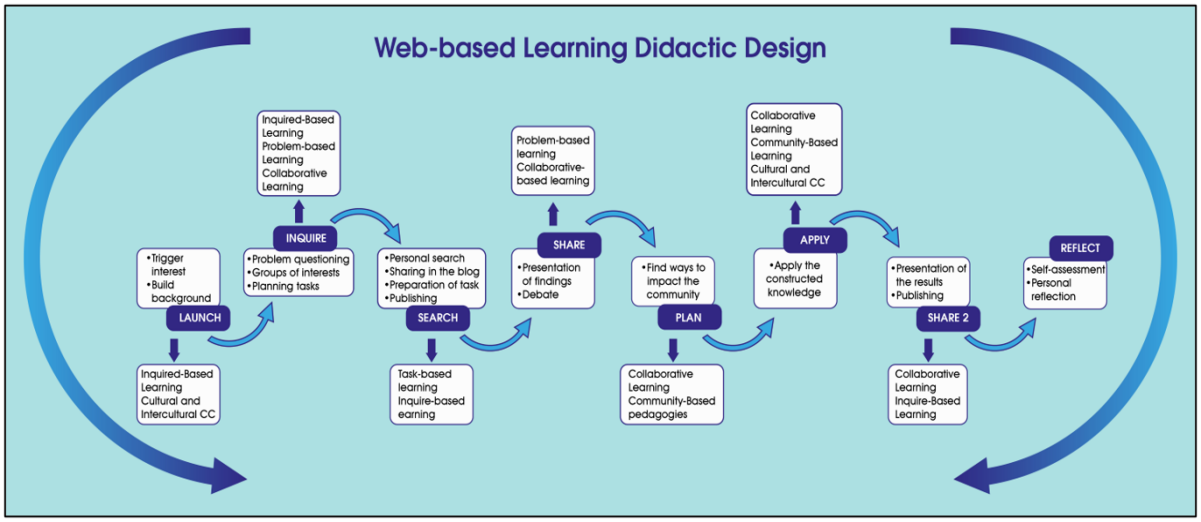

Figure 1. WBDD (The authors' own work)

determine the digital competence level (Cabero-Almenara & Palacios-Rodríguez, 2020) and the use of digital tools for the development of language skills (Alakrash & Abdul, 2021). At the end of this questionnaire, 105 teachers registered as volunteers to be part of the implementation phase. Sixty-five teachers enrolled in the diploma course, and 47 were finally certified.

A Web-Based Didactic Design

The WBDD is the result of the analysis of literature and input obtained from a preliminary self-assessment test applied to 299 English teachers in Colombia. The test is intended to evaluate TDC in 13 of DigCompEdu's 22 competencies and determine the use of digital tools and blogs for developing communicative skills (reading, listening, vocabulary, writing, and speaking).

The WBDD is an eight-step methodological proposal for teachers' training in incorporating ICTs into ELT with online and offline moments (specified in the description of each stage in the learning sequence). It is founded on solid pedagogical theories and approaches and intends to develop TDC (see **Figure 1**).

The WBDD intends to develop TDC by incorporating ICT tools into ELT in a process of substitution, augmentation, modification, and redefinition of technology. It also aims to train language teachers on adapting ELT didactics to a technology-mediated environment, foster collaborative and autonomous learning skills by implementing project-based, task-based, and collaborative-based learning strategies. Teachers' critical thinking is boosted by using problem-based and inquiry-based learning strategies, triggering teachers' capacities to relate constructed knowledge to local contexts via community-based pedagogy strategies. Finally, the didactic model proposes to awaken teachers' interest in using web-based learning materials to make students aware and develop cultural and intercultural competence.

The methodology is divided into two cycles. The first cycle is intended for teacher-learners to master the constructed knowledge (launch, inquire, search, and share 1 moment) before moving to the second cycle, where they transfer this knowledge to specific learning needs in their community or classrooms (plan, apply, share 2, and reflect). **Table 1** illustrates each learning moment.

The implementation of the WBDD was done through a 200-hour course on digital competence for ELT. The course comprised four modules. The course organization is contained in a public document that describes the objectives of the course, methodological and assessment strategies, and four course curricula, one for each of the modules that detail pedagogical strategies for each learning unit. The first module is called "introduction and preparation for the course." This learning unit plans to instruct teachers on using MOODLE-LMS, guide them on the construction of their sites, and provide an overview of the course. Module 2 focuses on TDC for developing receptive skills, and module 3 on TDC for developing productive skills. Finally, module 4 is devoted to the assessment and closing of the course.

Table 1. WBDD learning moments' description

Learning moment	Description	Founded theory
Launch (online)	An initial activity triggers teacher-learners' interest, provokes curiosity, and builds background.	Inquiry-based learning, cultural and intercultural competence
Inquire (online)	Teacher-learners formulate individual problem questions. Then, they gathered in interest groups to share the questions and select two to be searched.	Inquiry-based learning, problem-based learning, and collaborative learning
Search (off-line)	Teacher-learners look for information for each question posed individually, post this info in their PLEs, and visit teammates' PLEs. Finally, they design a presentation of the results.	Inquiry-based learning, task-based learning
Share 1 (online)	Interest groups present the findings to the whole class.	Problem-based learning and collaborative learning
Plan	Teacher-learners make teams plan an intervention in the classroom. The tutor provides a planning guide and gives feedback.	Collaborative learning, community-based Pedagogies
Apply	Teacher-learners apply the plan and collect evidence of the implementation.	Collaborative learning, community-based pedagogies, cultural and intercultural competence
Share 2	Teacher-learners present the results of the implementation.	Problem-based learning and collaborative learning
Reflect	Teacher-learners self-assess their performance in each learning moment and make an improvement plan.	

METHODOLOGY

Research Population and Sample

The participants belong to a non-probabilistic, specifically self-selected sample since teachers chose to participate, not being randomly selected from a larger population. Participants did not belong to an only one institution that compromised their participation, but the sample intended to assess the effectiveness of the proposed methodology in English teachers in general.

The implementation was done in three cohorts of the diploma course. The organization of these three groups does not obey a methodological intention but the convenience of the participants. For the analysis, teacher-learners were classified into two types of populations:

1. In-service English teachers: Public and private school English teachers registered voluntarily for the implementation phase through the exploratory survey.
2. Pre-service teachers (Universidad del Tolima BA in English teaching students).

Table 2 presents sample population data for teachers' condition, years of experience, gender, and teaching levels.

Research Design

This inquiry used a quantitative design. Closed-ended questions, in the form of multiple-choice answers, Likert scales, and rankings, enabled accurate data analysis using statistics. Considering the classification of research methods presented by Mackey and Gass (2005), the current study is a quasi-experimental design because there is neither an experimental nor a control group. However, the intervention's results are compared among the two target population groups to see the results that the implementation provokes in teachers' digital competence.

Data Collection Instruments

Teachers' digital competence test

The DigCompEdu check-in, adapted and translated by Cabero-Almenara and Palacios-Rodríguez (2020), is a questionnaire that measures the six areas of digital competence through 22 items. Spanish and Latin American experts recognize the DigCompEdu instrument for its reliability (Cabero-Almenara et al., 2023). A pre- and a post-test were applied before and after the methodology was implemented.

Table 2. Sample population description

Condition	Number of teachers	Percentage of teachers
PST	16	33%
In-service teachers	32	67%
Total	48	100%
Years of experience	Number of teachers	Percentage of teachers
1-5 years	10	21%
6-10 years	17	35%
11-15 years	3	6%
More than 15 years	2	4%
No teaching experience	16	33%
Total	48	100%
Gender	Number of teachers	Percentage of teachers
Female	26	54%
Male	22	46%
Total	48	100%
Teaching level	Number of teachers	Percentage of teachers
Pre-school	1	2%
Elementary	6	13%
High school	29	60%
Tertiary education	12	25%
Total	48	100%

Self-assessment form

This form requires teachers to assess their students ' performance in the eight moments of the learning trajectory that comprise the didactic design, through a 1 to 5 scale at the middle and end of the course. The data contributed to assessing the influence of implementing the web-based model on TDC.

Research Objectives

Research objective 1. To determine the effects of implementing a WBLDD on TDC and English teaching didactics.

Specific objectives. To assess the influence of the WBLDD areas and competencies of the digital competence framework–DigCompEdu and determine the outcomes of implementing the WBLDD in TDC and English didactics among the target populations.

Research objective 2. To assess the effectiveness of each of the eight learning moments in incorporating technology into language teaching.

Research Questions

Research question 1. What are the effects of implementing a WBLDD on specific areas and competencies of the DigCompEdu framework?

Research question 2. How effective is the WBDD in each learning moment in incorporating technology into language teaching?

Methods of Analysis

The data analysis was conducted using statistical software R version 4.2.2. The Likert package version 1.3.5 and the ggplot2 package version 3.4.0 were used to generate graphs and descriptive statistics. The Stats package version 4.2.2 was used to perform the Kruskal-Wallis and Wilcoxon comparison tests. All analyses were conducted with a significant error rate of 5%. The percentage of answers for each question was calculated using Quesenberry and Hurt's (1964) confidence intervals of 95%. The Likert scale question type's answers were represented using heat diagrams and bars. Averages and standard deviations were calculated for each digital tool used to develop each skill. A question with an average of 3 indicates a neutral use of the digital tool, an average greater than three suggests that the tool is used quite a bit, and an average less than 3 indicates little use.

Table 3. TDC Wilcoxon test results

	Pre-test average	Post-test average	Mean (dif)	Standard deviation (dif)	p-value
Global	2.88	3.65	0.77	0.62	0.0001
Groups					
G3	2.83	3.79	0.96	0.67	0.0001
G2	2.86	3.71	0.85	0.5	0.0001
G1	2.95	3.43	0.49	0.59	0.0064
Experience					
No experience	2.76	3.75	0.99	0.68	0.0001
More than 11 years	2.92	3.88	0.96	0.63	0.0580
1-5 years	2.77	3.36	0.59	0.60	0.0244
6-10 years	3.08	3.65	0.57	0.50	0.0012
Gender					
Male	2.98	3.76	0.78	0.51	0.0001
Female	2.80	3.57	0.77	0.70	0.0001
Condition					
Pre-service	2.78	3.77	0.99	0.66	0.0001
In-service	2.94	3.58	0.64	0.56	0.0001
Area					
5. Empowering learners	2.92	3.87	0.95	1.04	0.0001
6. Facilitating learners' digital competence	2.58	3.51	0.83	0.89	0.0001
3. Teaching and learning	2.92	3.76	0.83	0.94	0.0001
4. Assessment	2.85	3.55	0.70	0.79	0.0001
1. Professional engagement	2.9	3.58	0.68	0.75	0.0001
2. Digital resources	3.26	3.91	0.65	0.61	0.0001

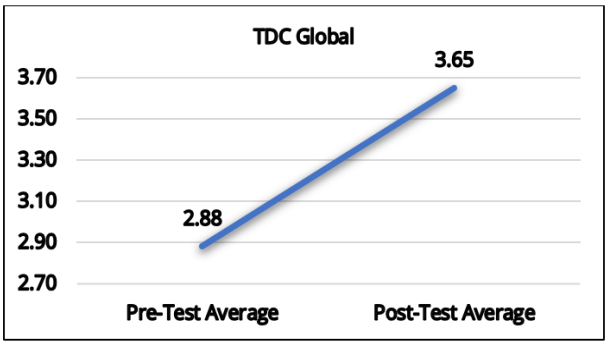

Figure 2. TDC global results (The authors' own work)

The software allowed us to answer research questions regarding the analysis of two target populations (pre- and in-service teachers). The questions were answered by teaching levels (elementary, high school, and university level), years of experience (no experience, 1 to 5 years, 6 to 10 years, and more than 10 years), gender (male and female), and teaching modalities in which teachers are grouped. Data was cross-referenced to establish relations among the different target populations.

RESULTS

Research question 1. What are the effects of implementing a WBLDD on specific areas and competencies of the DigCompEdu framework?

Table 3 presents the Wilcoxon test results. It compares the pre- and post-test averages, the mean of differences, the standard deviation, and the p-value, indicating the statistical significance of the observed changes.

The global results demonstrate that the TDC improved by 0.77 points between the pre- and post-test. The p-value (0,0001) confirms this improvement is highly significant (see **Figure 2**).

Regarding years of teaching experience, teachers with no expertise improved by 0.99 points, which suggests that this group benefited the most from the training process. Teachers with 1 to 5 years of

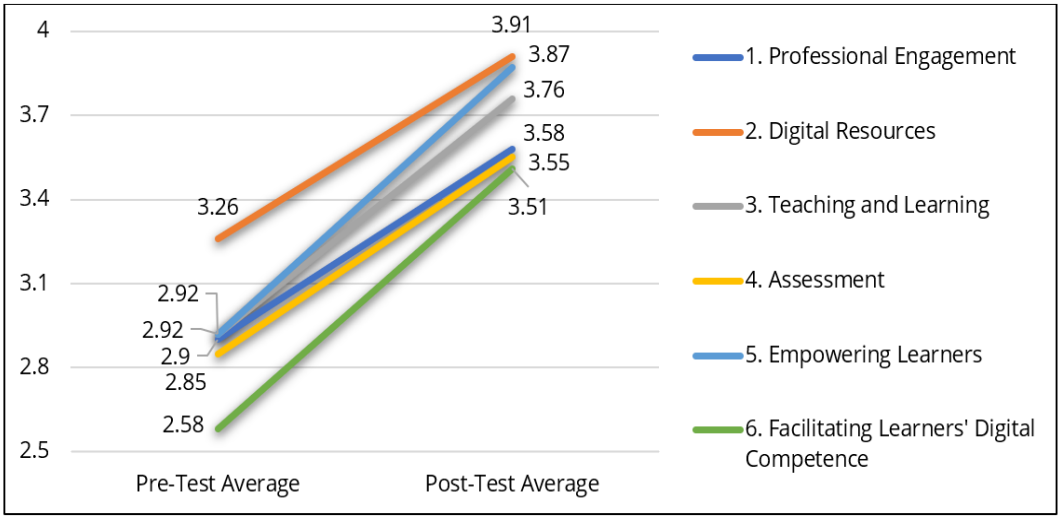

Figure 3. DigCompEdu areas result (The authors' own work)

experience enhanced by 0.59 points, and those with 6 to 10 years had a difference of 0.57 points. Both groups showed significant differences.

Finally, teachers, with more than 11 years of experience, improved by only 0.96 points, but with a p-value of 0.058, indicating that this difference was not statistically significant and being the group with less improvement. Results by gender indicate that female and male teachers both obtained significant improvements. Men got a difference of 0,78 points, and women a difference of 0,77 points. Concerning graduation conditions, pre-service teachers improved by 0.99 points, higher than in-service teachers, who improved by 0.64 points. Both changes were statistically significant; however, pre-service teachers demonstrated more incredible progress in developing digital competence

To answer the research question posed concretely, all assessed areas in the DigCompEdu showed statistically significant improvements. The "empowering students" area was the highest with a difference of 0.95 points ($p = 0.0001$) between the pre-test and the post-test. "Facilitating students' digital competence" showed an improvement of 0.83 points ($p = 0.0001$) and ranks second. The "teaching and learning" area is in third place, with an improvement of 0.83 points ($p = 0.0001$). The "assessment" area showed a difference of 0.70 points ($p = 0.0001$), and the "digital resources" area was the one with the least improvement, obtaining a difference of 0.65 points ($p = 0.0001$).

The areas with the most significant improvements were those related to students' digital competence development ("empowering learners" and "facilitating learners' digital competence"), suggesting that teacher-learners enhanced their ability to strengthen students' learning through digital tools. The areas with less improvement were those where teacher-learners scored higher in the pre-test (see **Figure 3**).

"Self-regulated learning" from the "teaching and learning" area, "accessibility and inclusion" from the "empowering students" area, and "communication and collaboration" from the "facilitating learners' digital competence" reached the highest difference when comparing the pre- and post-tests. This means that teacher-learners grew considerably in using digital technologies to enhance students' self-regulated learning processes, providing access to digital resources and learning activities for all students, and implementing learning activities that require learners to use technology to communicate and collaborate (see **Table 4**).

To answer research question 1, TDC improved significantly across all evaluated groups and areas. Teachers with no experience and pre-service teachers showed the most significant improvements, suggesting that the training model had a more substantial impact on those with less prior knowledge. The areas that improved the most were "empowering learners" and "facilitating learners" digital competence, indicating that teacher-learners strengthened their skills in students' DC development more than in areas related to teachers'. The competencies that stood out were "self-regulated learning," "accessibility and inclusion," and "communication and collaboration."

Table 4. DigCompEDu competencies' results

	Question	Average per question			Wilcoxon test
		Pre-test	Post-test	dif	p-Value
AREA 1. Professional engagement	Organizational communication	3.11	3.61	0.50	0.0003
	Professional collaboration	2.74	3.50	0.76	0.0001
	Reflective practice	2.98	3.76	0.78	0.0001
	Digital CPD	2.70	3.37	0.67	0.0001
	A1 average	2.90	3.58	0.68	0.0001
AREA2. Digital resources	Selecting	3.30	3.89	0.59	0.0001
	Creating & modifying	3.54	4.07	0.52	0.0001
	Managing, protecting, & sharing	2.93	3.78	0.85	0.0001
	A2 average	3.26	3.91	0.65	0.0001
AREA3. Teaching and learning	Teaching	3.07	3.80	0.74	0.0001
	Guidance	3.26	3.98	0.72	0.0002
	Collaborative learning	2.85	3.57	0.72	0.0001
	Self-regulated learning	2.43	3.59	1.15	0.0001
	A3 average	2.92	3.76	0.83	0.0001
AREA 4. Assessment	Assessment strategies	2.93	3.52	0.59	0.0001
	Analyzing evidence	2.98	3.57	0.59	0.0005
	Feedback & planning	2.63	3.54	0.91	0.0001
	A4 average	2.85	3.55	0.70	0.0001
AREA5. Empowering learners	Accessibility & inclusion	2.91	4.15	1.24	0.0001
	Differentiation & personalization	2.87	3.74	0.87	0.0001
	Actively engaging students	3.00	3.74	0.74	0.0005
	A5 average	2.92	3.87	0.95	0.0001
AREA6. Facilitating students DC	Information and media literacy	2.37	3.33	0.96	0.0001
	Communication	2.24	3.33	1.09	0.0001
	Content creation	3.02	3.52	0.50	0.0002
	Responsible use	2.54	3.35	0.80	0.0001
	Problem-solving	2.72	3.54	0.83	0.0001
	A6 average	2.58	3.51	0.83	0.0001
Total average		2.88	3.65	0.77	0.0001

Research question 2. How effective is the WBDD in each learning moment in incorporating technology into language teaching?

Table 5 presents the Wilcoxon test results. It compares the mid-term test and post-test averages, the mean of differences, the standard deviation, and the p-value, indicating the statistical significance of the observed changes.

In conclusion, no statistically significant improvement was found in self-assessment (+0.10 points). Teachers with more than 11 years of experience (+0.26 points, p = 0.046) and in-service teachers (+0.10 points, p = 0.04) showed statistically significant differences.

The learning moments with the most evident improvements were inquire (+0.27 points, p = 0.0008), share 1 (0.22 points, p = 0.0003), share 2 (+0.27 points, p = 0.0008), and plan (+0.16 points, p = 0.0001). This suggests that teachers felt more comfortable during the exploration and planning phases within the online teaching methodology. The search moment (-0.08 points, p = 0.8421) even showed a slight decline, which could indicate difficulties in this learning stage.

DISCUSSION

The area results contrast with studies that intended to self-assess TDC and whose results report low performance of teachers in the "facilitating students digital competence" (Bilbao-Aiastui et al., 2021; Dias-Trindade et al., 2021; Martín-Párraga et al., 2023; Sánchez-Caballé & Steve Mon, 2022; Torres Barzabal et al., 2022).

Leoste et al. (2022) and Santos et al. (2023) report little progress in the "facilitating learners' digital competence" area when assessing the effects of a synchronous online teacher training format of courses for children's teachers in STEAM-integrated learning activities. In the same vein, Reisoglu and Çebi (2020) found, after implementing the TDC development course, that pre-service teachers were weak in strategies to develop

Table 5. Self-assessment form Wilcoxon test results

	Mid-term test average	Post-test average	Media (dif)	Standard deviation (dif)	p-value
Global	4.47	4.57	0.10	0.40	0.0648
Groups					
G2	4.31	4.51	0.21	0.42	0.1334
G1	4.40	4.49	0.09	0.43	0.3540
G3	4.66	4.68	0.02	0.37	0.6234
Experience					
More than 11 years	4.43	4.69	0.26	0.37	0.0460
1-5 years	4.21	4.34	0.13	0.53	0.3844
6-10 years	4.42	4.51	0.09	0.32	0.5848
No experience	4.71	4.71	0.00	0.39	0.9742
Teaching level					
High school	4.49	4.62	0.13	0.38	0.2754
University	4.46	4.58	0.11	0.44	0.3812
Elementary	4.45	4.40	-0.05	0.48	0.8892
Gender					
Female	4.43	4.57	0.14	0.49	0.1140
Male	4.52	4.57	0.05	0.46	0.4492
Condition					
In-service	4.37	4.56	0.19	0.38	0.0400
Pre-service	4.60	4.58	-0.02	0.41	0.8450
Learning moment					
2. Inquire	4.31	4.58	0.27	0.61	0.0008
7. Share 2	4.29	4.56	0.27	0.86	0.0008
4. Share 1	4.44	4.67	0.22	0.77	0.0003
5. Plan	4.56	4.71	0.16	0.56	0.0001
6. Apply	4.58	4.64	0.07	0.72	0.0184
1. Launch	4.49	4.51	0.02	0.72	0.0947
8. Reflect	4.60	4.60	0.00	0.67	0.0582
3. Search	4.55	4.47	-0.08	0.69	0.8421

and implement the competencies related to the "facilitating learners' digital competence" area (information and data literacy, digital content creation, safety, and problem-solving).

The results for specific competencies contrast with the preliminary study, where "self-regulated learning" and "communication and collaboration" obtained the lowest scores. The analysis shows that the diagnosis made in the preliminary test strengthened weak areas and competencies in formulating the WBLDD methodology and the curricular design for the implementation phase.

The results on competencies align with the findings from Santos et al.'s (2023) study, which found that "self-regulated learning" and "communication and collaboration" ranked among the top ten digital competencies for academics. In contrast, Reisoglu and Çebi (2020) state that pre-service teachers must enhance their strategies for developing and applying "communication and collaboration" competence.

The offline learning challenges aligned with the ones reported in the study by Lai and Hashim (2021). Lukashe et al. (2024) claimed that methodological proposals should foster comprehensive skill development strategies (soft and experiential skills) and digital learning.

CONCLUSIONS

The TDC pre- and post-test results contrast with those in the preliminary self-assessment test, where the areas related to teachers' digital competence were the highest, and those related to students were the lowest. "Teaching and learning" (40% of the teachers in C level), "digital resources" (65% in level B and 24% in level C), and "professional engagement" (65% in level B and 22% in level C) obtained the highest scores in study 1. This fact proves that the diagnosis before the methodology design was effective since the WBLDD privileged the development of areas related to students, which were the weakest in the preliminary study.

The self-assessment results show that teachers' perceptions of their performance in each learning moment did not significantly differ between the two testing moments. The off-line learning moments were

the stages where teacher-learners reported struggling most. The teacher-learners' lack of autonomy, time management, and motivation affected their performance during the search moment, when they had to look for information to answer the posed questions and post it in their personal learning environments, and during the reflect moment, when they had to self-evaluate their performance throughout the learning process.

In conclusion, few studies have explored the effectiveness of digital tools in English teaching for developing skills. Future research studies should focus on assessing English teachers' digital competence in Colombia as a starting point to formulate new methodological proposals that increase the incorporation of technology into language teaching. This kind of research would also allow the construction of a repertoire of tools that may serve as a reference for lesson planning and strategies to tackle students' language learning problems. Self-assessing teachers' digital competence also provides valuable input for professional development plans in local universities as a first step to make more flexible curricula and reach remote regions. The WBDD learning model becomes a significant contribution to educational policy development since it demonstrates how bottom-up proposals can shed light on the formulation of educational policies in Colombia. The main challenges in online learning have to do with preparing teachers and students to assume learning as a personal responsibility. More emphasis should be placed on developing self-regulated skills to enhance autonomous learning and practical classroom strategies beyond formulating top-down policies that hardly affect learning dynamics. Finally, curricular programs should allow web-based learning to develop learners' autonomy and critical thinking, expanding the classroom beyond its four walls and roof.

Limitations

The whole process was mostly successful. Even teachers from remote territories, such as the indigenous communities of Coyaima in Tolima and Isnos in Huila, completed the course requirements despite all the difficulties of connectivity and resources in their rural settings.

Some of the limitations of the recruitment process, methodological and curricular design, and implementation were as follows:

The teachers' recruitment process was time and energy consuming. The administrative process for students' enrollment into the Tolima University academic platform also had a considerable workload. Accomplishing Institutional formalities was slow, interfering with the established research schedules.

Some rural teacher-learners lack Internet connectivity and technological equipment to complete the assigned tasks. These teachers received personalized advice and training to incorporate alternatives like downloading online activities on the teachers' computers and designing multimedia resources. Some online sessions had to be postponed many times to allow all the participants to complete the tasks.

Few studies have explored the effectiveness of digital tools in English teaching for developing skills. Future research studies should focus on assessing English teachers' digital competence in Colombia as a starting point to formulate new methodological proposals that increase the incorporation of technology in language teaching. This kind of research would also allow the construction of a repertoire of tools that may serve as a reference for lesson planning and strategies to tackle students' language learning problems. More emphasis should be placed on practical classroom strategies beyond formulating top-down policies that hardly affect learning dynamics. To enhance its usefulness, further inquiries should be made to evaluate LMS Moodle worldwide in online learning administration, particularly at Universidad del Tolima. Finally, curricular programs should give web-based learning a unique opportunity to develop learners' autonomy and critical thinking, expand the four walls and a roof limit of classrooms, and open education to remote geographical areas, attending to pupils' learning rhythms and styles.

Due to the limited sample size, effect size analyses or control for potential confounding variables were not included , as these require greater statistical power to ensure the reliability of the results. This limitation has been considered in the interpretation of the findings, and we recommend that future research with larger and more representative samples explore these aspects in greater depth.

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Ethics declaration: This study was approved by the Ethics Committee at the University of Tolima on 5 May 2023 with approval code 360123. All participants were provided with detailed information about the study's purpose, procedures, and rights, including the right to withdraw at any time without any consequences. Written informed consent was obtained from all participants prior to their participation in the study. To ensure the privacy and confidentiality of personal data, all collected information was anonymized and securely stored in a password-protected drive. Access to the data was restricted to authorized members of the research team only. No sensitive or identifiable personal information was shared or published as part of the study.

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Data availability: Data generated or analyzed during this study are available from the authors on request.

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