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Original articles

Piloting, Validation, and Definition of a Self-Perception Instrument for University Teachers' Digital Competencies in English Language Teaching in Costa Rica

Pilotaje, Validación y Definición de un Instrumento de Autopercepción para las Competencias Digitales de Docentes Universitarios en la Enseñanza del Idioma Inglés en Costa Rica

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Abstract

This study aimed to develop, validate, and define a self-perception instrument to assess the digital competencies of university teachers in English language teaching in Costa Rica. Based on previous research hand theoretical frameworks on digital competencies, a questionnaire was constructed, focusing on key dimensions such as digital literacy, ICT integration in teaching, and teacher appropriation and commitment. The methodology employed a quantitative approach with a correlational and cross-sectional design, utilizing statistical techniques, including Confirmatory Factor Analysis (CFA), Classical Test Theory (CTT) and Item Response Theory (IRT), to evaluate the instrument's validity, reliability and objectivity. The results enabled informed decision-making and the definition of the most appropriate instrument for application to university English language teachers at the national level.

Keywords: Digital competencies, teacher competencies, didactic resource use, technological competencies, Information and Communication Technologies.

Summary: Introduction, Methodology, Results and Discussion, Conclusions and recommendations.

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Resumen

Este estudio tuvo como objetivo desarrollar, validar y definir un instrumento de autopercepción para evaluar las competencias digitales de los docentes universitarios en la enseñanza del idioma inglés en Costa Rica. Basado en investigaciones previas, modelos y marcos teóricos sobre competencias digitales, se diseñó y construyó un cuestionario enfocado en dimensiones y subdimensiones claves como la alfabetización digital, la integración de las TIC en la enseñanza y la apropiación y el compromiso docente. La metodología siguió un enfoque cuantitativo con un diseño correlacional y transversal, utilizando técnicas estadísticas como el Análisis Factorial Confirmatorio (AFC), la Teoría Clásica del Test (TCT) y la Teoría de Respuesta al Ítem (TRI), para evaluar la validez, confiabilidad y objetividad del instrumento. Los resultados permitieron una toma de decisiones fiables e informadas y la definición del instrumento más adecuado, así como sus dimensiones y competencias digital, para su aplicación a docentes universitarios de inglés a nivel nacional.

Palabras clave: Competencias digitales, competencias docentes, uso de recursos didácticos, competencias tecnológicas, Tecnologías de la Información y la Comunicación.

Introduction

This article presents the development, validation, and definition of a self-perception instrument tailored to assess the digital competencies of university-level English language teachers in Costa Rica. It is built upon two previous works by the author: a systematic review of instruments in this field (Alpizar, 2024b) and a postgraduate thesis on the relationship between digital competencies and the didactic use of ICT in English teaching (Alpizar, 2024a).

Within the vast diversity of models, frameworks, and profiles on teachers' digital competencies, existing references provide general guidelines for digital teaching competencies but lack a contextual focus on English language teaching and the practical integration of ICT. Thus, this research aims to generate a more context-specific tool that reflects both self-perceived proficiency and the pedagogical application of ICT by English language teachers.

In this article the following acronyms are employed:

Table 1

Glossary of Technical Acronyms

Acronym	Meaning
CFI	Comparative Fit Index
TLI	Tucker-Lewis Index
CFA	Confirmatory Factor Analysis
IRT	Item Response Theory
CTT	Classical Test Theory
ICT	Information and Communication Technologies

Source: Own elaboration

The following matrix facilitated the creation of a suitable self-perception instrument for measuring teachers' digital competencies, considering the existing theories surrounding the research topic:

Table 2

Dimensions and Teacher Digital Competencies

Dimension	Sub-Dimension	Digital Competencies
Digital Literacy	Information Literacy	Navigation, search, and filtering of information, data, and digital content (using different software and browsers to access websites)
		Management, evaluation, storage, and retrieval of data
		Use of electronic journals
		Creation, editing, use, and administration of websites
		Creation, use, and administration of blogs
		Use of specialized databases, libraries, and repositories
	Communication and Collaboration	Promotion of communication and interaction skills and strategies with the community through ICT
		Exchange of data and information with other users
		Promotion of online citizen participation
		Promotion of collaboration through official channels
		Promotion of netiquette, language used in networks, behavior, and respect towards other users
		Management of digital identity and profile
		Use of instant messaging and video calling through applications (Messenger, built-in messaging service in social networks, messaging on platforms such as Moodle or Blackboard, among others)
		Use of email
		Use and administration of spaces, groups, and posts on social networks
		Use of learning management platforms (Moodle, Blackboard, Schoology, Google Classroom, among others)
		Use of text messages
		Use, administration, and moderation of users and content in online forums
		Creation, editing, use, and administration of wikis
	Creation and Manipulation of Digital Content	Promotion of respect for authorship rights, licenses, and programming
		Use of editing, creation, and manipulation functions of files through word processors (doc, docx, txt, pdf, cbr, among others)
		Creation, conversion, and editing of images (PNG, JPEG, BMP, GIF, PSD, TIFF, among others)
		Use of presentation functions (PPT, Canva, Prezi, among others)
		Use and management of information sets and databases
		Use of editing, creation, and manipulation functions of spreadsheets

Dimension	**Sub-Dimension**	**Digital Competencies**
		Creation, recording, conversion, and editing of audio files (MP3, WAV, among others)
		Creation, recording, conversion, and editing of video files (mp4, avi, flash, open source)
	Technological Devices	Use, administration, installation, and updating of laptops and PCs
		Use, administration, installation, and updating of tablets
		Use, administration, installation, and updating of smartphones
		Use and manipulation of local storage devices (USB, CD, DVD, external memory, among others)
		Use and manipulation of global storage media (iCloud, Drive, Dropbox)
		Basic technical knowledge management by the teacher regarding networks, connections, software, and hardware, among others, that do not require immediate intervention from a technical support department.
Security	User Security	Ensuring cybersecurity for users in spaces used for activity development, which should not compromise personal information or family data of teachers and students.
		Health and well-being when using ICT (having suitable space, accessories, a chair, desk, and other supplies for their tasks)
		Digital citizenship and responsibility.
		Web information publication (passwords and geolocation).
	Institutional Data Security	Access to and integrity of suitable equipment and information (valid author licenses and open-source software)
		Ethical and legal use of ICT
		Access to and verification of the intra-institutional network and the internet
		Ensuring the protection and security of institutional data
Integration of ICT in Teaching	Curricular Scope	Integration of ICT use in the curriculum
		Planning, development, monitoring, and evaluation of ICT use in teaching processes
		Use of didactic materials and ICT resources
		Recognition, understanding, and expression of emotions through the use of ICT
	Pedagogical Scope	Design of educational scenarios supported by ICT
		Assessment of student training in the use of ICT
		Creating a climate of motivation, empathy, and learning through the use of ICT
	Didactic Scope	Application of activities based on previous experiences related to the use of ICT

Dimension	Sub-Dimension	Digital Competencies
		Evaluation and feedback on the effectiveness of ICT-mediated educational scenarios
		Provision and definition of ICT environment, resources, and activities
		Designing activities, learning situations, and assessments that integrate the use of ICT
	Organizational Scope	Identification and definition of the most appropriate use of ICT
		Ensuring equitable access to the use of ICT
		Guiding students in the learning process based on individual needs and interests
Appropriation and Teacher Commitment		Identification of technological needs (equipment, ICT knowledge, connectivity, among others)
		Implementation of aspects of innovation and creativity
		Self-reflection on the use of ICT
		Teacher commitment to continuous practice and training in the didactic use of ICT
		Knowledge of policies on the use of ICT at institutional, local, national, regional, and international levels by different competent entities

Source: Alpizar, M. (2024b)

For this research, the security dimension was not considered, as some of its competencies were deemed to be covered within the Digital Literacy dimension, while others fall under the responsibilities of institutional departments (e.g., Occupational Health and Information Technologies) or relate to the technological infrastructure of each institution.

Research Problem

Considering the previously outlined and analyzed context, the research problem that guided this study was:

- To address the process of pilot testing, validation, and definition of an appropriate instrument to measure the self-perception of digital competencies in university teachers of English language teaching in Costa Rica.

General Objective

- To explain the process of piloting, validation, and definition of an appropriate instrument to measure the self-perception of digital competencies in university teachers of English language teaching in Costa Rica.

Specific Objectives

- To understand the process of piloting, validation, and definition of an appropriate instrument to measure the self-perception of digital competencies in university teachers of English language teaching in Costa Rica.
- To analyze the results of the pilot test and make the necessary adjustments to the instrument to improve its validity and reliability.

- To define the final version of the self-perception measurement instrument for teachers' digital competencies, considering the results of the pilot test and validation process.

To thoroughly document the design, pilot test, and validation process of the instrument to establish guidelines for its future application and continuous improvement.

Methodology

The study employed a quantitative approach within the positivist paradigm, based on careful observation and the measurement of objective reality. This approach enabled the testing of theories through the analysis of relationships between variables, as was the case in this research.

According to Creswell (2013), variables can be measured using instruments, enabling the collection of quantified data for analysis through statistical procedures. This approach is applied in the present study to quantify the relationship between teachers' digital competencies and their didactic use of ICT.

As noticed by Best and Kahn (2006), (2013), Delgado (2014), Hernández et al. (2014), and Hernández and Mendoza (2018), correlational research seeks to identify the relationship or degree of association between two or more concepts, categories, or variables within a given sample or context.

In this case, the expectation was that if Variable A (teachers' digital competencies) is systematically associated with Variable B (the didactic use of ICT), then predicting future phenomena may be possible, and the results may suggest additional hypotheses for testing.

Thus, the research hypothesis was formulated as follows:

- The greater the number of digital competencies a teacher possesses, the higher their didactic use of ICT. Conversely, the fewer digital competencies a teacher has, the lower their didactic use of ICT.

Scope of the Study

According to Delgado (2014), Hernández et al. (2014), and Hernández and Mendoza (2018), if two variables are correlated and the magnitude of their association is known, this provides a foundation for predicting, with varying degrees of accuracy, the approximate value of one variable based on the known value of the other.

This study followed a non-experimental, cross-sectional approach, meaning no variables were deliberately manipulated. As stated, non-experimental studies do not intentionally modify independent variables to observe their effects on others because the phenomena have already occurred, are occurring, or will continue to occur. This aligns with the perspectives of Kerlinger & Lee (2000) and Delgado (2014), who describe non-experimental research as a systematic empirical inquiry in which the researcher does not have direct control over the variables, as their manifestations have already occurred or are inherently unmodifiable.

Research Design

A cross-sectional (transversal) design was selected as the most appropriate non-experimental approach. A key characteristic of this type of non-experimental design is that data are collected at a single point in time, which was deemed appropriate following the global COVID-19 pandemic, as the study was based on the experiences of university English language teachers during the period of virtual or remote education.

Furthermore, correlational cross-sectional designs seek to establish relationships between variables. Consequently, considering these elements of non-experimental design, the study employed a questionnaire as its instrument to identify teachers' self-perception of their digital competencies and their frequency of ICT implementation for didactic purposes.

Population and Sample

As Best and Kahn (2006), Hernández et al. (2014), and Hernández and Mendoza (2018) indicated, the target population had to meet specific characteristics aligned with the research objectives and be quantitatively measurable. Based on approval requests sent to both public and private universities in Costa Rica, the estimated sample size included 153 university English language teachers nationwide.

These individuals shared a similar teaching background in English language instruction and met the regulatory requirements to practice their profession at the university level. All participants held at least a bachelor's degree in English Language Teaching, which was established as an inclusion criterion for the study's target population and sample.

However, a limitation emerged regarding private universities, as some institutions did not provide an exact number of participating teachers, making it uncertain how many instructors actually took part in the study. Additionally, despite requesting participation from more private universities, some did not respond, further complicating the determination of the total population of university-level English teachers in Costa Rica.

Given these challenges, the study adopted a non-probability sampling method, following the recommendations of Hernández et al. (2014) and Hernández and Mendoza (2018). These authors stated that in non-probability sampling, element selection is not based on probability but rather on factors related to the study's characteristics and the researcher's objectives.

Among non-probability sampling techniques, convenience sampling was chosen, as this method involves selecting participants who are readily available and accessible at the time of data collection (Best & Kahn, 2006; Fraenkel et al., 2012; Hernández et al., 2014).

Variables and Instruments

According to Best and Kahn (2006), correlational research focuses on examining relationships between variables, testing hypotheses, and developing generalizations, principles, or theories with universal validity.

The expectation was that if Variable A is systematically associated with Variable B, it might enable the prediction of future phenomena, and the results may suggest additional hypotheses for further testing.

The instrument included key demographic aspects (gender, age range, and years of experience) to profile the sample population. Variables were operationally defined to establish

the measurement procedures, with a detailed description of the instruments aligned to the research objectives.

Table 3

Variables, conceptualization, instrumentalization, and operationalization

Variables Definition	Teachers' digital competencies	Didactic use of ICT in English teaching courses
Conceptual	Based on the type of responses, it is classified as an ordinal qualitative variable, since its items are prescriptive, with restricted responses, ordered from lowest to highest in terms of proficiency level according to a Likert scale. It is worth noting that this is a latent variable (construct), as digital teaching competencies are based on a person's cognitive traits. Additionally, it is considered an index variable, as it has been theorized that competencies comprise skills, knowledge, attitudes, practices, emotions, and other aspects, which generate a series of manifestations that serve as necessary indicators to assess digital teaching competencies.	Based on the type of responses, it is classified as an ordinal qualitative variable, since its items are prescriptive, with restricted responses, ordered from lowest to highest in terms of frequency of use according to a Likert scale. It is a latent variable (construct) because the didactic use of ICT is based on the frequency of technology use in the classroom. Furthermore, it is considered an index variable, as it has been theorized that competencies generate a series of manifestations that serve as the necessary indicators to assess the didactic use of ICT.
Instrumental	The study measured teachers' perceptions of their digital competencies in English language teaching and identified the competencies they possess, as outlined in the proposed theoretical framework.	Through the instrument, the relationship between digital competencies of English language teaching staff and the use of technological resources, as well as the organization of didactic work with ICT, is described. Depending on the level of digital competencies teachers possess, the didactic use of ICT may be enhanced or not.
Operational	The first part of the questionnaire, using a three-point Likert scale, focused explicitly on teachers' digital competencies. It consisted of 12 items and aimed to assess the digital competencies of English language teaching staff. The questionnaire was structured into dimensions and sub-dimensions of different digital competencies, with the following distribution: Digital Literacy (6 items), Teacher Integration of ICT (2 items), and Teacher Appropriation and Commitment (2 items).	The second part of the questionnaire aimed to gather descriptions from English language teaching staff regarding elements such as ICT use, lesson planning phases, didactic strategies, and instructional materials for teaching English through ICT. The dimensions considered were: Digital Literacy (17 items), Teacher Integration of ICT (2 items), and Teacher Appropriation and Commitment (1 item).

Source: Alpizar, M. (2024a)

According to Wallace (1998), although the construction and implementation of a questionnaire require time, once this stage is completed, it allows for its application to a large population, as in this case, and enables the efficient and effective extraction of the necessary results.

This technique selection was sufficient to support the collection of the necessary information, especially since it aligns with the theoretical and methodological approach. The measurement object allowed for the specification of construct indicators; the items correspond to each indicator defined by the dimensions of digital teaching competencies and the didactic use of ICT, as per Delgado (2014).

Determination of the validity, reliability, and objectivity of the instrument

According to Hernández et al. (2014), Delgado (2014), and Hernández and Mendoza (2018), reliability refers to the consistency with which repeated application of an instrument to the same individual or object produces identical results. This was demonstrated through internal consistency and coherence measures using Cronbach's alpha coefficient.

Validity refers to the extent to which an instrument truly measures the intended variable. Validity can be demonstrated through three different types of evidence: content-related, criterion-related, and construct-related evidence. For this research, all three types were selected.

Content validity was established first, as it reflects how well the instrument covers the specific content domain being measured, according to Delgado (2014) and Hernández et al. (2014). The questionnaire included dimensions and subdimensions of digital teaching competencies based on theoretical foundations. For this stage, four university professors specializing in English language teaching and Educational Technology validated the instrument, providing feedback on item wording, application inclusion, and scale reduction.

Following Rojas et al. (2022), a pilot test was conducted using items approved by experts, administered to 125 English teachers from elementary, secondary, and open education levels.

Construct validity was established through a Confirmatory Factor Analysis (CFA) of the collected data, which examined the instrument's internal structure. Criterion validity was established by comparing the instrument with external criteria measuring the same construct, using predictive validity in this case.

Additionally, construct validity was considered from a scientific perspective, referring to how well the instrument represents and measures a theoretical concept, as well as its operationalization, and three stages were implemented.

In the first stage, a theoretical framework was developed through a literature review, establishing the relationship between digital teaching competencies and ICT didactic use.

The second stage included the statistical analysis of concept associations through a correlation design, supplemented by expert validation.

The next stage involved interpreting empirical evidence regarding the construct's validity. The instrument successfully measured the relationship between digital teaching competencies and ICT didactic use in English language teaching, achieving full validity through these complementary approaches.

Finally, objectivity, the extent to which the instrument is free from researcher bias and tendencies in its administration, scoring, and interpretation, was ensured by standardizing

administration procedures, maintaining consistent instructions and conditions for all participants, and applying an unbiased analysis method to interpret the results.

Results and Discussion

Preliminary Pilot Testing of the Instrument

To appropriately define and justify the instrument, a preliminary pilot test was conducted using items approved by experts with a sample of 125 English teachers from elementary, secondary, and open education settings. With the collected data, a Confirmatory Factor Analysis (CFA) was performed, along with other necessary tests detailed below. This process enabled the justification and strengthening of the instrument's internal structure, ensuring that it effectively measured what it was intended to measure.

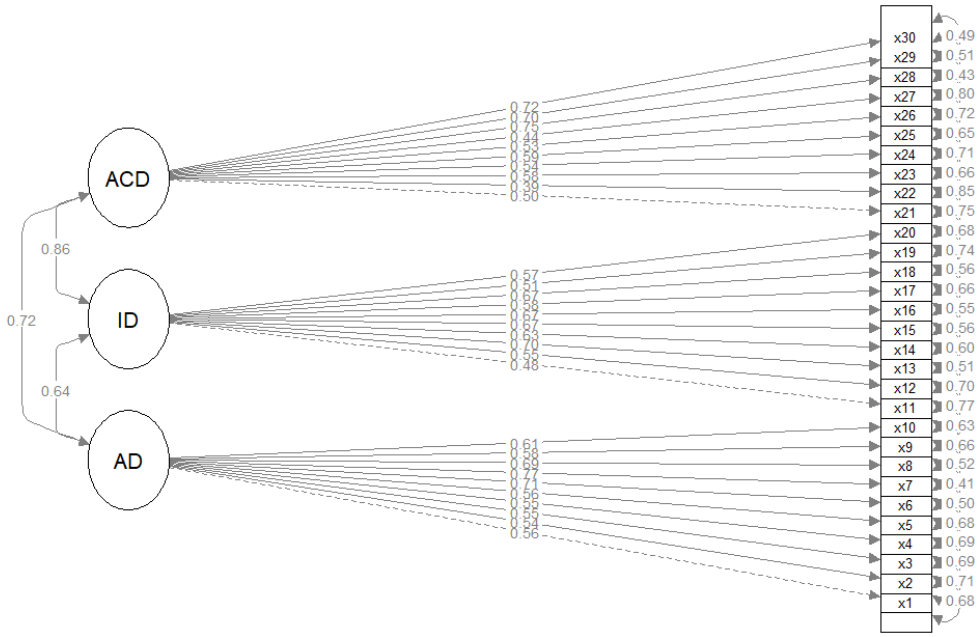
Confirmatory Factor Analysis (CFA)

The items associated with each dimension were assigned to the model to ensure the best possible representation. It is important to note that, for the purpose of applying the analysis, Spanish acronyms were used for the stipulated dimensions to facilitate their entry into the corresponding software. These acronyms are as follows: Digital Literacy (AD), Teacher Integration of ICT (ID), and Teacher Appropriation and Commitment (ACD).

The results obtained are presented below:

Figure 1

Factor Loadings by Dimensions



Source: Prepared based on data obtained from the preliminary pilot test

It is important to highlight that, for each dimension, the factor loadings associated with each item were expected to fall within similar value ranges. The analysis revealed that:

- In Dimension (AD), item values ranged between 0.54 and 0.77.
- In Dimension (ID), item values ranged between 0.48 and 0.70.
- In Dimension (ACD), most of the eight items had values between 0.50 and 0.75.

However, two items deviated significantly:

- Item 22 (use of spreadsheets): factor loading of 0.39.
- Item 27 (use of local storage devices): factor loading of 0.44.

Both items showed lower factor loadings compared to the others, preliminarily indicating that these items did not align well with their assigned dimension.

Based on the previous figure and the Confirmatory Factor Analysis (CFA) results, the following comparative tests were conducted:

a) A comparison was made to determine whether the proposed model fits better than a null model (without variables), yielding a p-value of 0.000, which indicates a significantly better fit than the null model.
b) A comparison was made to determine whether the proposed model fits better than a baseline model (a theoretical model that covaries the dimensions), also yielding a p-value of 0.000, indicating a significantly better fit than the baseline model.

Both results indicated that the proposed model is superior to simpler theoretical models. However, additional fit measures were examined to assess the model's accuracy:

Table 4

Test/Measure and Value

Test/Measure	Value
Comparative Fit Index (CFI)	0,731
Tucker-Lewis Index (TLI)	0,709

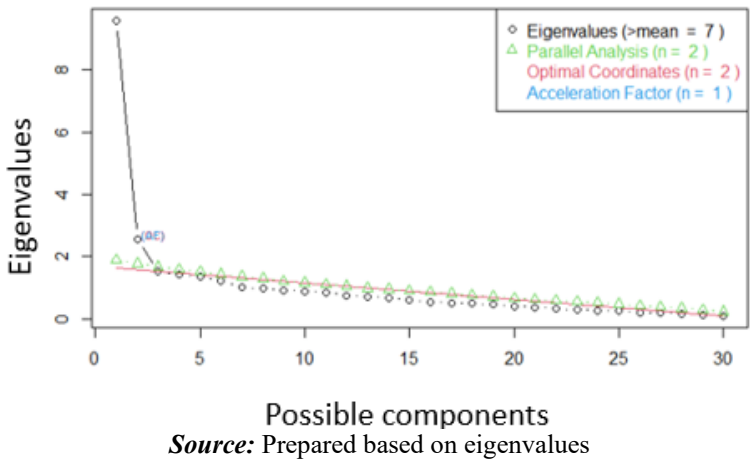
Source: Prepared based on collected data.

Both fit measures yielded values between 0 and 1, where the closer the value is to 1, the better the model fit. Values around 0.9 are considered acceptable. However, in both cases, it was observed that the evaluated model did not provide an optimal fit to the observed data, prompting further analysis of the data.

The initial step involved examining eigenvalues to determine the optimal number of dimensions, with results as follows:

Figure 2

Sedimentation Plot



Source: Prepared based on eigenvalues

The graphical analysis showed up to 7 possible dimensions, but the optimal and recommended solution was to retain two factors, as indicated in the graph legend. This revealed initial issues in dimension detection.

Given the research objective to optimize the three predefined dimensions, these were used as reference points for internal analysis to improve overall consistency. The analysis incorporated both Classical Test Theory (CTT) and Item Response Theory (IRT), as indicated by Martínez, Hernández, and Hernández (2014).

Dimension: Digital Literacy

Using CTT methodology (Martínez, Hernández, and Hernández, 2014), this dimension demonstrated excellent reliability with Cronbach's $\alpha = 0.855$. Item deletion analysis showed this value would decrease if any items were removed, confirming all items should be retained.

Table 5

Dimension: Digital Literacy (CTT)

Item	Item Mean	Alpha if Item is Deleted
Item 1	2,015873	0,8465086
Item 2	1,912698	0,8460739
Item 3	1,825397	0,8427036
Item 4	1,841270	0,8429890
Item 5	2,182540	0,8437073
Item 6	2,285714	0,8325510
Item 7	2,142857	0,8311771
Item 8	2,277778	0,8397880
Item 9	2,658730	0,8455701
Item 10	2,547619	0,8452137

Source: Prepared based on the results of the items

According to IRT, as stated by Martínez, Hernández, and Hernández (2014), when dealing with polytomous models (i.e., models with items that have more than two response categories), Partial Credit Models should be employed. Initially, it is necessary to determine which model best fits the dimension. The hypothesis test indicates that the two-parameter Rasch model best explains the dimension, as shown below:

Table 6

Dimension: Digital Literacy (Rasch model)

Models	LRT	Degrees of Freedom	p-value
Rasch - 1Parameter	19,38	1	<0,001
1Parameter - 2Parameter	37,42	10	<0,001

Source: Prepared based on results for the dimension

Once the model was identified, the aim was to ensure that the cut-off points between the responses of the items were at a similar distance and not overly skewed toward the positive or negative side of the measured competency. Therefore, in general, the items are presented appropriately, as shown below:

Table 7

Dimension: Digital Literacy (Categories and Discrimination)

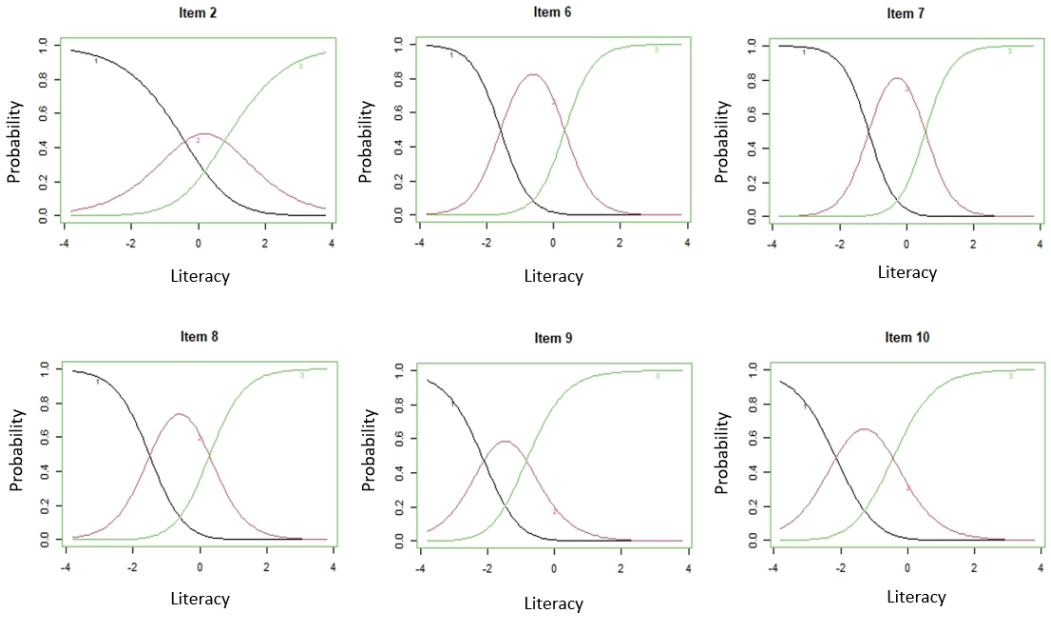
	Item	Category 1	Category 2	Discrimination
x1	Item 1	-0,957	0,864	1,125
x2	Item 2	-0,403	0,789	1,031
x3	Item 3	-0,427	1,239	1,189
x4	Item 4	-0,458	1,192	1,183
x5	Item 5	-1,385	0,498	1,303
x6	Item 6	-1,581	0,339	2,342
x7	Item 7	-1,134	0,562	2,540
x8	Item 8	-1,494	0,293	1,920
x9	Item 9	-2,101	-0,840	1,655
x10	Item 10	-2,135	-0,444	1,569

Source: Prepared based on the results of the items

The items, in general, appeared optimal, but there are six that are important to highlight as follows:

Figure 3

Items 2, 6, 7, 8, 9, and 10 discrimination



Source: Prepared based on the results of the items

The previous figure highlights:

- In item 2, the central response category did not make a significant contribution.
- The responses of items 6 and 7 discriminated well and very sharply.
- The responses to Item 8 discriminated well; however, for the two lowest response categories, discrimination was skewed more toward the negative side of the skill.
- People with neutral or positive levels of the skill were identified by the highest category, while lower levels were reflected in response categories 1 and 2.

Dimension: Teacher Integration of ICT

According to Classical Test Theory (CTT), the Cronbach's Alpha coefficient for this dimension was 0.8478, which is considered quite optimal. Then, when analyzing the impact of removing any item, it was observed that the coefficient decreased in each case. Therefore, according to CTT, no item should be removed.

Table 8

Dimension: Teacher Integration of ICT (CTT)

Item	Item Mean	Alpha if Item is Deleted
Item 11	4,119048	0,8418642
Item 12	4,357143	0,8367199
Item 13	3,865079	0,8245338
Item 14	4,603175	0,8345965
Item 15	3,904762	0,8246825
Item 16	3,690476	0,8279005
Item 17	4,079365	0,8342958
Item 18	3,484127	0,8312106
Item 19	4,595238	0,8409413
Item 20	4,523809	0,8367800

Source: Prepared based on the results of the items

According to the Item Response Theory (IRT) approach, since these are polytomous models, Partial Credit Models must be used. To determine the best fit for this dimension, the following results were obtained:

Table 9

Dimension: Teacher Integration of ICT (Rasch model)

Models	LRT	Degrees of Freedom	p-value
Rasch - 1Parameter	0.06	1	0.801

Source: Prepared based on results for the dimension

Since items 19 and 20 did not show diversity in the responses obtained, it was not possible to present the table with category intersections. Therefore, a direct analysis of the item characteristic curve was conducted.

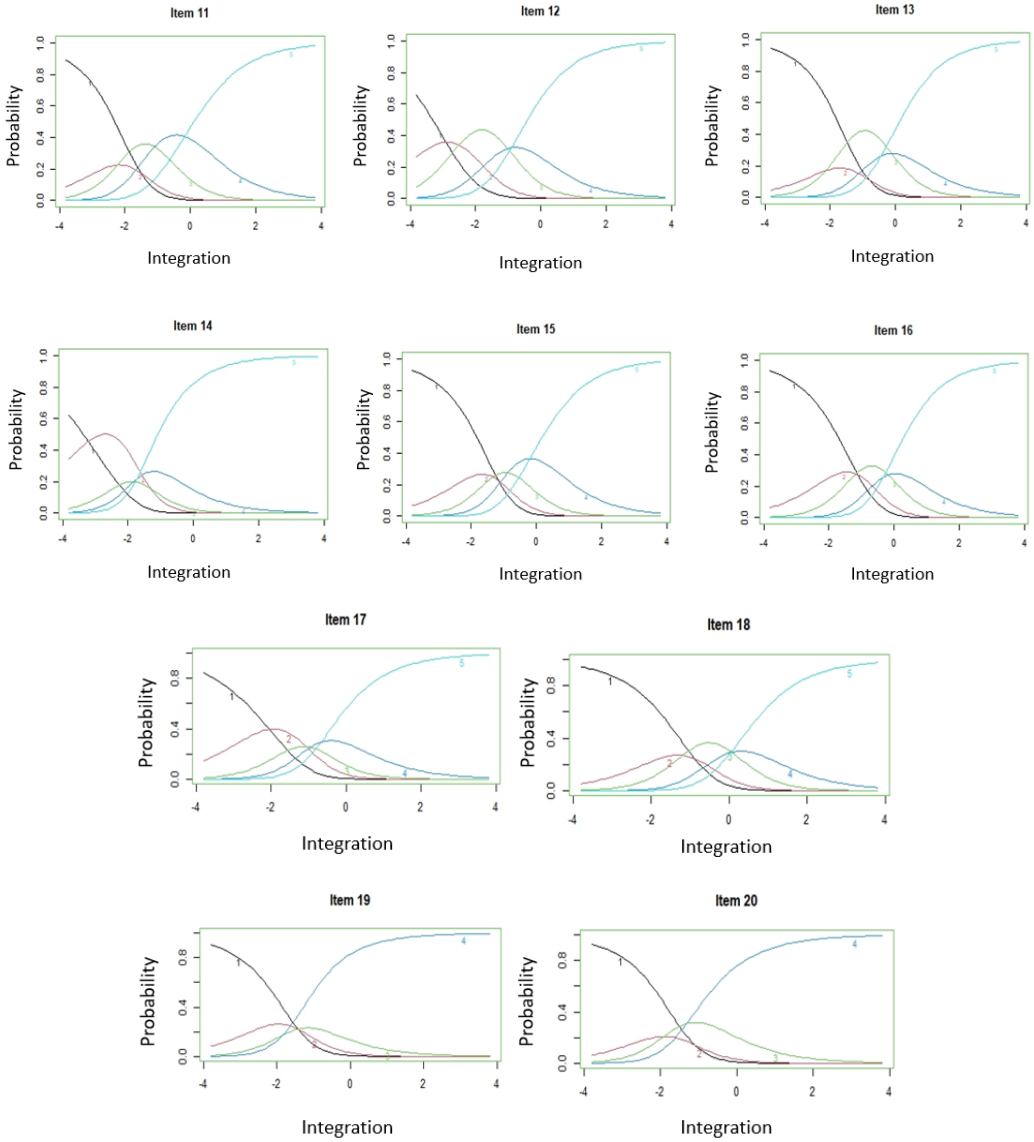
The following observations were made from the item characteristic curves:

- Item 11: Response category 2 did not contribute, while categories 3 and 4 overlapped.
- Item 12: Item discrimination based on skill level was very low in the negative skill range, and categories 2 and 4 contributed almost nothing.
- Item 13: Categories 2 and 4 did not contribute at all, and category 3 contributed only slightly below the neutral skill level.
- Item 14: This item did not discriminate well because category 5 encompassed both neutral and high skill levels, while categories 3 and 4 did not help determine low skill levels.
- Item 15: Category 2 did not contribute, and categories 3 and 4 did not add significantly.

- Item 16: Categories 2 and 4 did not contribute, category 3 contributed very little, and category 5 captured both neutral and positive skill levels.
- Item 17: The discrimination from categories 3 and 4 was almost non-existent, while categories 1 and 2 effectively distinguished low skill levels, and category 5 identified neutral and positive skill levels.
- Item 18: Categories 2 and 4 did not contribute. Category 3 provided slight discrimination at neutral skill levels, while categories 1 and 5 discriminated at negative and positive skill levels, respectively.
- Item 19: No one selected category 1, which shifted the graph values by one category. Categories 3 and 4 did not contribute; category 2 only discriminated at low skill levels; and category 5 captured neutral and high skill levels.
- Item 20: No one selected category 1, causing the graph values to shift by one category. Category 3 did not contribute; category 2 discriminated at low skill levels; category 4 slightly discriminated at low levels; and category 5 distinguished between neutral and high skill levels.

Figure 4

Items 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20 discrimination



Source: Prepared based on the results of the items

Dimension: Teacher Appropriation and Commitment

According to Classical Test Theory (CTT), the Cronbach's Alpha for this dimension was 0.8250, which is considered quite optimal. When applying CTT, it was found that removing Item 22 (related to the use of spreadsheets) would increase internal consistency to 0.8282. Upon re-evaluating the consistency of the dimension without this item, no further items were found to require elimination, as doing so would decrease internal consistency. It is worth noting that Item 27 (focused on the use of different local storage devices) showed a slight decrease in Cronbach's Alpha if removed, with a value of exactly 0.8270.

Considering the Item Response Theory (IRT), since these are polytomous models, Partial Credit Models must be used. To determine the best fit for this dimension, the following results were obtained:

Table 10

Dimension: Teacher Appropriation and Commitment (Rasch model)

Models	LRT	Degrees of Freedom	p-value
Rasch - 1Parameter	1.43	1	0.233

Source: Prepared based on results for the dimension

Since Item 26 did not show diversity in responses, it is not possible to present the table with the category intersections. Therefore, a direct analysis of the item characteristic curve was conducted.

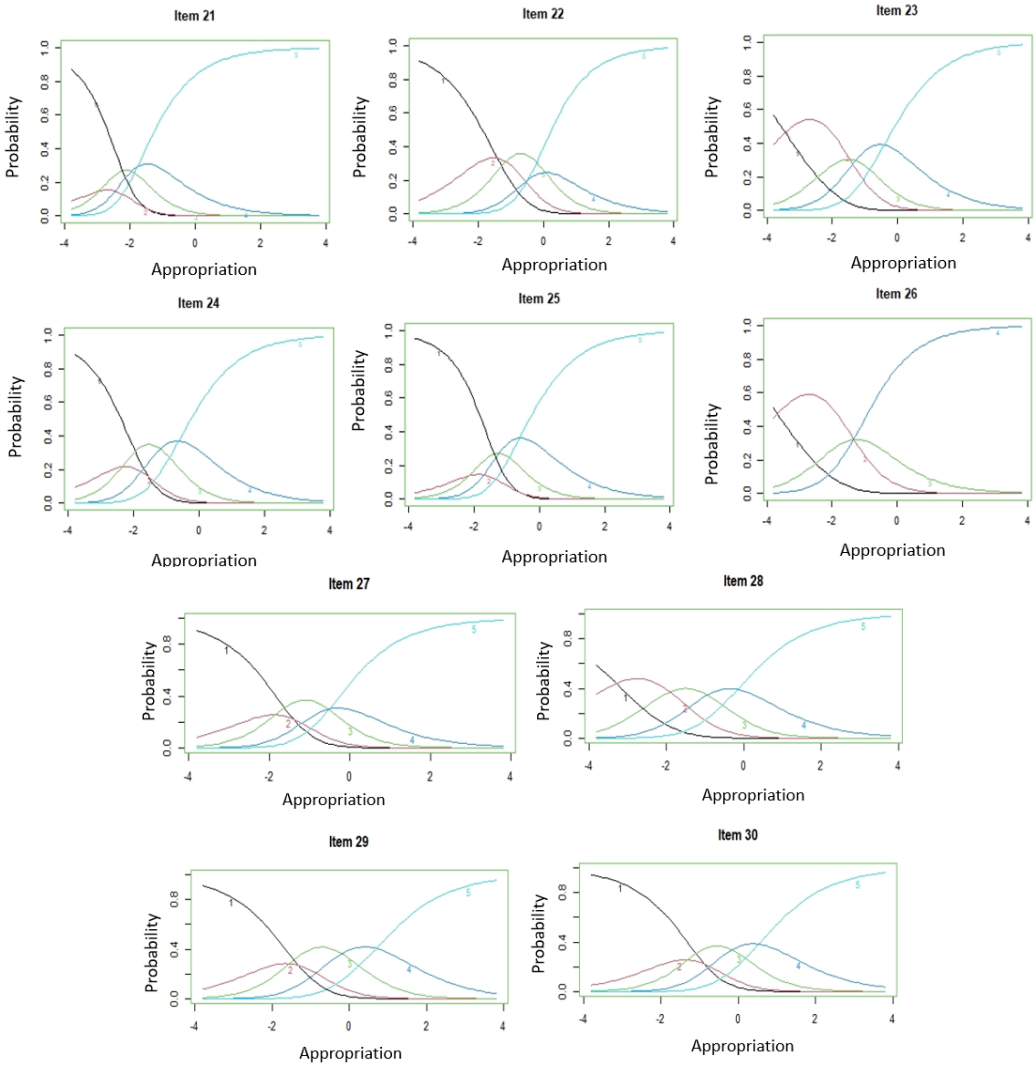
It is essential to note that, in general terms, category 5 in Items 21 to 27 encompassed both positive and neutral skill levels. Below is a detailed breakdown by item:

- Item 21: Category 1 indicated low skill levels, category 2 contributed nothing, and categories 3 and 4 also reflected low skill levels.
- Item 22: Category 1 demonstrated low skill levels, while categories 2 and 3 also showed low levels closer to neutral, and category 4 contributed nothing.
- Item 23: Categories 1 and 3 contributed nothing, whereas categories 2 and 4 indicated low skill levels.
- Item 24: Category 1 reflected low skill levels, category 2 contributed nothing, and categories 3 and 4 slightly indicated low skill levels.
- Item 25: Category 1 showed low skill levels and discriminated well; categories 3 and 4 slightly reflected low skill levels near neutral. Category 2 contributed nothing.
- Item 26: Since no one selected category 1, the graph values shifted by one category. Categories 2 and 4 contributed nothing; category 3 showed low skill levels, and category 5 increased rapidly.
- Item 27: Correct discrimination was observed at low skill levels in category 1, followed by category 3, which discriminated well near neutral levels. Categories 2 and 4 contributed nothing.
- Item 28: All five categories contributed some level of discrimination. Categories 1 through 3 reflected low skill levels; category 4 indicated a level very close to neutral; and category 5 increased rapidly across positive skill levels.
- Item 29: Category 1 declined rapidly in low skill levels; category 2 contributed nothing; categories 3 and 4 spanned low and neutral levels; and category 5 increased rapidly at positive skill levels.

- Item 30: Category 1 declined slowly across low skill levels, covering a significant range; category 2 contributed nothing; categories 3 and 4 reflected neutral levels; and category 5 increased rapidly at positive skill levels.

Figure 5

Items 21, 22, 23, 24, 25, 26, 27, 28, 29, and 30 discrimination



Source: Prepared based on the results of the items

Conclusions and recommendations

Based on the results of the tests performed, the following decisions were made regarding the final version of the instrument:

- To achieve more appropriate and accurate item functioning and behaviour, considering that the curves must have similar shapes, with the lowest category always on the left and the highest on the right, the scale was reduced from a five-point to a three-point scale to fit better. This followed the same approach used for the first dimension, which performed best, unlike the other two dimensions, as it consisted of a three-point scale. This decision was supported by previous analyses, which showed that response categories 2, 3, and 4 in most items did not contribute, making it more reasonable to reduce the scale. The same applied to items 21 to 30, where response categories 2 and 4 did not contribute.

- Items that were weak in measuring their intended constructs were reworded to strengthen their clarity and precision.
- Items 22, focused on the use of spreadsheets, and item 27, related to the use of different local storage devices, were eliminated, as their removal increased internal consistency according to Cronbach's Alpha.
- Following the recommendations of the advisors, items 23 and 24, related to using audio, podcasts, and videos to expose students to the English language, were divided into two separate items each: one focused on use and another on creation.
- Furthermore, it was suggested to incorporate two new items: one related to basic knowledge of network functionality and another addressing the use of different operating systems.

The validated instrument demonstrated strong psychometric properties and contextual relevance, effectively assessing the self-perceived digital competencies of English language university teachers and their frequency of ICT integration in English language teaching.

Its structure enables decision-makers to use it as a diagnostic and planning tool within higher education institutions. Beyond academic applications, it can support professional development strategies, teacher evaluations, and resource allocation at both the institutional and governmental levels.

The adjustments made based on pilot testing—such as reducing the Likert scale to three points and removing items with weak discriminative power—enhanced the instrument's overall coherence, clarity, and reliability.

To ensure its long-term utility, it is recommended that the instrument be applied periodically and adapted as digital technologies and teaching modalities evolve.

Unlike internationally recognized frameworks such as DIGCOMP or the INTEF Common Framework for Digital Competence, the instrument presented in this study was specifically designed for the Costa Rican higher education context. It focuses on English language teaching, incorporating dimensions such as digital literacy, didactic use of ICT, and self-reflection. This specificity provides universities and policymakers with a more practical tool for diagnosis, evaluation, and planning professional development.

Moreover, it is suggested that educational institutions integrate this tool into teacher training programs to promote digital inclusion and didactic innovation in English language instruction. Finally, fostering collaborative environments where teachers share their ICT-based practices will further strengthen the role of technology in language education.

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Appendices

Annex No.1 – Likert Scale Questionnaire Used for Preliminary Pilot

This instrument arises from research on the topic of teachers' digital competencies and the didactic use of ICT by English language teachers. This instrument will be used solely for academic purposes.

Objective:

The purpose of this instrument is to identify the current digital competencies of English language teachers and their perceptions of the didactic use of ICT in the courses they teach.

Please read and complete the following questionnaire. Select one option from the ones provided according to the scale—based on your level of knowledge in the first part, and frequency of use in the second part. The scale is structured in two sections: the first focused on teachers' digital competencies, and the second on the didactic use and integration of ICT.

Dear Teacher,

You will be asked a series of questions regarding your perception of your digital competencies in English language teaching. The questionnaire is anonymous and confidential. It consists of 30 items and will take no more than five minutes of your time. You are kindly asked to reflect on each question and answer with complete honesty. Please remember to mark only one answer per question.

If you have any questions before completing the instrument, you can contact me at the following email address: mario.alpizarrodriguez@ucr.ac.cr

Informed Consent:

If you feel that you have received the necessary information and had the opportunity to ask questions—which have been answered appropriately—please indicate that you understand the purpose of the project, the conditions of your participation, and that you consent to participate as a research subject in this study:

YES NO

Thank you very much.

Part One: Basic Information:

Gender: M: F: Other:

Age: _____

Years of experience: _____

Part Two: Perception of Your Digital Teaching Competencies

Dimension	Subdimension	Item	Statements	Do Not Possess	Beginner	Advanced
Digital Literacy	Information Literacy	1	I have the knowledge to recover deleted, corrupted, or inaccessible files, as well as those with formatting errors.			
	Communication and Collaboration	2	I am familiar with netiquette rules.			
		3	I have knowledge about students' digital identity and profile (e.g., online citizenship, participation through official channels, netiquette, and digital identity management).			
	Creation and Manipulation of Digital Content	4	I am able to verify different types of licenses for publishing content (e.g., copyright, copyleft, Creative Commons).			
	Technological Devices	5	I have basic technical knowledge as a teacher regarding networks, connections, software, hardware, etc., that do not require immediate intervention from IT support.			

Dimension	Subdimension	Item	Statements	Do Not Possess	Beginner	Advanced
		6	I have the knowledge to protect my devices against threats such as viruses, malware, among others.			
ICT Integration in Teaching	Curricular, Pedagogical, and Didactic Field	7	I have knowledge of designing educational environments supported by ICT.			
		8	I am familiar with methodologies for English teaching that involve the use of ICT.			
Appropriation and Teacher Commitment		9	I am able to identify technological needs (e.g., equipment, ICT knowledge, connectivity, etc.)			
		10	I am aware of my areas for improvement and seek ongoing training options for the didactic use of ICT.			

Part Three: Frequency of Didactic Use of ICT

Dimension	Subdimension	Item	Statements	Never	Almost Never	Sometimes	Usually	Always
Digital Literacy	Information Literacy	11	Do I use different browsers to search and filter information, data, and digital content?					
		12	I use online platforms to store and manage shared files and content (e.g., Drive, Dropbox, Office 365, iCloud, among others).					
	Communication and Collaboration	13	I use websites, blogs, and wikis to support my classes.					
		14	I use online communication tools (e.g., email, forums, instant messaging, chats, videoconferencing, among others).					
		15	I use learning management systems (e.g., SharePoint, Moodle, Blackboard, Schoology, Google Classroom).					
		16	I use social media and learning communities to share English language content (e.g., Facebook, Twitter, Instagram, Google+, among others).					
		17	I apply basic netiquette rules, including behavior, language used on networks, and respect among class members.					

Dimension	Subdimension	Item	Statements	Never	Almost Never	Sometimes	Usually	Always
		18	I manage spaces to help students develop their digital identity and profile (e.g., online citizenship, participation through official channels, netiquette, digital identity management).					
	Creation and Manipulation of Digital Content	19	I use text file formats (e.g., doc, docx, txt, pdf, among others).					
		20	I use images as part of my didactic planning (e.g., PNG, JPEG, BMP, GIF, PSD, TIFF, among others).					
		21	I use presentations (e.g., PowerPoint, Canva, Prezi) and visual designs (e.g., infographics, interactive charts, concept maps, timelines, among others).					
		22	I use spreadsheets (e.g., Excel, Access, among others).					
		23	I use audio or podcasts to expose students to the English language (e.g., mp3, wav, among others).					
		24	I use videos to expose students to the context of the English language (e.g., MP4, AVI, MKV, Flash Player, open-source formats).					
		25	I use gamification tools to teach English (e.g., Kahoot, Quizziz, Quizlet, word searches, Cypher Code, among others).					
	Technological Devices	26	I use various digital devices to support my teaching (laptop, PC, tablets, smartphones, among others).					
		27	I use different local storage devices (e.g., USB drives, CDs, DVDs, external hard drives, among others).					
ICT Integration in Teaching	Curricular, Pedagogical, and Didactic Field	28	When planning and designing my lessons, I integrate the use of ICT by both myself and my students.					
		29	After completing my courses, I evaluate and receive feedback on the effectiveness of ICT-mediated learning environments.					
Appropriation and Teacher Commitment		30	I use spaces to self-reflect on the use of ICT throughout my courses.					