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An Approach to Teachers´ Digital Competency in Latin America

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Inter-American Development Bank
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ProFuturo

A PROGRAMME OF:

Fundación Telefónica

"la Caixa" Foundation

IDB

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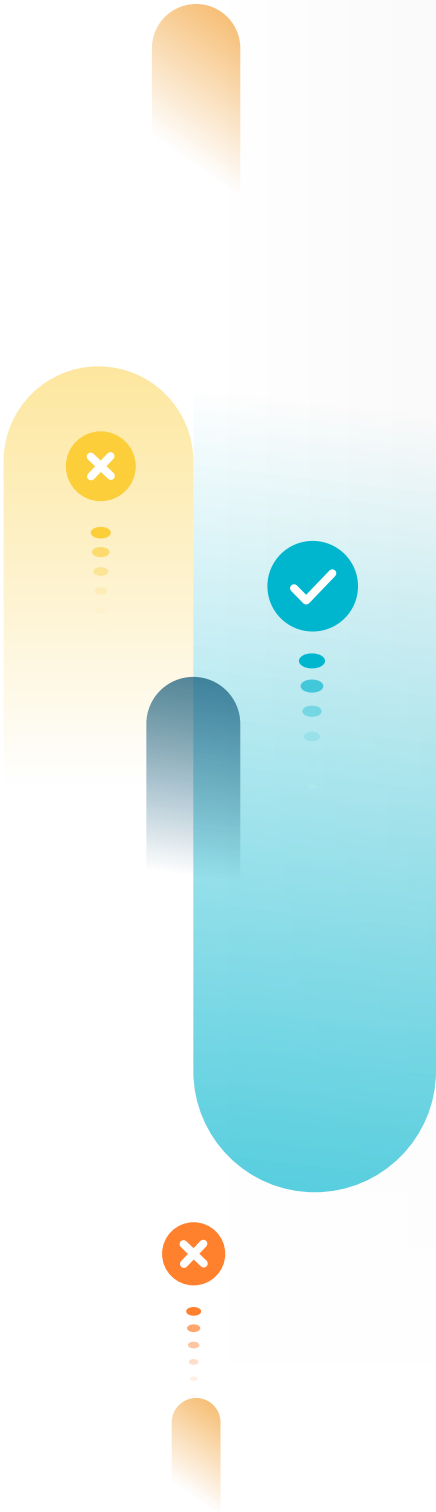

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Contenido

Foreword

This study is the result of a fruitful collaboration between the Inter-American Development Bank (IDB) and the ProFuturo Foundation. It aims to serve as a practical guide for the design of data-based strategies to strengthen teacher education in Latin America and the Caribbean.

In the digital age, data have become a key resource to improve public education policies. The collection and analysis of data make it possible to identify patterns, recognize areas for improvement, and drive informed and evidence-based decisions. Teachers are the main element of any education system directed towards effective learning. The digitalization of education systems has advanced significantly, with significant acceleration since the COVID-19 pandemic. However, for digital tools to translate into more relevant and higher-quality learning, it is essential that teachers are able to access them and make effective use of them in the classroom. Therefore, understanding the level of maturity of teachers' digital competence is key.

This study represents the first regional effort to collect teachers' perceptions of their capacity to effectively integrate digital technologies into their educational practices. The data collected through the self-assessment based on the Edutec Guide offer a valuable source to guide educational authorities in the design of public policies and training plans that respond to the real needs of teachers.

The better we understand how teachers assess their own competencies and needs, the more likely we are to design relevant, effective, and sustainable training programs. Identifying gaps is the first step in designing interventions that ensure that every investment in technology results in tangible improvements in students' educational experience.

Having tools and methodologies to map teachers' training needs related to technology is more necessary today than ever. But beyond serving as inputs for education systems, these tools must empower teachers themselves by providing useful information to identify areas for growth and offering a personalized roadmap for their professional development, from reflection to classroom implementation.

In short, this study invites us to reflect on the urgent need to strengthen teachers' digital competencies as an essential condition to improve both access to and the quality of education in the region. This process must begin with a shared conceptual framework and validated measurement instruments that allow for accurate and comparable assessments.

We hope that the findings presented here will help guide a new generation of public policies for teachers and education systems in Latin America and the Caribbean, focused on the strategic use of all technology investments. Only then can we ensure that digital transformation in education leads to a real and lasting impact on student learning.

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Executive Summary

In a context of accelerated digital transformation and a profound learning crisis, this study presents a regional overview of teachers' perceptions of their digital competence based on self-assessments by more than 28,000 educators from six Latin American countries. The findings offer a solid basis for rethinking teacher education strategies in the region, summarized in three key messages:

1. **Most teachers consider that they have not yet reached even a basic level of digital competence for teaching.** Only 27 percent of participating teachers reported at least a basic level of digital competence related to the pedagogical use of technology, while 29 percent reported competence in digital citizenship, and 40 percent in professional development competencies. This means that most of the teachers surveyed perceive limited ability to use technology and lack the minimum competencies necessary to make adequate use of such technologies for educational purposes.

2. **Teachers' individual characteristics influence their levels of digital competence.** Factors such as age, gender, education level, technology training, and their area of instruction are associated with self-reported levels of digital competence. In general, younger, male teachers with postgraduate training who teach science, technology, and mathematics (STEM) subjects tend to report higher levels of digital competence. Understanding teachers' profiles enables the design of more effective, equitable, and context-sensitive training strategies that build on teachers' strengths and meet their specific needs.

3. **Teacher training must be continuous, contextualized, and practice-oriented.** The development of digital competencies is not achieved with a uniform approach distanced from the reality of the classroom. Training cycles must include practical application, reflection, and peer collaboration. Toward this end, it is critical to coordinate institutional efforts and generate systematic evidence to shape effective public policies.

This study seeks to contribute to an equitable and sustainable educational transformation that empowers teachers, places them at the center of pedagogical innovation, and ensures that they have the necessary tools and pathways to prepare their students to be active, ethical, and responsible citizens in the digital world.

1 Introduction

This study provides an overview of the current state of teachers' digital competence in Latin America based on teachers' self-assessments in six countries: Colombia, Ecuador, Honduras, Mexico, Panama, and Peru. The aim of this collaboration between the IDB and ProFuturo is to provide a guide for the design of teacher training strategies in the digital field.

In a digital age when technology is evolving at a dizzying pace, the development of digital competencies is becoming increasingly important for both teachers and students. The integration of technology in education not only contributes to improving educational quality, but also prepares students to face the challenges of the contemporary world. However, in Latin America, there is limited data on teachers' levels of digital competence. This study seeks to address that gap.

The initial background chapter contextualizes this need, highlighting how the digital transformation of recent decades has revealed both the opportunities and the gaps in the educational use of technology. In this context, the level of teachers' digital competence is key to ensuring inclusive, equitable, and quality education in the region.

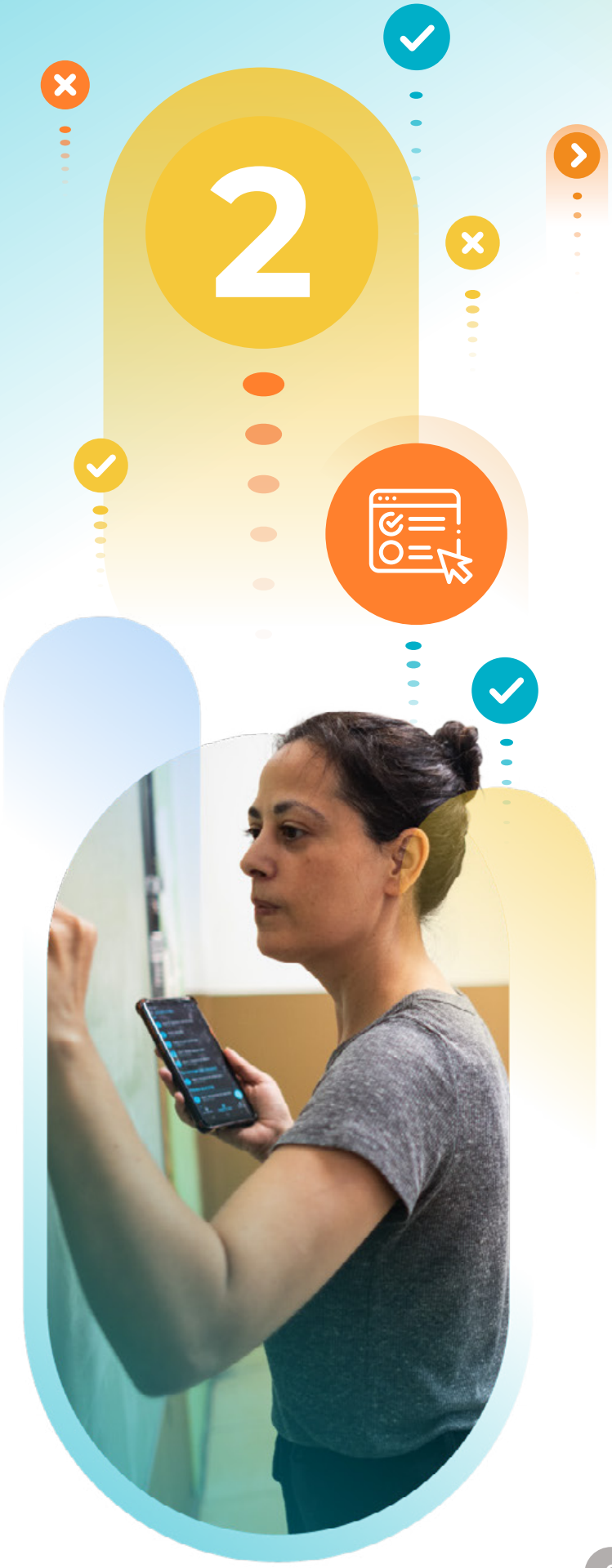
Chapter 2 presents the basic concepts of the Edutec Guide's self-assessment of teachers' digital competence. Based on international references such as UNESCO and the European Commission's DigCompEdu Framework, this formative diagnostic instrument focuses on three main areas: pedagogy, digital citizenship, and professional development.

Chapter 3 describes how the study was implemented. Data were collected from 28,358 teachers between 2021 and 2024. The

chapter highlights that, although the data are not representative of each country, they provide an overview of trends and factors associated with the development of digital competencies in the region.

Chapter 4 focuses on analysis of the results. Besides presenting the levels of digital competence reported by the participating teachers, the data are also analyzed based on their sociodemographic characteristics. The analysis reveals that age, gender, education level, and technology training are determining factors in the competency levels reported by teachers.

The study concludes with a series of recommendations based on the literature and on the analysis carried out. It highlights the need to strengthen teacher education by focusing on the pedagogical integration of technology, active learning, and peer collaboration. In addition, inter-institutional collaboration and the generation of continuous evidence for decision-making are recommended.



2 Background: Importance of Digital Teaching Competencies

It has become commonplace to say that we live in an era of rapid technological advances so dizzying as to easily affirm that this is the fourth Industrial Revolution. Increasingly advanced technologies are being developed and integrated into production processes and society. This has a profound impact on the way people live and work, and therefore implies challenges and opportunities for education, employment, communications, and even regulation.

When focusing on the education field, facing the challenges and taking advantage of the opportunities of the digital revolution makes it clear that education continues to be as relevant as ever to society. In other words, education must continue to be effective in ensuring that the adults of the future have the necessary skills to adapt and be resilient in the face of the speed of change. Above all, they must be able to master the competencies necessary to interact critically with emerging digital technologies and use them ethically and responsibly to build a fairer world.

The most extreme situation in recent years associated with the challenges of harnessing the opportunities of technology occurred as a result of the COVID-19 pandemic. The effort to address the resulting school closings that affected more than 1.6 billion students worldwide highlighted the lack of digital infrastructure and the digital divide in the most vulnerable areas. But is also revealed

how the lack of digital competencies for effective and responsible virtual interaction made it impossible to continue the learning process for millions of children.

On the other hand, the emergency shift to virtual education following school closings did prompt students, families, and teachers to quickly acquire an initial competency level using digital resources and incorporating technologies into teaching and learning processes. Governments in Latin America and the Caribbean made great efforts to guarantee educational continuity, acquiring devices for students, expanding access to connectivity, enabling educational platforms with digital content, and even broadcasting educational content via television and radio (Arias Ortiz et al., 2021). Thus, the digital transformation processes that countries were already promoting moved forward, albeit in unplanned ways and with various limitations (Cruz-Aguayo et al., 2022). As a result, the inequalities that already existed between different socioeconomic levels, or between urban and rural populations, set different starting points that ended up deepening the digital divide and, consequently, the learning gap.

Beyond the immediate impact of the pandemic, data from the 2022 Programme for International Students Assessment (PISA) confirm that Latin America and the Caribbean (LAC) is facing a deep and persistent learning crisis. Only one in four 15-year-old students in the region reaches the basic level of proficiency in mathematics, and more than half do not achieve it in reading and science. This highlights the urgency to transform education systems in order to ensure that all students learn the fundamental skills necessary to fully participate in society (Arias Ortiz et al., 2024).

In this scenario, technology offers an opportunity to close the gap in education. Access to the digital world can accelerate, diversify, and amplify learning processes. It facilitates educational continuity, offers an alternative to students outside the formal education system, and expands opportunities for disadvantaged students due to factors such as geography, socioeconomic status, ethnicity, disability, immigration status, language, or gender. Technology can also improve the effectiveness of educators by providing tools that support instructional design, classroom management, personalized learning, and professional development (Arias Ortiz et al., 2025).

For these technological opportunities to translate into real improvements in learning, it is essential to focus on teachers. Several studies agree that teacher training is among the factors with the greatest impact on students' academic performance. However, many training strategies are not aligned with teachers' needs and, in most cases, do not have sufficient depth to transform the classroom (Darling-Hammond et al., 2017).

This focus is relevant because, when we talk about strengthening teachers' competencies for the digital age, we are referring in the broadest possible sense to the opportunities that technology can offer to prepare students for the future. Even so, according to data from the international survey known as Teachers and School Leaders as Lifelong Learners (TALIS) conducted in 2018, only 56 percent of teachers in Organization for Economic Cooperation and Development (OECD) countries reported having received training in the use of information and communication technologies (ICT) as part of their initial teacher training (OECD, 2019). Moreover, ICT skills for teaching are among the areas where more teachers indicate having greater training needs.

The use of digital resources and tools requires that the teacher be able not only to navigate and access the vast amount of materials available on the Internet, but also to critically evaluate them, choose those that are most pertinent according to their needs and interests, and, above all, know how to take advantage of them to enrich their classroom practice. This process of inquiry, analysis, integration, and creation of resources and methodologies is significant because it constitutes the necessary lever to personalize learning, adapting content and methodologies to the individual needs of students (UNESCO, 2023). This is especially relevant in vulnerable contexts such as those in LAC. Equally important is the ability of teachers to communicate and collaborate effectively with their students in the classroom, as well as with parents, caregivers, and the rest of the educational community.

A final aspect worth noting in relation to the importance of strengthening teachers' digital competencies is the need for educators to be able to teach and guide their students in the safe use of technology and the protection of their rights. Teachers must develop skills in media literacy, critical use, active and responsible participation, and emotional resilience and well-being to prepare students to navigate the challenges of the digital world ethically and safely (UNESCO, 2024c).

3

Basic Concepts to Understand the Edutec Guide's Self-Assessment of Digital Teaching Competencies

The Edutec Guide is a free online diagnostic training tool that assesses the degree of technological adoption in schools and the level of digital competence of teachers, and then recommends specific improvements and free training resources to achieve them. Created by the Innovation Center for Brazilian Education (CIEB) in 2019, this tool is based on widely recognized international references. Among them are the European Commission's DigCompEdu framework, which defines six areas and 22 digital competencies for educators; the International Society for Technology in Education (ISTE) standards, which guide the pedagogical use of technology in school contexts; and the European Union's TET-SAT tool, which promotes teacher self-assessment in four dimensions. These references were analyzed and adapted by the CIEB to build a matrix of digital teaching competencies contextualized to the Brazilian education system, which served as the conceptual basis for the development of the Edutec Guide (Silva, 2019).

Unlike the international tools referenced, which were designed in the European and North American contexts, the Edutec Guide

was developed specifically for Brazil and, therefore, is closer to the Latin American context. Its main strength lies in the adaptation of international frameworks to a single digital competence matrix with progressive descriptors that take into account the realities of public schools in the region. For this reason, the guide has served as a diagnostic instrument in different Latin American countries, making it possible to capture the levels of technological acquisition in educational environments with similar structural challenges.

The Edutec Guide consists of two self-reporting tools: (i) the self-assessment of teachers' digital competencies, and (ii) the self-assessment of technological adoption in schools. This study focuses specifically on the data collected using the first tool in different Latin American countries, with a view to contributing to an overview of the state of teachers' digital competence in the region.

The self-assessment tool for teachers consists of a questionnaire with 23 multiple-choice questions (see Appendix 1) that allows them to self-assess their performance in 12 digital competencies distributed in three areas: pedagogy, digital citizenship, and professional development. Table 1 shows the definitions for each of the 12 competencies. Based on the tool's conceptual framework, the areas inquire about three fundamental topics:

- ICT as a means to expand students' learning possibilities and ensure that they are proactive **(pedagogy)**.
- The importance of making social, critical, responsible, and transformative use of educational ICT **(digital citizenship)**.
- The use of ICT as a means to develop professional teaching competencies and multipliers **(professional development)**.

TABLE 1. Digital Teaching Competencies

AREA	COMPETENCE	DEFINITION
PEDAGOGY	Pedagogical practice	Be able to incorporate technology into students' learning experiences and educational strategies.
	Personalization	Be able to use technology to create learning experiences that meet the needs of each student.
	Evaluation	Be able to use technology to monitor and guide the learning process and assess student performance.
	Selection and creation	Be able to select and create digital resources that contribute to the teaching and learning process, and to classroom management.

TABLE 1. Digital Teaching Competencies (Cont.)

AREA	COMPETENCE	DEFINITION
DIGITAL CITIZENSHIP	Responsible use	Be able to make and promote the ethical and responsible use of technology.
	Critical use	Be able to make and promote a critical interpretation of the information available in digital media.
	Safe use	Be able to make and promote the safe use of technologies (data protection strategies and tools).
	Inclusion	Be able to use technological resources to promote inclusion and educational equity.
PROFESSIONAL DEVELOPMENT	Self-development	Be able to use digital technologies in continuing education and professional development activities.
	Self-assessment	Be able to use digital technologies to evaluate teaching practices and take actions to improve them.
	Sharing	Be able to use technology to participate in learning communities and promote peer exchange.
	Communication	Be able to use technologies to maintain active, systematic, and effective communication with the actors of the educational community.

Source: Gottlieb et al. (2024).

According to the teachers' responses to the questionnaire, the level of acquisition of each of these digital competencies is defined based on the stages of adoption and use of ICT (Anderson, 2010) – exposure, familiarity, adaptation, integration, and transformation – which are defined in Table 2.

The results obtained from the application of the digital competence self-assessment have a double use that is worth highlighting. At the individual level, the diagnostic-formative nature of the tool allows teachers to take ownership of their learning process and motivates them to reflect on their teaching practice (Gottlieb et al., 2024). At the end of the questionnaire, each teacher receives a personalized feedback report according to the level achieved in each area and skill, which makes it easier for the teacher to identify opportunities for improvement and manage concrete actions to reach his or her full potential. In addition, the tool provides teachers with a series of strategically selected training resources to support their professional development.

With respect to the education system, the aggregate results of the instrument are visualized in dashboards to guide decision-making at the local, regional, or national levels. These data are especially valuable because they come directly from teachers, who are precisely the people who know their context and skills best. Therefore, the results offer key quantitative

TABLE 2. Levels of Technological Acquisition

LEVEL	DEFINITION
EXPOSURE	Technologies are not used in pedagogical practice, or the teacher requires the support of someone to use them, and the use of such technologies is only personal. The teacher identifies technologies as a tool, not as part of the digital culture.
FAMILIARITY	The teacher begins to know and use technologies in his or her activities, and identifies and sees technologies as support for teaching. The use of technologies is focused on the teacher.
ADAPTATION	Technologies are used regularly and can be integrated into the planning of pedagogical activities. The teacher identifies technologies as complementary resources to improve teaching and learning processes.
INTEGRATION	The use of technologies is frequent in the planning of activities and in interaction with students. The teacher works with technologies in an integrated and contextualized way in teaching and learning processes.
TRANSFORMATION	The teacher uses technologies in an innovative way, shares them with colleagues, and carries out collaborative projects beyond the school environment, thus showing experience in the use of digital technologies that the teacher sees as a tool for social transformation.

Source: Gottlieb et al. (2024).

information for the planning of training strategies aligned with the expectations and real professional development needs of teachers.

Various studies in Latin America show both progress and challenges in terms of the digital competence of teachers. The International Computer and Information Literacy Study (ICILS) Teachers Panel 2021 highlighted improvements in the use and trust of ICT by teachers during the pandemic in Uruguay, the only country in the region included in the study (Strietholt et al., 2021). For its part, a study based on the Check-In tool of the DigCompEdu framework showed that most university professors in seven Latin American countries are at an intermediate level of digital competence, influenced by factors such as age and institutional infrastructure. In Brazil, the CIEB's Edutec Guide has shown a general level of familiarity (second level) with technologies and has been key to the national strategy for educational digital transformation. In general, these studies agree that, although the effective integration of digital tools can contribute to the improvement of educational quality, considerable challenges remain in the region.

4 How to Measure the Level of Acquisition of Digital Competencies by Teachers in Latin America

The purpose of this study is to analyze teachers' self-perception of their digital competence based on the results of the Edutec Guide self-assessment. The aim is to explore trends and factors associated with the development of these competencies. Data collection was carried out between 2021 and 2024 through the self-assessment surveys conducted by the IDB and ProFuturo, as explained below.

In total, 28,358 teachers from Colombia[1], Ecuador, Honduras, Mexico, Panama, and Peru participated in the survey. It is worth mentioning that the data collected are anonymized. Table 3 shows the number of participating teachers per country, the percentage that share represents of the total number of participants, and, as a scale, the percentage it represents of the total number of primary teachers per country, according to data from the UNESCO Institute for Statistics (2024).

Although a significant number of teachers participated in the survey, three clarifications

[1] All the participating teachers in Colombia come from the municipalities of Palmira and Manizales, since implementation of the Edutec Guide responded to specific initiatives of the education secretariats of both cities.

TABLE 3. Numbers and Percentages of Participants in the Self-assessment of Digital Teaching Competencies

Country	Years	Number of Participating Teachers	Percentage of Total Participants	Total Number of Primary School Teachers Nationwide	Percentage of Participants Compared to the National Total
Colombia	2022 - 2023	1.428	5%	180.781	1%
Ecuador	2021 - 2024	9.118	32%	79.602	11%
Honduras	2023	985	3%	41.528	2%
Mexico	2021 - 2024	8.613	30%	567.929	2%
Panama	2022 - 2024	1.825	6%	22.102	8%
Peru	2022 - 2024	6.389	23%	217.304	3%
TOTAL	**2021 - 2024**	**28.358**	**100%**	**1.109.246**	**3%**

Source: Prepared by the authors; data for the total number of primary teachers nationwide is from UNESCO Institute for Statistics (2024).

need to be made about the implementation of the questionnaire by both organizations. First, although the IDB and ProFuturo have the same self-assessment questionnaire (Appendix 1) available on their respective digital platforms, they deploy the tool differently. In the case of the IDB, the Edutec Guide is applied in response to specific requests from the countries of the region, with the aim of analyzing the results of a specific group of teachers. In this sense, the IDB's digital platform is enabled for scheduled implementations during a limited period of time. During this period, each educational authority has access to a dashboard of aggregated results and, at the end, is given a final report that analyzes the results and makes recommendations.

For its part, ProFuturo has the self-assessment questionnaire on its website open to the public in multiple languages. In this case, applications of the tool are carried out within the framework of the organization's teacher training model in closed calls for specific teachers or open calls launched at the national level. The data collected are only available to institutions that have collaboration agreements with ProFuturo Foundation.

The second clarification is that, although the 23-question survey that makes up the self-assessment is the same for both organizations, there are some differences in the registration forms (where certain sociodemographic data about the teachers are collected, such as gender, age, and educational level, among others). Therefore, the same information is not available for some variables regarding teacher characteristics. To overcome this difficulty, a unification of variables was carried out (see Appendix 2, where both questionnaires are compared in a table).

A third clarification is that the data collected are not representative of the participating countries. In other words, the teachers who have participated in the self-assessment through the IDB or ProFuturo do not constitute statistically representative samples of each

country, nor were they selected through random sampling. Rather, they are part of targeted groups according to the work of both organizations in the region. In addition, there may be a self-selection bias, given that teachers who chose to participate may share certain characteristics (such as greater interest in technology or greater professional motivation) that do not necessarily reflect the broader teaching population. In addition, certain key pieces of information are unavailable, such as the schools of origin of the participants. These limitations pose significant challenges when interpreting the results, as they make it difficult to generalize the findings to each country and, by extension, to the region. However, they are still enlightening results, as they allow for identifying patterns, common challenges, and priority areas in the development of teachers' digital competences.

In this sense, beyond presenting comparisons between countries, the intention of this study is to present a general overview of the digital competency level of teachers in the participating countries of Latin America and to propose lines of action to help guide efforts at digital transformation in education.

Profile of Teachers Who Participated in the Self-assessment of Digital Competence

The vast majority of participating teachers work in public schools at the primary level. Among those who reported their age, the average is 45 years, with 60 percent of participants between the ages of 35 and 54. In terms of gender, 74 percent are women, 26 percent are men, and 0.09 percent selected the "other" option or preferred not to report their gender. Regarding their academic background, most have university studies (63 percent), 28 percent have a master's degree or specialization, 4.4 percent have non-tertiary post-secondary or lower education, 2.7 percent have tertiary technical education studies, and 2 percent have a doctoral degree. Among teachers for whom there is information on technology-specific training, only 27.5 percent reported having received any training in this area. Table 4 summarizes the characteristics of the teachers who participated in the self-assessment.

TABLE 4. Characteristics of Participating Teachers (Percent)

	COLOMBIA	ECUADOR	HONDURAS	MEXICO	PANAMA	PERU	AVERAGE OF THE SIX COUNTRIES
Level of education							
Preschool	-	8,4	0,0	3,9	14,9	1,8	5,8
Primary	-	91,6	51,6	96,1	85,1	98,2	84,5
High school	-	0,0	51,5	0,0	0,0	0,0	10,3
AGE							
Under 20	0,0	0,0	0,0	0,6	0,2	0,1	0,2
20 to 24	0,7	1,1	0,9	5,5	0,7	0,4	1,5
25 to 29	1,9	5,3	6,9	10,2	1,8	1,2	4,5
30 to 34	6,2	12,2	11,5	15,6	5,0	2,7	8,9
35 to 39	12,9	17,1	11,7	18,3	14,1	7,8	13,6
40 to 44	16,5	16,7	14,1	16,4	14,8	12,3	15,1
45 to 49	14,3	14,4	17,8	13,0	18,5	14,5	15,4
50 to 54	17,0	16,2	15,0	9,1	19,2	20,3	16,1
55 to 59	13,2	11,1	19,2	6,5	13,6	21,2	14,1
60 to 64	12,2	5,1	2,2	3,4	5,9	16,5	7,6
Over 65	5,1	0,9	0,7	1,4	6,3	3,0	2,9
GENDER							
Female	-	68,1	-	71,7	81,0	76,8	74,0
Male	-	31,9	-	28,2	19,0	23,0	25,9
Other	-	0,01	-	0,01	0,00	0,03	0,01
I'd rather not say	-	0,06	-	0,06	0,05	0,14	0,08
EDUCATION LEVEL							
Postsecondary non-tertiary or lower	-	4,8	0,0	3,1	6,8	7,5	4,4
Technical tertiary education	-	5,9	0,0	1,2	2,7	3,9	2,7
University education	-	56,1	84,9	59,7	62,6	51,1	62,9
Master's degree or specialization	-	32,3	15,1	31,0	27,6	33,4	27,9
Doctorate	-	1,0	0,0	4,9	0,2	4,0	2,0
TECHNOLOGY TRAINING							
Yes	-	31,4	-	22,3	26,7	29,5	27,5
No	-	68,6	-	77,7	73,3	70,5	72,5
SUBJECTS							
Art	-	5,4	20,7	2,5	4,0	0,7	6,7
Natural sciences	-	12,4	13,8	6,6	1,3	3,7	7,5
Social sciences	-	2,3	30,4	2,5	2,7	1,0	7,8
English	-	0,0	11,7	0,0	0,0	0,0	2,3
Language and communication	-	16,3	44,0	10,3	5,9	2,0	15,7
Mathematics	-	10,4	36,4	7,0	6,1	8,2	13,6
Physical education	-	6,4	24,3	3,4	14,2	3,2	10,3
Technology and computer science	-	12,8	8,3	9,7	22,9	6,6	12,1
All or most subjects	-	17,1	18,5	35,0	4,8	50,0	25,1
Other	-	16,9	23,9	22,8	38,2	24,5	25,3

Source: Prepared by the authors.

5

Digital Competency of Teachers in Latin America: Findings, Trends, and Opportunities

This section presents the digital competency levels of teachers in the six countries of the region that participated in the Edutec Guide self-assessment. In addition, the results are analyzed considering different characteristics of the participants, such as age, gender, education level, training in technology, and the subjects they teach at school. This comprehensive perspective allows for a better understanding of the context in which digital competencies are developed, as well as for the identification of patterns and relationships between the different variables.

Since the groups of teachers participating in the self-assessment do not constitute representative samples by country, as explained earlier, and because there are important differences in the numbers of participants per country, the average levels for the group of participating countries were calculated as the simple average of the country-level averages. This provides a comprehensive view of the state of teachers' digital competence in the region, while acknowledging the limitations of the sample.

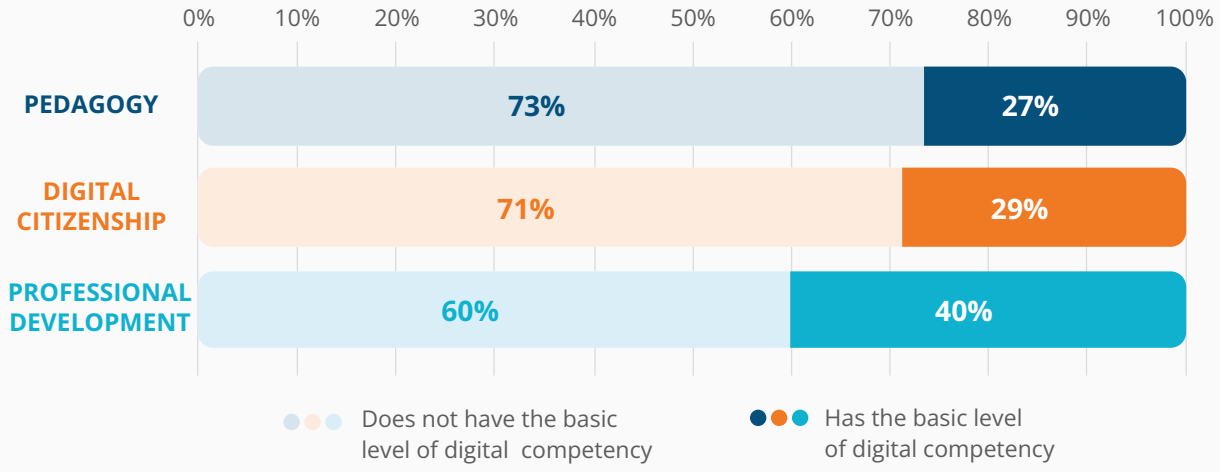
Level of Acquisition of Digital Competencies in Latin America

To begin, this section presents the results of the self-assessment of teachers' digital competencies in each of the three competency areas: pedagogy, digital citizenship, and professional development. Although the Edutec Guide framework contemplates five levels of acquisition (Table 2), a basic digital competency level is defined in order to simplify the analysis – that is, a threshold is defined beyond which a teacher can be considered to have the basic skills necessary to make appropriate use of technology for a pedagogical purpose.

For the purposes of this study, this limit is defined at the "adaptation" level (the third of five levels), since at this point teachers begin to make periodic use of technological resources to improve teaching and learning processes. Thus, we refer to a low category, which includes the first two levels of the scale (exposure and familiarity). At these levels, teachers make limited use of technologies, that is, either they do not use them, they require support to do so, or they make incipient use of them that focuses on themselves and not yet on the classroom. In contrast, teachers who reach the higher three levels of acquisition (adaptation, integration, or transformation) demonstrate at least a basic level of digital competence.

Figure 1 shows the percentage of teachers who either reach or do not reach the basic digital competency level. On average, in the participating countries, only 27 percent of the teachers surveyed reach the basic level in the pedagogical dimension, 29 percent in digital citizenship, and 40 percent in professional development.[2]

FIGURE 1. Percentage of Surveyed Teachers who Reach the Basic Level of Digital Competence in All Three Areas (Average of participating countries, in percent)



Source: Prepared by the authors.

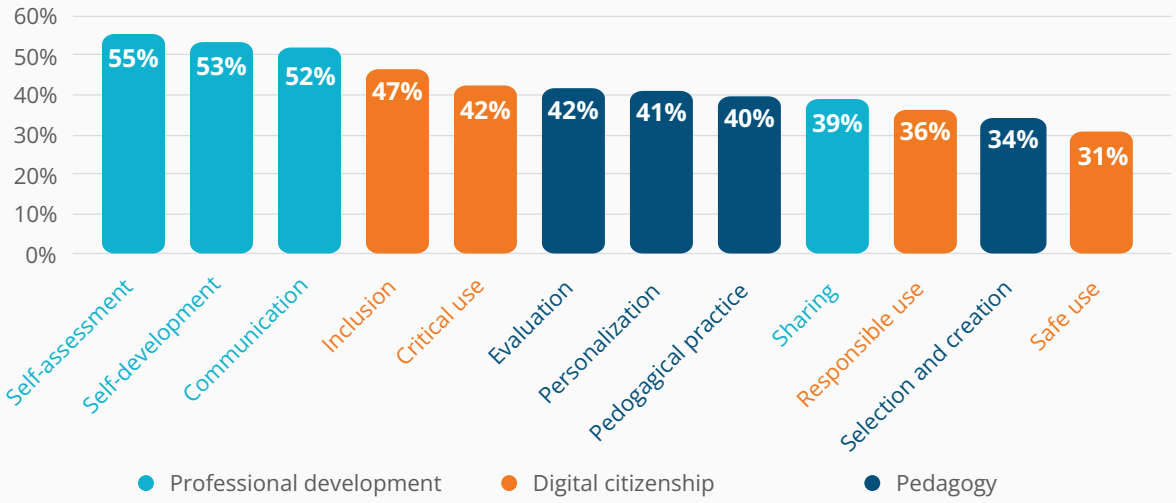
[2] Figure A3.1 in Appendix 3 presents the breakdown into the five levels of the Edutec Guide framework.

The figure shows that most of the teachers who participated in the self-assessment do not consider that they have the minimum level of digital competence, which presents a challenge considering the demands of the current digital age. Although the sample is not representative, some trends can be seen in teachers' different skills, such as the fact that they make greater use of technology for professional development than for pedagogical practice. These results may indicate a greater acquisition of technology for teacher training, but greater difficulties integrating it into the classroom.

The figure also shows the results of teachers in the three areas of pedagogy, digital citizenship, and professional development. To delve into the detail of each area, Figure 2 presents the disaggregated results for the 12 digital competencies of the Edutec Guide framework, divided into their three respective areas (see Table 1):

- **PEDAGOGY:** Evaluation, personalization, pedagogical practice, selection and creation.
- **DIGITAL CITIZENSHIP:** Inclusion, critical use, responsible use, safe use.
- **PROFESIONAL DEVELOPMENT:** Self-assessment, communication, self-development, sharing.

FIGURE 2. Percentage of Surveyed Teachers with the Basic Level in the 12 Digital Competencies



Source: Prepared by the authors.

In Figure 2, the 12 digital competencies are presented in descending order according to the percentage of participating teachers who report a minimum digital competency level.[3] In addition, each competency is color-coded according to its corresponding area: light blue for professional development, orange for digital citizenship, and dark blue for pedagogy.

[3] See Figure A3.2 in Appendix 3 for the distribution of teachers in each of the five levels of the Edutec Guide framework.

The results indicate that the competencies with the highest proportion of teachers reporting at least the minimum competency level are self-assessment (55 percent), self-development (53 percent), and communication (52 percent), all of which correspond to the area of professional development. In contrast, greater challenges are observed in the competencies related to the safe use of technology (31 percent) and the selection and creation of digital resources (34 percent), where the proportion of teachers who do not reach the basic competency level is higher.

Figure 2 also allows for identifying, by area, the most advanced and challenging competencies for teachers in the region. In the area of **professional development**, there is greater progress in the use of technology for self-assessment, self-development, and communication, followed by sharing. It is worth noting that the self-assessment competency is the most developed among teachers. This represents a key opportunity for professional development, as it suggests that most teachers are open to using digital technologies to assess their own teaching practice and take actions to improve it.

> Self-assessment is the most developed digital competence among teachers, suggesting a high willingness to use technology to reflect on and improve their teaching practice.

In the area of **digital citizenship**, there is a greater development in the use of technological resources to promote inclusion, followed by the ability to make critical use of technologies. However, responsible use and safe use of technologies are among the skills that present the greatest opportunities for improvement, taking into account the 12 competencies evaluated.

Finally, in the **pedagogical** area, the competency with the highest percentage of teachers reaching the basic level is evaluation, closely followed by personalization, pedagogical practice and, finally, on the far right of the figure, selection and creation.

Having reviewed the self-reported levels of digital competence, it is useful to analyze these results in light of the correlations between competencies found in the data. The correlation matrix presented in Table 5 shows the degree of relationship between the different competencies. Higher values (closer to 1) indicate a strong and positive relationship between two competencies, while values closer to 0 reflect a weaker relationship. Colors highlight these associations, with darker shades of green for stronger correlations. Generally speaking, all values in the matrix are positive and are between 0.52 and 0.74, so they can be considered moderate to high correlations according to common statistical conventions.

These correlations are important for the design of teacher training strategies because strengthening certain competencies could contribute to the development of others. For example, the correlation between personalization and selection and creation suggests that teachers with a high level of development in one of these competencies also tend to report high levels in the other, and the same is true for low levels.

TABLE 5. Correlation Matrix between the 12 Digital Competencies

		1	2	3	4	5	6	7	8	9	10	11	12
PEDAGOGY	1. Pedagogical practice	-											
	2. Evaluation	0,65	-										
	3. Personalization	0,62	0,73	-									
	4. Selection and creation	0,66	0,72	0,74	-								
DIGITAL CITINZENSHIP	5. Responsible use	0,54	0,60	0,62	0,68	-							
	6. Safe to use	0,56	0,61	0,63	0,69	0,71	-						
	7. Critical use	0,57	0,62	0,64	0,70	0,69	0,72	-					
	8. Inclusion	0,54	0,61	0,64	0,66	0,64	0,66	0,68	-				
PROFESSIONAL DEVELOPMENT	9. Self-development	0,55	0,55	0,57	0,62	0,57	0,59	0,61	0,59	-			
	10. Self-assessment	0,52	0,60	0,62	0,63	0,59	0,60	0,63	0,63	0,63	-		
	11. Sharing	0,53	0,60	0,62	0,66	0,61	0,65	0,65	0,64	0,61	0,64	-	
	12. Communication	0,52	0,58	0,60	0,63	0,58	0,60	0,62	0,60	0,61	0,62	0,67	-

Source: Prepared by the authors.

However, it is important to clarify that correlation does not imply causation. In addition, it is possible that there are external variables not considered that are simultaneously influencing several competency areas. For example, factors such as the type of school (urban or rural), access to the Internet and technological devices, or socioeconomic level may affect the development of multiple digital competencies in a cross-cutting way. These contextual variables could act as confounding factors, raising the values of the correlations observed between competency areas. Therefore, the results should be interpreted with caution. In any case, these results reinforce the idea that the development of digital competence is an integral process where advancing in one competency can be linked to the strengthening of others, although it does not automatically guarantee their improvement.

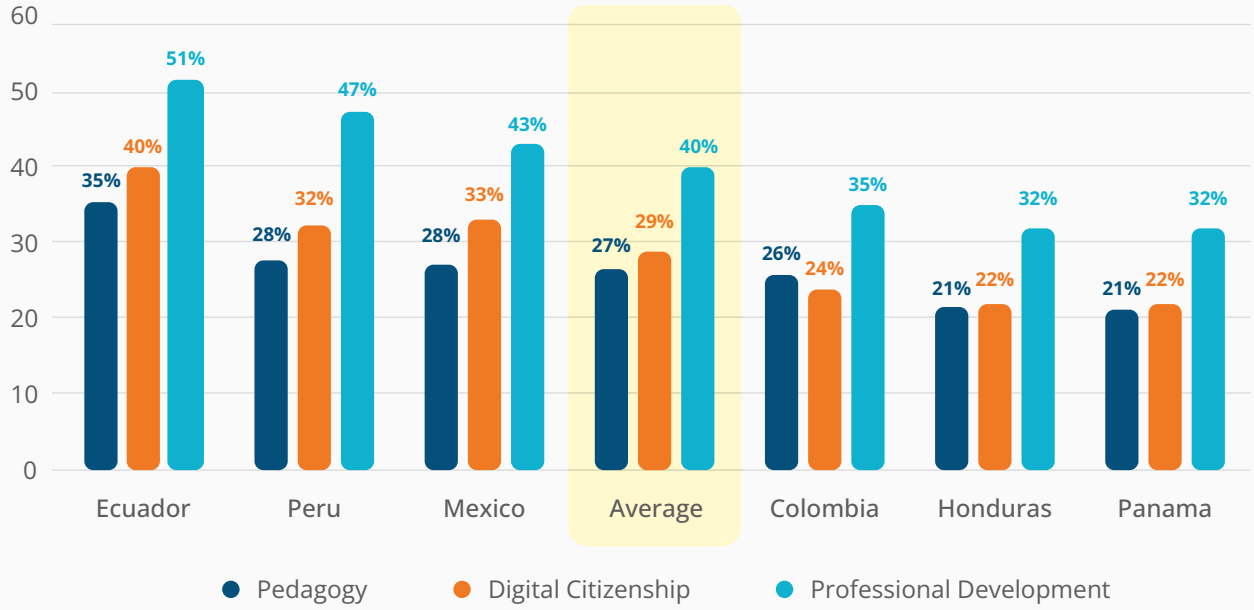
> Strengthening one digital competence may be associated with the development of others. For example, teachers with high competency levels in personalization also tend to excel in selecting and creating digital resources.

Regarding the relationships between competencies in the same area, Table 5 shows that digital pedagogical competencies have the highest correlations among each other, with values closer to 0.7, while the correlations between digital competencies in professional development are more moderate.

Relationships between the different areas are also observed. For example, the competency of selection and creation (pedagogy) presents high correlations with others such as critical use (digital citizenship) and sharing (professional development). In contrast, the pedagogical practice competency shows weaker correlations with the rest, which may suggest that mastery of digital competencies does not necessarily guarantee their direct application in the classroom. It is therefore important that digital competency development strategies include a practical component that helps teachers translate what they have learned into concrete pedagogical actions.

Country Results

FIGURE 3. Percentage of Teachers Surveyed in Each Country with the Basic Level of Digital Competence in the Three Competency Areas



Source: Prepared by the authors.

Figure 3 shows the percentage of teachers participating in the survey who have at least a basic level in the three digital competency areas for the six countries analyzed, and the country average, ordered from highest to lowest.[4] LThe different colors of the bars distinguish the three areas evaluated: pedagogy, digital citizenship, and professional development.

Ecuador leads the results for the three areas, with 35 percent of teachers exceeding the minimum competency level in pedagogy, 40 percent in digital citizenship, and 51 percent in professional development. Peru and Mexico also exceed the average of the participating countries, while Colombia, Honduras, and Panama fall below it. However, these results

[4] See Figure A3.3 in Appendix 3 for the complete distribution in the five levels of the Edutec Guide.

TABLE 6. Percentage of Teachers Surveyed with the Basic Level in the 12 Digital Competencies (Color scale)

		Ecuador	Peru	Mexico	Average	Colombia	Honduras	Panama
PEDAGOGY	1. Pedagogical practice	47%	38%	44%	40%	47%	32%	31%
	2. Evaluation	51%	41%	44%	42%	43%	38%	33%
	3. Personalization	49%	47%	43%	41%	38%	34%	34%
	4. Selection and creation	45%	37%	38%	34%	33%	27%	28%
DIGITAL CITIZENSHIP	5. Responsible use	48%	39%	41%	36%	31%	32%	29%
	6. Safe to use	41%	36%	35%	31%	27%	23%	23%
	7. Critical use	52%	46%	46%	42%	40%	35%	33%
	8. Inclusion	56%	51%	53%	47%	42%	40%	39%
PROFESSIONAL DEVELOPMENT	9. Self-development	62%	60%	63%	53%	52%	37%	46%
	10. Self-assessment	64%	62%	61%	55%	54%	45%	44%
	11. Sharing	50%	46%	39%	39%	32%	34%	32%
	12. Communication	61%	59%	52%	52%	53%	41%	43%

Source: Prepared by the authors.

should be interpreted with caution, as they may be influenced by specific characteristics of the participating teachers in each country, such as the socioeconomic status of the schools.

Figure 3 also shows that, in general, the most developed area among teachers is professional development, followed by digital citizenship and pedagogy. In Colombia, however, this trend shifts, with a slightly higher proportion of teachers exceeding the basic level in pedagogy (26 percent) than in digital citizenship (24 percent).

Ecuador, Peru, and Mexico exceed the average. More than 60% of teachers in these countries report basic levels of digital competence in self-assessment and self-development.

To delve into the results of the six countries across the 12 digital competencies, Table 6 presents the percentage of teachers by country who report at least a basic level of digital competence. The cells in the table are on a color scale, with darker green highlighting the highest values and red highlighting the lowest.

As noted above, most teachers report higher competence levels in the area of professional development (higher concentration of green cells), while in pedagogy and digital citizenship (especially in safe use) there is ample room for improvement. In particular, it is worth highlighting the progress of Ecuador, Peru, and Mexico in self-assessment and self-

development competencies, with more than 60 percent of teachers reporting at least a basic level of digital competence.

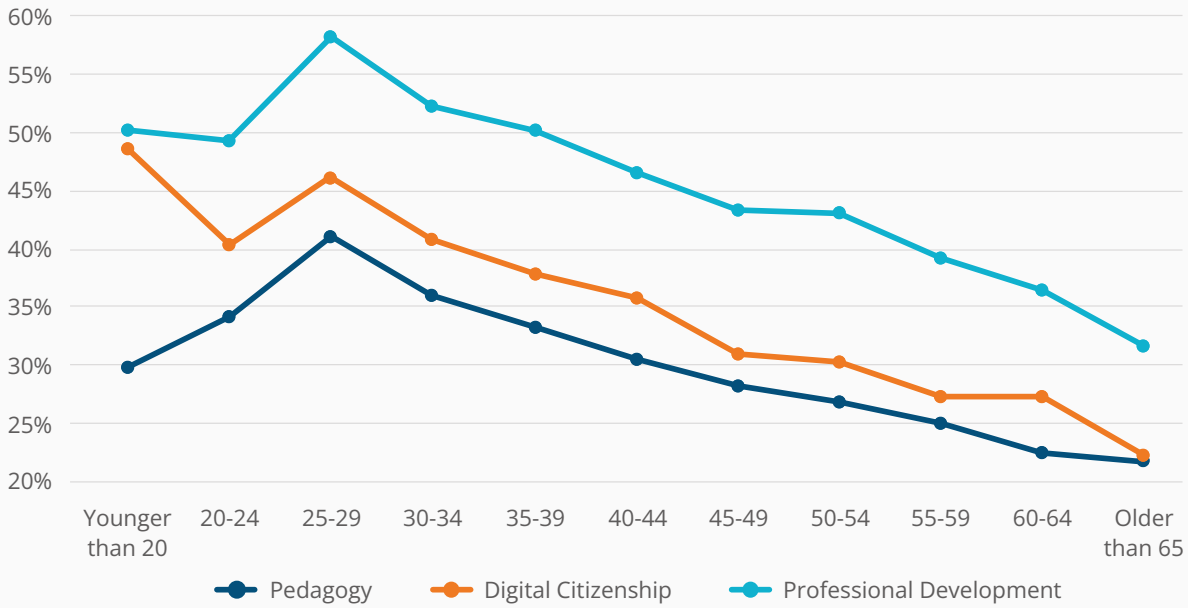
However, these results may also be influenced by specific national policies. For example, in Ecuador, much of the professional development for teachers is carried out through massive online courses (MOOCs), which could partially explain the high levels reported in this area.

Age

The average age of teachers who participated in the digital competence self-assessment is 45 years. While participants range in age from 18 to 79, 60 percent fall within the 35 to 54 age group, as was shown in Table 4.

Figure 4 shows the relationship between teachers' age and the level of self-perceived development in the three digital competency areas: pedagogy, digital citizenship, and professional development.[5] In general, for the three areas, a peak is reached among the youngest teachers, specifically between 25 and 30 years of age, with a higher proportion of teachers with a basic competency level. Subsequently, this percentage tends to decrease progressively in all areas.

FIGURE 4. Percentage of Teachers Surveyed with the Basic Level in Each Digital Competency Area, by Age Range



Source: Prepared by the authors.

[5] See Figure A3.4 in Appendix 3or the complete distribution at the five levels of the Edutec Guide.

It is also interesting to see that the relationship is not entirely linear; rather, there is a steep learning curve among younger teachers, increasing from 18 to 30 years of age. It should be noted that age does not necessarily reflect years of teaching experience, so these trends may be related both to exposure to technology at different stages of life and to differences in the training received by different generations of teachers.

This finding of greater development of digital competencies among younger teachers has been previously documented (Inan and Lowther, 2010; Jiménez-Hernández et al., 2020). However, although the youngest teachers may be considered "digital natives" because they grew up in a digital environment, the curve observed in the figure can be explained by a lack of familiarity and accumulation of experiences in the pedagogical use of technology. Knowing how to use technology is not necessarily the same as knowing how to teach with it. In this sense, younger teachers need time and practice to effectively integrate these technologies into teaching, suggesting that digital competencies can be improved with appropriate training and practice opportunities (Ng, 2012). This is relevant for all age groups: incorporating technology into the classroom is a skill that can be taught and learned.

> Knowing how to use technology is not necessarily the same as knowing how to teach with it.

According to the Technological, Pedagogical, and Content Knowledge (TPACK) Model, which helps teachers integrate technology into their pedagogical practice (Mishra and Koehler, 2006), traditional technology training methods are not enough to produce in-depth understanding and develop effective technological skills. Experience and practice are crucial. This may explain why younger educators are still in the process of developing their digital teaching competencies, which aligns with the learning curve observed.

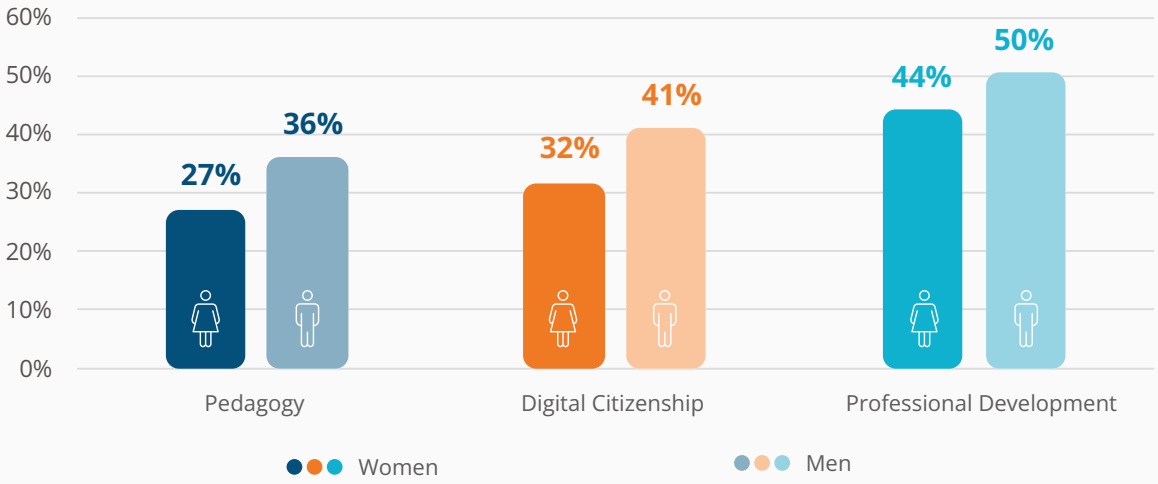
Gender

Of the total number of teachers with registered gender information (89 percent of participants in the self-assessment), 74 percent are women, 26 percent are men, 0.08 percent selected the option "I prefer not to say," and 0.01 percent selected "others" (Table 4). These figures are consistent with the international trend: on average, in OECD countries, 70 percent of teachers are women (OECD, 2024). Specifically, in Latin America and the Caribbean, women represent 73 percent of the teaching workforce (76 percent if only primary school is considered). Data on non-binary gender categories are almost non-existent (Elacqua et al., 2024).

Figure 5 shows the percentage of participating teachers who report at least a basic competency level in the three areas of digital competence, disaggregated by gender.[6] The corresponding percentages for the "other" or "I prefer not to say" options are not included due to the small sample size (4 and 20 teachers, respectively, among the more than 28,000 participants), which makes it difficult to draw accurate comparisons without the risk of bias or misinterpretation.

[6] Figure A3.5 in Appendix 3 provides complete information for all gender categories by level.

FIGURE 5. Percentage of Teachers Surveyed with a Basic Level in Each Digital Competency Area, by Gender



When analyzing the results by gender, it can be observed that men report higher levels of digital competence across all three areas compared to women. This difference is 9 percentage points in the areas of pedagogy and digital citizenship, and 6 points in professional development. Some tentative explanations for this gap include a possible over-representation of men in STEM subjects (such as technology, mathematics, or natural sciences) or in secondary grades, where the use of digital technologies is more prevalent. These characteristics may influence the reported levels of digital competencies and will therefore be further explored in the section on associated factors.

> Women report lower levels of digital competence than men, which could reflect self-perception biases rather than actual differences in skills.

The difference between the reported performance of male and female teachers may also point to a tendency among women to underestimate their own abilities. There are studies on self-reporting of technology-related skills that find that women tend to have a much lower self-perception of their digital competence compared to their male colleagues (Gómez-Trigueros and Yáñez de Aldecoa, 2021; Sieverding and Koch, 2009). However, while women tend to report lower levels and men higher levels in self-assessment questionnaires, overall, the differences between men and women in their actual ICT skills are minimal (Hahn et al., 2022).

Regarding the digital competencies of teachers who do not identify with binary gender categories, there is a gap in research on this population. One study, although not focused on teachers, found that young non-binary people tend to report higher content creation skills

compared to their peers (De-Coninck and d'Haenens, 2023). In any case, the self-assessment results highlight the importance of collecting data from diverse population groups in order to guide the design of training programs that take gender differences into account and aim to close existing gaps.

Education Level

The questionnaire registration form also collected information on the highest level of education attained by teachers in five of the six participating countries. The exception was Colombia, where the self-assessment was administered using a previous, reduced version of the registration questionnaire, which included less data from teachers.

As shown earlier in Table 4, most teachers hold a university degree (63 percent) while almost 28 percent have completed a master's degree or specialization. The percentages of teachers without tertiary education or with technical (non-university) tertiary education are low, at 4 and 3 percent, respectively. Doctoral degrees are even more scarce, with only 2 percent of educators having them. At the regional level, although data on initial teacher training varies across countries, in most cases, more than 80 percent of students are taught by teachers with a formal teaching degree, according to UNESCO's latest report on Latin American teachers (UNESCO, 2024b).

Regarding the self-perceived digital competence according to teachers' education level, Figure 6 shows that the percentage of surveyed teachers who report basic levels in the three digital competency areas tends to increase significantly among those with postgraduate studies.[7] Among teachers with non-tertiary post-secondary or technical tertiary education, for example, these percentages are approximately 29 percent in pedagogy, 35 percent in digital citizenship, and 45 percent in professional development. These figures are similar for teachers with a university education (who constitute most of the participants in this study): 28 percent, 32 percent, and 43 percent, respectively, in the three areas.

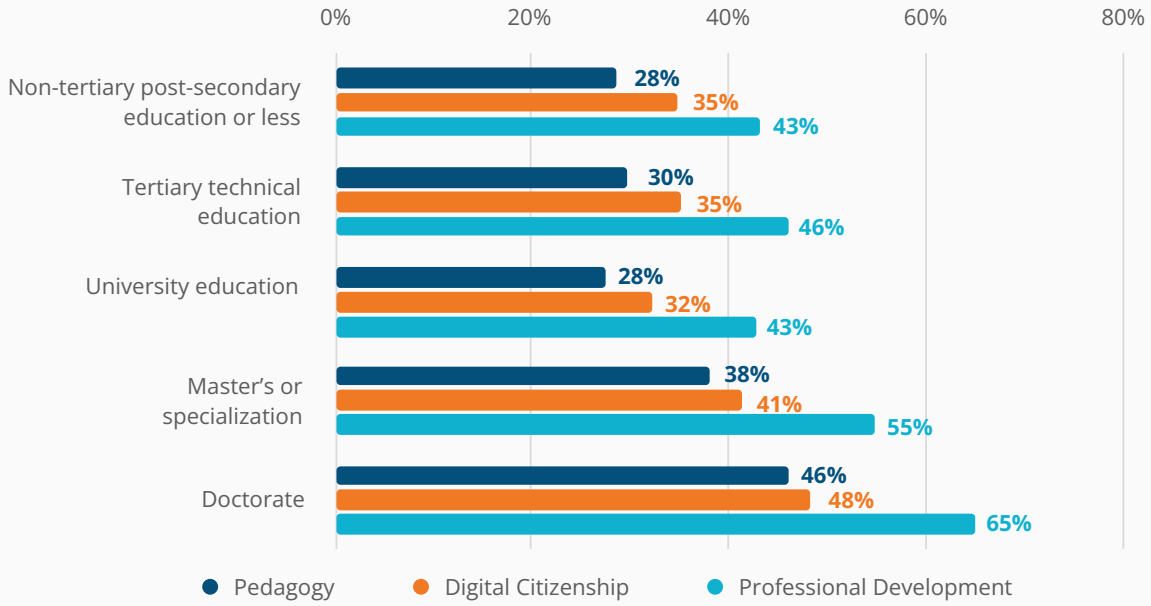
> Teachers with postgraduate degrees report higher levels of digital competence, highlighting the value of continuous education for professional development.

In contrast, teachers with postgraduate studies report higher levels of digital competence. For instance, in the area of professional development, 55 percent of teachers with a master's degree or specialization report having at least a basic level of competence. This figure rises to 65 percent among teachers with a doctoral degree.

These figures underline the importance of promoting teachers' access to and participation in training programs. Apart from contributing to strengthening their digital competencies,

[7] See Figure A3.6 in Appendix 3 for more details on the five levels of the Edutec Guide.

FIGURE 6. Percentage of Teachers Surveyed with the Basic Level in Each Digital Competency Area, according to the Teachers' Highest Level of Studies



Source: Prepared by the authors.

particularly in the area of professional development, a higher educational level among teachers is positively associated with students' learning outcomes. This is demonstrated by a study by Woessmann (2003) based on data from the Trends in International Mathematics and Science Study (TIMSS). At the same time, it is essential to continue promoting advanced training and continuous professional development so that more teachers reach the highest levels of technological acquisition, thus contributing to strengthening the regional education systems in the digital age.

Training in the Use of Technology

For 91 percent of the teachers who participated in the self-assessment, information was collected on whether they had completed or were currently undertaking any training in the use of technology to support teaching and learning processes. Table 4 presents these data, which can help to better understand the levels of digital competence achieved by teachers. On average, among the countries for which information is available, 27.5 percent of teachers reported having received this type of training.

How, then, does the perception of digital competency levels differ between teachers with or without training in the use of technology? Figure 7 shows that a higher percentage of surveyed teachers with a background in technology report basic digital competency levels in all three

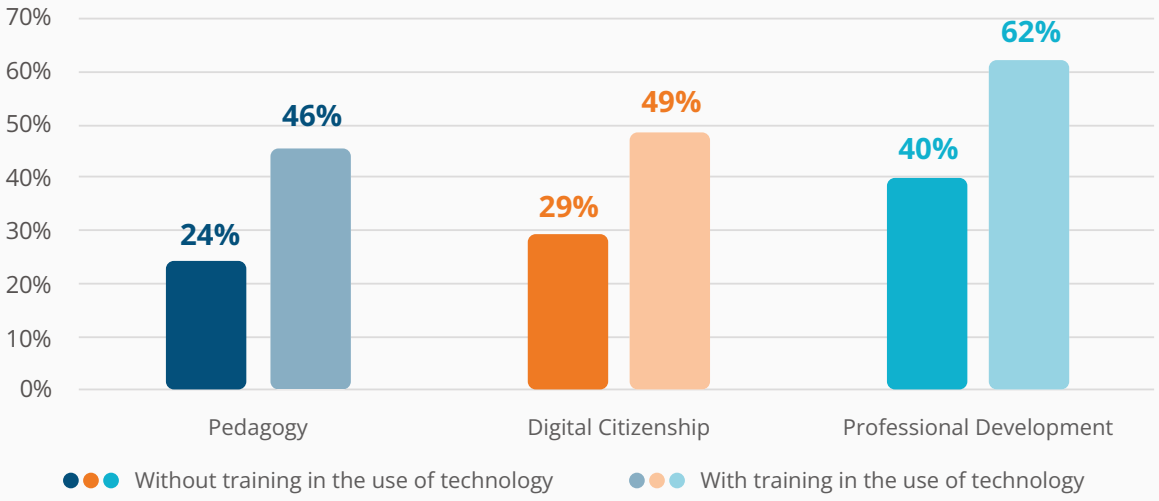
areas: pedagogy, digital citizenship, and professional development.[8] On average, this difference amounts to 21 percentage points across the three areas.

The literature on the use of technology in education has examined factors such as training in ICT and its effect on teachers' decisions to use ICT more frequently in their classrooms. A study of more than 20,000 teachers in Spain found that those who had received ICT training in the previous year were more likely to use ICT more frequently for pedagogical purposes. The probability that trained teachers would use technology in their classes was between 1.30 and 1.79 times higher in primary school and 1.24 times higher in secondary school, compared to teachers who had not received the training (Gómez-Fernández and Mediavilla, 2022).

Teacher training in the use of technology for pedagogical purposes is essential, as it increases teachers' readiness to integrate it effectively into classroom practice.

Teacher training in the use of technology for pedagogical purposes is essential, as it increases teachers' readiness to properly integrate those technologies into their classroom practice. In other words, when teachers feel prepared and confident in the use of technological tools, they tend to incorporate them more frequently into teaching (Inan and Lowther, 2010).

FIGURE 7. Percentage of Teachers Surveyed with the Basic Level of Digital Competencies, according to the Teachers' Training in the Use of Technology



Source: Prepared by the authors.

[8] See Figure A3.7 in Appendix 3 for more details on the five levels of the Edutec Guide.

This highlights the importance of offering timely training that not only provides technical knowledge, but also strengthens teachers' confidence to apply technology effectively in educational processes.

Teaching Areas

Another interesting aspect to analyze is the digital competency levels reported by teachers according to the subjects they teach in their school. In other words, the self-assessment results of teachers who teach different subjects can be compared to identify any notable differences or patterns.

The percentages of teachers who teach each subject were presented earlier in Table 4. It is important to mention that teachers could select more than one subject when completing the questionnaire, which is why the sum of the percentages is greater than 100 percent. Among the surveyed teachers who reported this information (73 percent), a large share teach most or all subjects in the curriculum (25.1 percent), 15.7 percent teach language or communication, 13.6 percent mathematics, 12.1 percent technology and computer science, 10.3 percent physical education, 7.8 percent social sciences, 7.5 percent natural sciences, 6.7 percent art, and 2.3 percent English. In addition, 25.3 percent reported teaching subjects other than those listed.

The high percentage of surveyed teachers who teach most subjects is not surprising, since in primary education, and especially in the early grades, the "single-teacher" model is common. Under this model, a single teacher is responsible for most subject areas. This is consistent with the fact that most of the participants in the self-assessment are primary school teachers. In contrast, in secondary education, the subject-specialist model is more prevalent. Under this model, different teachers are in charge of specific subjects according to their area of expertise.

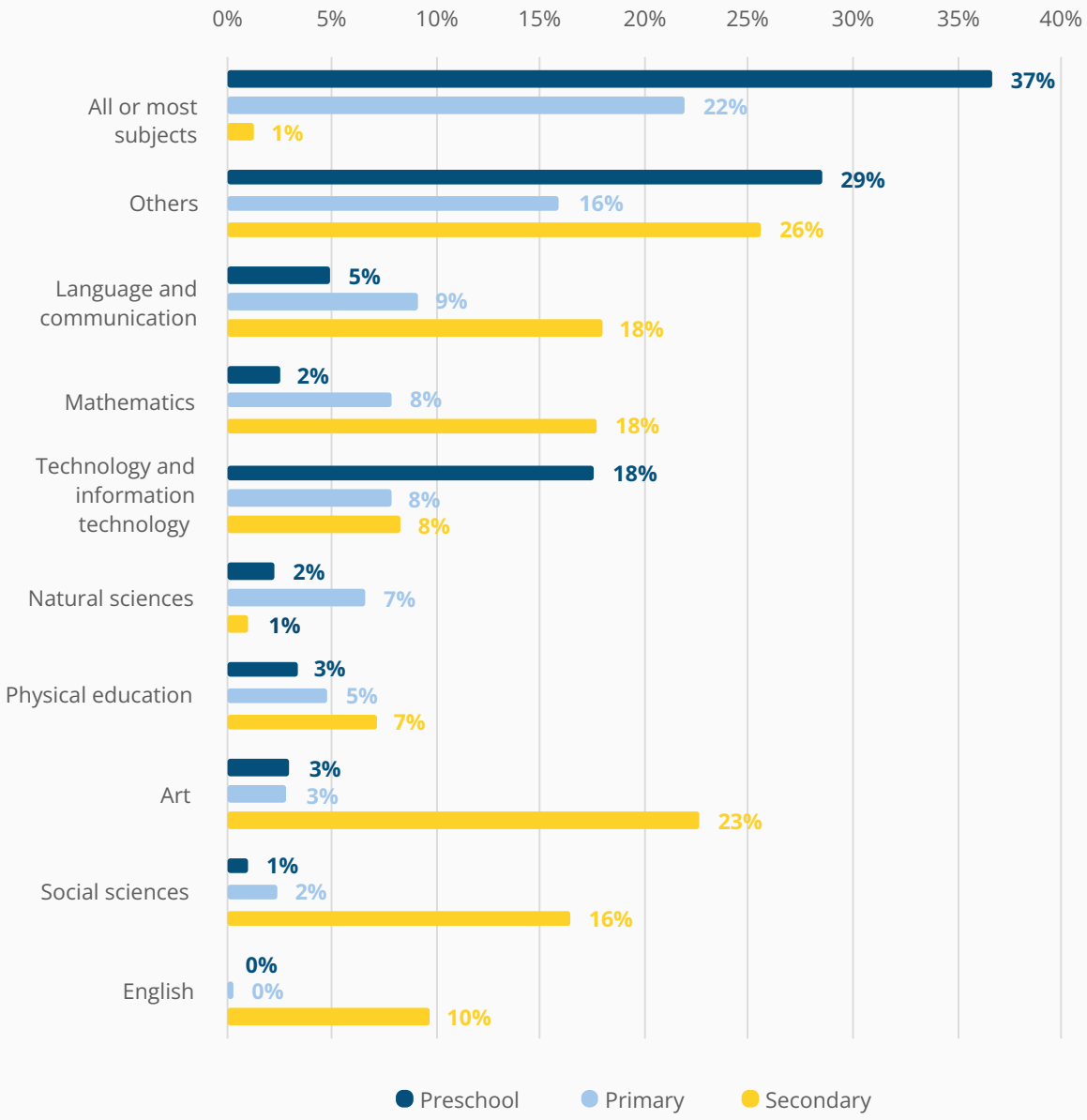
According to the data analyzed in this study, the most selected answer among preschool and primary school teachers about the subjects they teach was "all or most subjects." Figure 8 shows that this is the case for 37 percent of preschool teachers and 22 percent of primary teachers. On the other hand, only 1 percent of secondary school teachers indicated that they taught most subjects. As mentioned above, this may be due to the greater presence of single-teacher models in preschool and in the early grades of primary school.

> STEM area teachers report higher levels of digital competence, underscoring the link between teaching specialization and the pedagogical use of technology.

To analyze teachers' results by subject, Figure 9 presents the percentage of teachers who participated in the Edutec Guide self-assessment who have the minimum level of competence required to make adequate use of educational technologies by subject.[9] For the three areas

[8] See Figure A3.8 in Appendix 3 for more details on the five levels of the Edutec Guide..

FIGURE 8. Percentage of Teachers Surveyed Who Teach Each Subject according to Their Level of Education



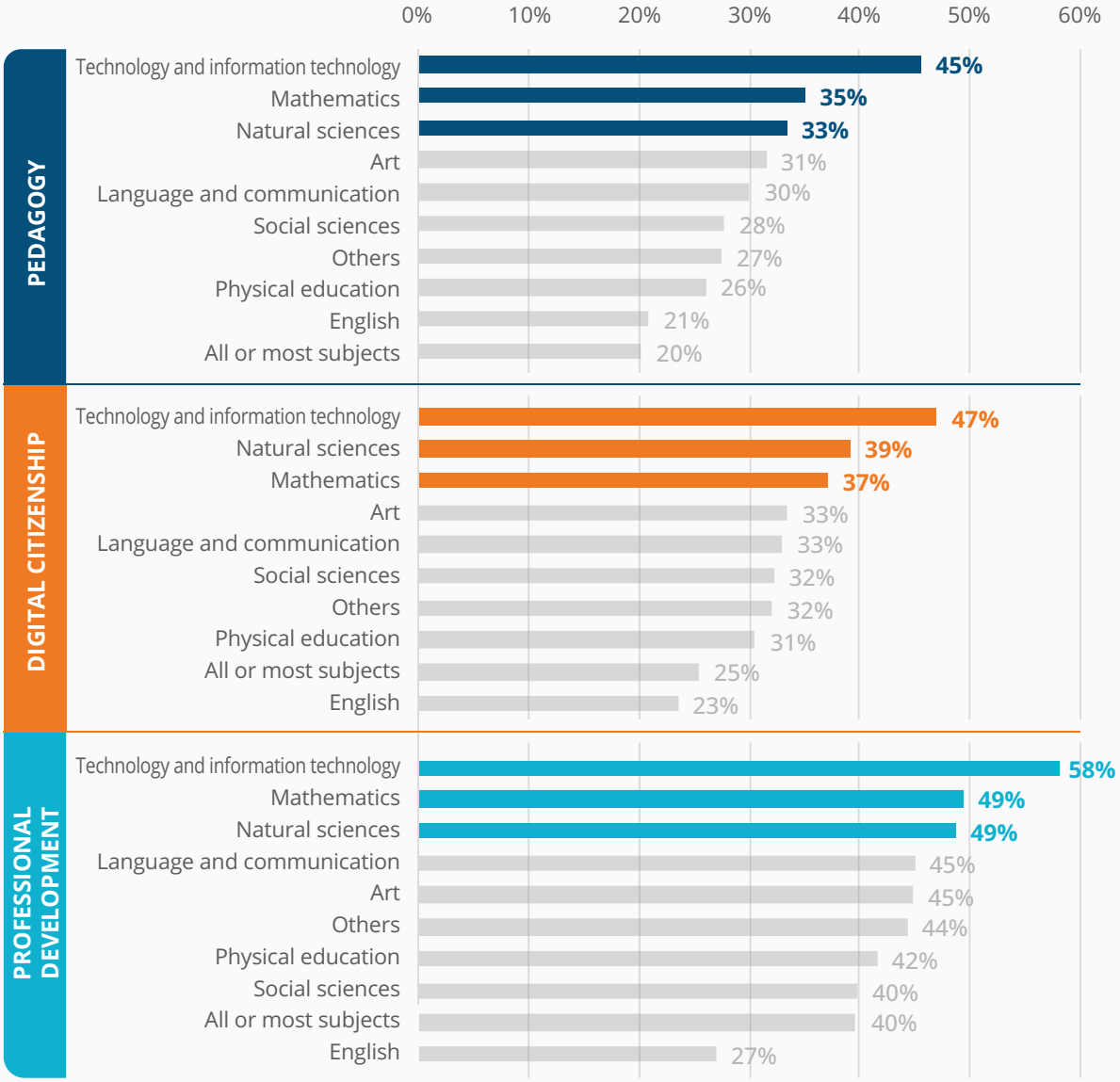
Source: Prepared by the authors.

of pedagogy, digital citizenship, and professional development, teachers of technology and computer science, mathematics, and natural sciences (colored bars) rank the highest. In other words, teachers who teach STEM subjects report higher digital competency levels compared to teachers of other subjects. This finding is consistent with the fact that STEM subjects are, by definition, closely linked to digital technologies and skills.

When comparing the percentage of teachers by subject and gender, Figure 10 shows there is not a higher proportion of men teaching STEM subjects. This is a positive finding, considering the historical underrepresentation of women in these areas due to social norms and educational biases (OECD, 2024).

On the other hand, the low percentages of teachers who teach all or most subjects with a basic level of digital competence are striking. The proportion of female educators in preschool and the early primary grades, where single-teacher models are more common, is much higher than

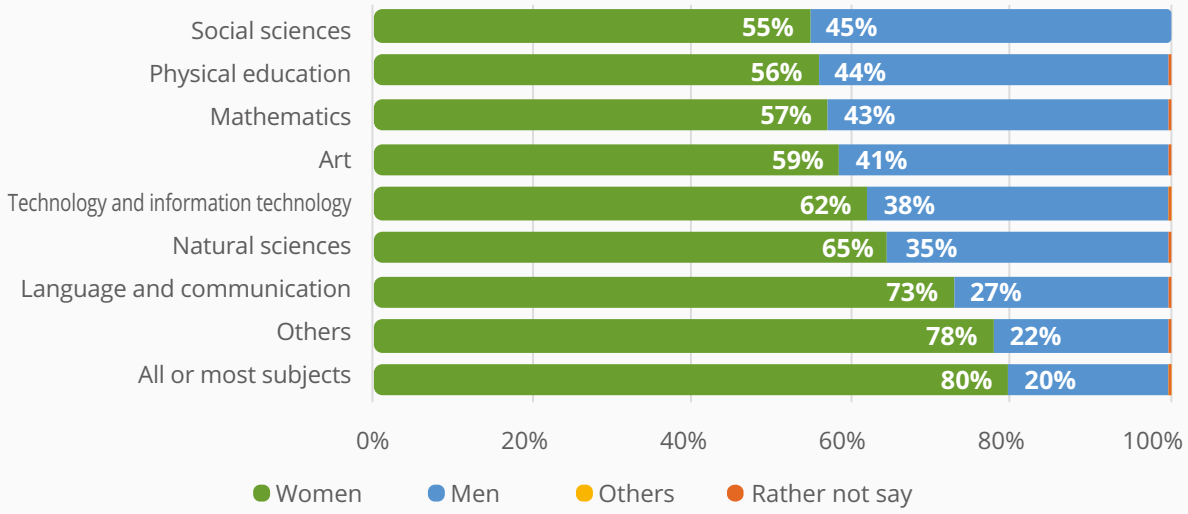
FIGURE 9. Percentage of Teachers Surveyed Who Have the Basic Level of Digital Competencies, according to Their Area of Teaching (Descending order)



Source: Prepared by the authors.

in later grades (UNESCO, 2024b; OECD, 2024). This raises the question of whether the results may be partly explained by a greater tendency among female teachers to underreport their digital competency level. However, other factors besides gender may also be influencing this outcome, such as a reduced use of educational technologies in the early grades. The fact that younger students tend to have less-developed digital skills reduces the likelihood that teachers will make use of ICT in their classrooms (Gómez-Fernández et al., 2022). In addition, the type of training that early grade teachers receive may focus less on ICT and more on the development of foundational skills.

FIGURE 10. Percentage of Teachers Surveyed by Gender, by Subject

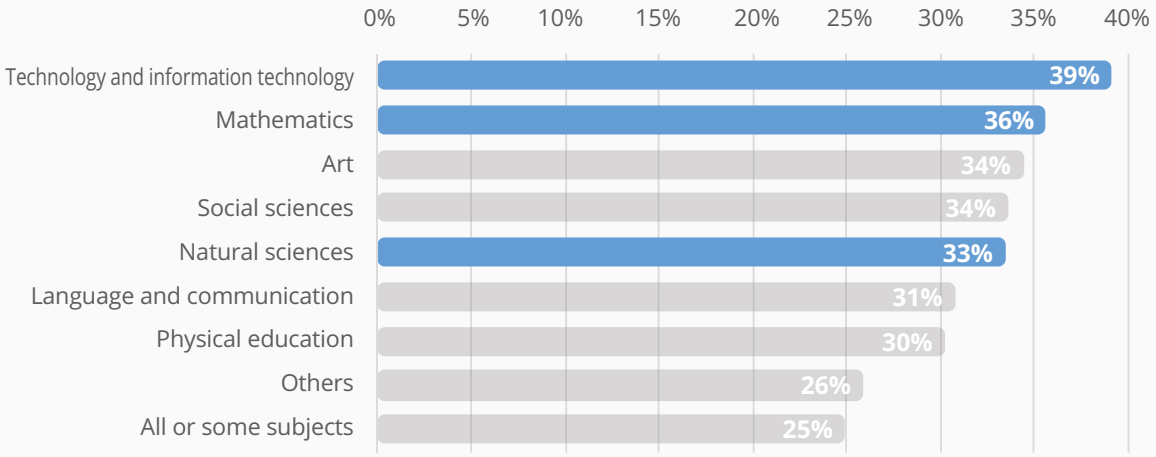


Note: The subject of English is not included in the figure because there is no gender information for the teachers who reported teaching this subject.

Source: Prepared by the authors.

Figure 11 examines whether the greater development of digital competencies among teachers who teach STEM subjects is related to having received training in the use of technology. The figure, which presents the percentage of teachers per subject who report having this type of training, shows that a higher proportion of teachers of technology and computer science and mathematics have received such training. They are closely followed by art teachers, who also occupy the top places in Figure 9.

FIGURE 11. Percentage of Teachers Surveyed with Training in the Use of Technologies, according to the Subjects They Teach



Source: Prepared by the authors.

Factors Associated with the Reporting of Higher Levels of Digital Competence by Teachers

To conclude the analysis of the characteristics of the teachers who participated in the self-assessment and their effect on the level of digital competence development, a probit model is used. This type of model predicts the probability that a variable of interest (the digital competency level, in this case) will take one of two possible values – below or above the basic level of digital competence necessary to effectively integrate technologies into teaching practice – based on a series of independent variables. In this study, those variables are the characteristics of the teachers: age, gender, education level, ICT training, and teaching area.

The dependent variable of the model takes the value of 1 if the teacher has the basic competency level, and 0 if not. Using the results detailed in Table 7, the aim is to estimate the probability that teachers fall above the minimum digital competence level, based on the characteristics (independent variables) included in the analysis.

The marginal effects (in the last three columns of the table) indicate how the probability of exceeding the minimum competence level in the three areas covered by the self-assessment tool (pedagogy, digital citizenship, and professional development) changes when an independent variable increases by one unit (or changes category in the case of categorical variables), holding all other variables constant. The coefficients of each variable indicate the direction (positive or negative) and the magnitude of their influence on teachers' digital competence levels.

TABLE 7. Factors Associated with the Basic Digital Competency Level of Teachers: Probit Regression Analysis Results

VARIABLES	PEDAGOGY (Marginal Effects)	DIGITAL CITIZENSHIP (Marginal Effects)	PROFESSIONAL DEVELOPMENT (Marginal Effects)
GENDER (BASE: FEMALE)			
Male	0,058***	0,065***	0,040***
AGE (BASE: YOUNGER THAN 20)			
20 to 24	0,055	-0,057	0,003
25 to 29	0,085	-0,039	0,053
30 to 34	0,009	-0,111*	-0,036
35 to 39	-0,030	-0,146**	-0,067
40 to 44	-0,056	-0,166***	-0,110*
45 to 49	-0,075	-0,211***	-0,142**
50 to 54	-0,096	-0,228***	-0,154**
55 to 59	-0,107*	-0,256***	-0,195***
60 to 64	-0,135**	-0,256***	-0,225***
Over 65	-0,133**	-0,286***	-0,258***
EDUCATION (BASE: POST-SECONDARY OR LOWER)			
Technical tertiary education	0,001	-0,008	0,012
University education	-0,001	-0,014	0,008
Master's degree or specialization	0,083***	0,060***	0,110***
Doctorate	0,168***	0,138***	0,221***
Technology training	0,191***	0,174***	0,197***
SUBJECTS TAUGHT			
STEM subjects	0,060***	0,050***	0,043***
All or most subjects	-0,084***	-0,079***	-0,058***
OBSERVATIONS[10]	25.945	25.945	25.945

Source: Prepared by the authors.
Note: Fixed effects are included by country and by year. Missing values are controlled for by including additional categories.
*** p<0.01, ** p<0.05, * p<0.1.

[10] Although the total number of teachers participating in the Edutec Guide self-assessment was 28,358, only 25,945 teachers were included in the model. This is due to the absence of complete data in two countries. In Colombia, only data on the age of teachers are available; and in Honduras there are data on age, education level, and subjects taught, but not on gender or technology training (Table 4). Therefore, these two countries were excluded from the main model. The results presented in Table 7 correspond to the model that includes all explanatory variables (gender, age, education level, technology training, and subjects taught), and is based only on data from the remaining four countries, using fixed effects by country and year. Robustness analyses were carried out estimating two additional models: one excluding the variables of gender and technology training (which allows for Honduras to be included), and another using only the age variable (which allows for the inclusion of the six countries). In all three models, the results obtained are maintained over time, which supports the validity of the main findings.

The coefficients shown in Table 7 indicate how each independent variable affects the probability of reaching the minimum digital competency level. As an example, in the case of gender, male teachers have a higher probability of reporting higher competency levels than women (base or reference category). Specifically, being male is associated with an increase of 5.8 percentage points (p.p.) in the probability of reporting minimum digital competencies in pedagogy. The results for the other areas are similar: 6.5 p.p. in the case of digital citizenship competencies and 4 p.p. in professional development. These differences are statistically significant in all three areas.

As previously mentioned in the gender section, these results may suggest that men tend to self-assess better than women, that women tend to underestimate their skills, or a mixture of both. As for the people who reported another gender identity other than the binary categories, as well as those who indicated that they did not want to report this information, the number of observations is so small (4 and 20 teachers, respectively) that they are not included in the model due to lack of representativeness.

Regarding the age of teachers, the negative coefficients for most age categories suggest that the older the teachers are, the lower the probability of having a basic digital competency level in all three areas. Taking teachers under 20 years of age as the base category, the negative marginal effects indicate that, approximately from the age of 30, the probability of reporting minimum competency levels decreases. This difference (the absolute value of the coefficients) increases with age.

In the area of digital citizenship, the gap between older and younger teachers becomes statistically significant starting with the 30-34 age category. In the area of professional development, this occurs starting from the 40-44 age group. Finally, in pedagogy, although the coefficients are negative from age 35 onwards, they are only statistically indistinguishable from zero for those over 55. This means that, in terms of pedagogical digital competencies, there are no statistically significant differences in the probability of having the minimum competency level between teachers under 20 and those in other age ranges up to 55 years. Therefore, the age-related digital gap is less pronounced in this area. Meanwhile, for the other two areas, the difference in the probability of reaching the minimum level becomes statistically significant at younger ages.

In addition to age, teachers' education level is also a relevant factor in the self-reporting of digital competencies. Having a graduate degree is associated with a higher probability of achieving minimum competency levels in all three areas, compared to teachers who only have post-secondary or lower education. Specifically, teachers with a master's degree or specialization have probabilities of 8.3, 6, and 11 p.p. higher of reaching minimum digital competency levels in pedagogy, digital citizenship, and professional development, respectively. These values increase to 16.8, 13.8, and 22.1 p.p. for teachers with a doctorate degree. It is worth emphasizing that all these differences are statistically significant. On the other hand, the difference between teachers with post-secondary education or lower and those with technical or university education is not significant in any of the three areas, indicating that there are no significant differences between teachers with these levels of education.

Training in the use of technology also has a positive and significant effect across all areas, increasing the likelihood of having the minimum digital competency level by 19.1 p.p. for pedagogy, 17.4 p.p. for digital citizenship, and 19.7 p.p. for professional development. This finding underscores the importance of keeping teachers up to date on issues of innovation and educational technologies with the aim of improving their ability to integrate those technologies into teaching and learning processes. In a world where technology is constantly evolving, it is crucial that teachers are prepared to use it effectively, equipping students with the necessary skills for the future job market.

Finally, the model explores the subjects taught by teachers as a factor associated with the development of their digital competencies. As expected, teaching STEM subjects (specifically, technology and computer science, mathematics, and natural sciences) is associated with a higher probability of reporting minimum digital competency levels in pedagogy (6 p.p.), digital citizenship (5 p.p.), and professional development (4.3 p.p.).

Conversely, teachers who teach all or most subjects are less likely to have the minimum digital competency level than more specialized teachers. As noted earlier in the section on teaching areas, this may be because these teachers typically work in early grades with younger students, where technology use is more limited. Nevertheless, digital technologies have great potential for the professional development of teachers, regardless of the grade level they teach, so it is important to design training strategies adapted to their specific needs.

In summary, the analysis of the factors associated with teachers' digital competencies reveals the importance of various individual and professional characteristics. Gender, age, education level, training in the use of technology, and teaching areas affect the probability of reporting minimum levels of digital competence. Being male, having a postgraduate degree, receiving training in technology, and teaching STEM subjects all increase this probability, while advanced age and teaching most subjects in the curriculum reduce it. These findings underscore the need for inclusive training strategies that respond to the diverse profiles of teachers, strengthening the integration of digital technologies into education in order to improve learning quality in the region.

6

Reflections and Recommendations

The analysis of the findings for the three digital competency areas covered by the Edutec Guide highlights teachers' strengths in self-assessment, self-development, and communication, and skills related to their own professional development. However, it also shows the need to strengthen teachers' ability to achieve the pedagogical integration of technology and its responsible and safe use.

Therefore, to continuously improve the teaching and learning process to address the challenges of the digital revolution, there is a need for teacher training in digital competencies that adapts to teachers' needs and, at the same time, to the demands of the digital society. This need should be translated into strategic action plans that prioritize teacher training, coordinated institutional efforts, and the generation of systematic evidence. As for teacher training, six recommendations can be highlighted to improve the current scenario outlined in this study.

1. **Emphasize the Pedagogical Integration of ICT:** The findings, which show that teachers are better prepared to acquire competencies related to professional development compared to pedagogical competencies, suggest the need for training plans that allow teachers to translate their technological knowledge into meaningful learning experiences tailored to their students' context. This entails incorporating real classroom experiences into training, with strategies that take into account age, sociocultural context, and available resources (Peña et al., 2024).

   In addition, the programs must be flexible and adaptable to both teachers who are just beginning to develop their digital competencies and those who already demonstrate more advanced proficiency levels. According to UNESCO's framework for digital transformation in education, teacher training programs should integrate digital competencies in a way that prepares educators to use, create, and manage digital technologies in the teaching-learning process. These efforts should be supported by a culture open to creativity, collaboration, and innovation, fostering an environment of continuous learning (UNESCO, 2024a).

2. **Focus on Active Learning:** Closely related to the previous point, in order to help teachers connect what they have learned with their classroom practice, training programs should enable teachers to become actively involved by reflecting on their practices and applying specific teaching models (Peña et al., 2024). The objective is to provide active and practical training that allows teachers to learn by doing (e.g., creating and executing didactic plans that include online content and applications). This will enable teachers to take an active role in their educational contexts, drawing on support, exchange, and feedback among peers (Boeskens et al., 2020). This will help bridge the gap between theoretical knowledge and its practical application, encouraging teachers to implement what they have learned in their own classrooms.

3. **Develop Strategies for Peer Collaboration, Mentoring, and Support:** Evidence shows that teacher training programs that use effective collaborative structures to solve problems and learn together contribute positively to student achievement (Darling-Hammond et al., 2017). This study finds lower levels of trust and digital competence among women and older teachers, emphasizing the need for age- and gender-responsive training plans. Research also shows that collaboration and support among teachers can positively impact both teaching practice and student learning (Kraft et al., 2018). Therefore, training plans should include cooperative learning or reverse mentoring, where younger teachers support older ones. Likewise, offering support through mentors specialized in pedagogy would help maintain the focus on improvement objectives, allowing teachers to have a reference point and receive experienced guidance, especially when implementing new methodologies (Peña et al., 2024). The provision of safe spaces for practice,

where teachers can share resources, didactic strategies, and innovative ICT integration experiences, could help break down barriers of self-perception and strengthen personal and peer learning (Burns, 2023).

4. **Strengthen Digital Citizenship:** Given that the findings of this study indicate a lower acquisition of skills for responsible use and, above all, safe use of technology, there is a need to reinforce digital literacy around data protection, cybersecurity, and online coexistence. Teachers should develop the necessary competencies to effectively access various digital technologies, interact with them ethically and critically, and create, use, and share information and knowledge, especially through social media platforms (Falloon, 2020). In this sense, if teachers receive clear guidelines and resources to address these issues and to promote inclusive and trustworthy digital environments, they can play a key formative role in the development of their students.

5. **Incorporate the Technological Dimension in Initial Teacher Training:** Educational technology needs to be incorporated into the curricula dedicated to initial teacher training, with an emphasis on its use for teaching different subjects. This allows future teachers to become familiar early on with active methodologies, digital teaching resources, formative assessment supported by ICT, and safe and responsible use of technology (Valliant, 2023). The quantity and quality of pedagogical practices that incorporate digital technologies promoted during initial training are essential for fostering meaningful adoption by future educators (Tondeur et al., 2020).

6. **Strengthen Continuous Training:** Transforming pedagogical practices to incorporate technology in the classroom requires ongoing training cycles that can only occur over time. Research shows that the best professional development programs follow a continuous cycle of training, classroom application, reflection on results, and reinforcement of learning (Peña et al., 2024). It is important to emphasize that strengthening continuing education goes beyond simply offering MOOCs, which are sometimes disconnected from the realities of the classroom and, therefore, have limited impact on changing teaching practices. In contrast, well-designed continuous learning cycles allow for continuous improvements according to the results that are achieved, ensuring that professional development remains updated and relevant throughout teachers' careers (UNESCO, 2025).

Regarding the coordination of institutional efforts, five main recommendations are presented.

1. **Contemplate the Importance of Inter-institutional Collaboration:** Coordinating efforts to align policies, share resources (e.g., technological platforms, expert support, open training), and provide training itineraries can be useful for the LAC region. In the case of ministries of education, individual country efforts could be leveraged to serve all and thus maximize the limited

resources of each country. Collaborative processes with training institutions and the private sector within each country can be highly beneficial, as they help enhance public policies aimed at providing quality teacher training. Collaborative governance models that share both information and diagnostic results (such as the results presented in this study), along with technological and training resources, can contribute to designing more effective and lasting training itineraries (Darling-Hammond et al., 2017).

2. **Link Training with Professional Incentives:** Teacher recognition systems or incentives that facilitate the collection, certification, and visibility of training efforts should be considered. Formal validation of digital professional development appears to be effective in reinforcing both motivation and the relevance of technology training (Zubillaga del Río, 2023). For example, motivational tools that recognize digital competence, such as official certifications, could have an impact on teacher progression and promotion.

3. **Strengthen Educational Leadership:** Although management teams are not included in the data analyzed in this study, UNESCO's Global Education Monitoring Report 2024/2025 states that achieving the digital transformation of education requires education leaders to organize, inspire, mobilize, and empower teachers and the broader education community (UNESCO, 2024a). However, given that education leaders often assume their functions without adequate training, the UNESCO report suggests strengthening educational leadership by focusing on the following four key areas: setting clear expectations for teachers and students, prioritizing learning and improving pedagogical practices, fostering collaboration to create a more inclusive and resilient environment, and supporting and promoting the professional growth of teachers and other members of the school community. In addition, the report highlights that these dimensions also apply to leaders at systemic and policy levels who need to align their actions with these priorities to achieve the desired impact.

4. **Promote Sustained Investment in Infrastructure and Resources:** Another key aspect to support active and practical learning, ensuring the integration of technological knowledge into pedagogical practice, is the implementation of policies that provide meaningful connectivity and technological equipment. This also includes ensuring that teachers have access to resources and sufficient time for planning pedagogical activities, along with strategies for maintenance and technical support to sustain progress in teacher training, technology adoption in classrooms, and the pedagogical integration of technology over time.

Finally, it is necessary to generate systemic evidence through evaluation processes on the effectiveness of teacher training. Above all, we need to understand and improve these processes as well as those that involve the integration of technologies in schools. Therefore, a final recommendation is proposed.

5. **Generate Continuous Evidence for Decision-making:** There is a need to create monitoring and evaluation systems that allow for the periodic measurement of progress in teachers' digital acquisition and its impact on student learning (Zubillaga del Río, 2023). At the same time, it is essential to generate evidence to inform policy and program design that leads to real improvements in learning outcomes. Evaluation should not be seen merely as a process of diagnosis and accountability, but also as an opportunity to use the resulting evidence to support change and continuous improvement (Mateo Berganza-Díaz, 2025). In this sense, evidence should guide the adjustment of policies, curricula, and training initiatives, ensuring ongoing improvements in training processes.

In summary, the findings, conclusions, and recommendations of this study reveal a significant opportunity to improve the professional development of teachers in Latin America through the integration of technological tools into pedagogical processes. Achieving this requires reconsidering pedagogical approaches, curricular design, and teacher training and support programs. It is equally important to rethink the management of schools and classrooms, ensuring that teachers have the resources and time needed to plan and use technological tools as facilitators of learning. If these actions are carried out in a systemic and collaborative way, the integration of technology in education will be equitable, meaningful, and innovative, equipping both teachers and students to successfully navigate the challenges and opportunities of digital transformation.

Appendices

Appendix 1. Questionnaire for the Self-assessment of Digital Teaching Competencies

PEDAGOGY

PEDAGOGICAL PRACTICE

Be able to incorporate technology into students' learning experiences and teaching strategies..

01. To what extent do I incorporate digital technologies into my pedagogical practice?

a) I know little about and rarely use digital technologies in my lesson planning and pedagogical practice. When I do, I need help from a colleague.
b) From time to time I use digital technologies to make my classes more interesting, to research content, and to make presentations.
c) I select and incorporate digital technologies frequently into my pedagogical practice, although not on all occasions that I could do so.
d) I know and use digital technologies frequently in my pedagogical practice. Whenever applicable, I incorporate digital tools in the planning of teaching-learning activities for my students.
e) I use digital technologies fluently in my pedagogical practice, including them every time I apply them in the implementation of projects integrated into the curriculum. I even support other colleagues to do the same.

02. How do I incorporate digital technologies into my pedagogical practices?

a) I use few digital technologies, such as email, social media, and text editing tools (e.g., Word). With the help of someone else, I am able to report the information that my school asks me for (e.g., in the PIAD).
b) I use digital technologies such as text editors (e.g., Word) and presentation editors (e.g., PowerPoint), multimedia projector, and Internet search engines to download content that allows me to develop or illustrate class topics. I recommend complementary sites or content (videos, images) for students.
c) In addition to text editors and presentations, I use digital resources such as educational programs, games, and videos, and involve my students in activities/projects, individual or collaborative, that seek to complement classroom learning with research on the Internet.
d) I use a variety of digital technologies in my pedagogical practice and I give prominence to my students, involving them in activities in which they can assume the role of authors and thus develop and express their knowledge, using multiple

languages and digital resources in their productions (text, videos, infographics, etc.), even from other digital content sought by themselves.

e) In addition to using a variety of digital resources in teaching activities, I involve my students in collaborative projects created by the students themselves, where they put their knowledge into practice with the use of digital technologies, promoting their development and participation; encouraging them to share their productions with the educational community through virtual pages.

EVALUATION

Be able to use digital technologies to accompany and guide the learning process and evaluate student performance.

03. To what extent do I use digital technologies to assess my students?

a) I don't use digital technologies in the evaluation of my students, I am aware of them and I use them a little, or I do it with the help of a colleague.
b) Sometimes I use digital technologies in assessment activities (e.g., recording my students' assessments).
c) I use digital technologies on a regular basis (e.g., quarterly) in my student assessment.
d) I plan and use digital technologies frequently (once or twice a month) for the evaluation and monitoring of my students' activities.
e) I continuously use digital technologies in my teaching practice to assess, track, and provide feedback to my students.

04. How do I use digital technologies to assess and track my students' performance?

a) I don't use, know little, or need the help of a colleague to support my students' assessment with technologies (e.g., to prepare and print exams and assessment activities).
b) I research and use questions, questionnaires or templates (machotes) from educational portals on the Internet that offer this type of ready material.
c) Sometimes I use ready-made evaluation materials that I look for on the Internet, but I also use resources such as quizzes, games, or tools that allow me to create exams and activities to evaluate my students.
d) In addition to using programs to create and correct diversified evaluation activities, my planning includes evaluation and monitoring of learning through portfolios or reflective journals in a virtual environment.
e) Whenever applicable, I make the evaluations of my students through diversified activities with the help of digital platforms that allow automated or partially automated correction and visualization of learning paths. I also use and evaluate my students' reflective portfolios or journals.

05. How do digital technologies help me guide my students' learning process?

a) I use little or no digital technologies and have difficulty using them in guiding my students' learning process.
b) At the end of each school year, I analyze the results of my students' evaluations recorded in a digital system to give feedback on their learning to parents or legal guardians and the educational director.
c) I use digital records of my students' periodic assessment results to identify learning needs, and from there, I seek to give individual feedback to some students.
d) I use technological tools that allow me to analyze the results of various evaluation activities and, along with their correction, I sometimes give individual feedback to my students.
e) I use technological tools that allow for the analysis of the results of various evaluation activities and, along with their correction, I always send individual feedback to each student by digital means.

PERSONALIZATION

Be able to use technology to create learning experiences that meet the needs of each student.

06. How do I use digital technologies to identify the pedagogical needs of my students?

a) I know little about how digital technologies can help me visualize the needs of each student and I use very little or am not in the habit of using digital tools for that.
b) I occasionally use digital technologies to assess my students, identifying those who need differentiated activities.
c) I use digital technologies periodically to assess learning and know the needs of my students and, from there, I select those who need complementary content and resources.
d) I frequently carry out actions to assess student learning with the support of digital technologies and analyze aggregated data on progress to monitor the development of each student's learning.
e) I personalize my pedagogical activities using digital platforms that allow for routine and at least partially automated assessment of students, creating learning paths and using differentiated resources, according to their needs.

07. How do I use digital technologies to personalize my students' learning processes?

a) I do not know, do not use, or need help from a colleague to use digital technologies in the adaptation of pedagogical activities to the needs of my students with specific demands.

b) I use digital technologies to support the development and delivery of specific activities or projects that require different content or activities for one or more of my students.
c) I use digital technologies to adapt and apply activities according to my subject, catering to the specific educational needs of my students.
d) I use digital technologies to create learning experiences, according to my teaching planning and the development of each student's learning, based on the context, interest, and profile of my students.
e) I develop individual and collective work plans with my students, jointly defining different learning paths with the support of digital technologies based on their profiles, rhythms, interests, and needs, and stimulating them to know themselves and identify their learning difficulties.

SELECTION AND CREATION

Be able to select and create digital resources that contribute to the teaching and learning process, and to classroom management.

08. How do I select and evaluate the digital resources I use in my pedagogical practices?

a) I am not used to looking for digital content or materials and, when I do, I use Internet search engines (Google, Explorer, etc.) to select and download educational content, sometimes with the help of a colleague.
b) Occasionally I look for digital resources to support a specific class, selecting videos, images and texts on the web, to work on certain content with students.
c) I know and regularly use digital technologies to prepare my classes. I use selection criteria to search for digital content and resources in educational repositories or other sources on the Internet.
d) I frequently select and evaluate educational content and resources in educational repositories or other sources on the Internet, using criteria such as curricular content, type of operating system (e.g., Windows, Ubuntu, etc.), the possibility of free use and remixing.
e) The selection of digital content and resources is part of my daily routine to use them in my pedagogical practices. I define criteria for evaluating materials, resources and sources of information to guide other colleagues.

09. How do I use my knowledge to create content and digital resources?

a) I have little knowledge about creating digital assets, I don't know how to do it, or I need help to do it.
b) I create content or digital resources such as texts and multimedia presentations, among others, to make my classes more interesting.
c) I look for and use digital content and resources that allow for the integration of technology with the topics of my subject.
d) I create or make combinations (remixes) with digital content and resources (texts, images, videos, etc.) for my classes, according to my curricular planning and the profile and needs of my students.

e) As part of my pedagogical routine, I create digital resources collaboratively, with different objectives, in various formats, respecting copyright, and I seek to share my creations in educational repositories or other sites on the Internet.

10. How do I help my students select appropriate digital content and resources?

a) I don't involve my students in the process of researching and selecting digital content and resources, I don't know how to do it, and I need help to do it.
b) I encourage my students to search the Internet for reference materials and supporting content to complement their academic work.
c) I present my students with educational sites, applications, and repositories that I have already selected with materials for them to choose from that will contribute to their studies.
d) I involve my students in the selection and evaluation of digital content and resources, teaching them to search based on specific criteria such as topic, topicality, authorship, usability, and remixing.
e) I implement project-based pedagogical practices where I show students how to search for and select appropriate digital content and resources to complement their learning, according to their own interests and educational needs.

11. To what extent do I work with my students on the creation of digital content and resources?

a) I have little knowledge to guide students in the creation of content and digital resources and I need help to do that.
b) I encourage my students to use digital technologies such as the Office suite (Word, Excel, PowerPoint) or Google Drive to do academic work.
c) I often propose jobs to my students that allow them to create presentations, demonstrations, and videos with the support of digital technologies to deepen the content of the classes.
d) I involve students in collaborative activities of editing and combining content and digital resources in various media (video, text, etc.), according to the didactic objectives and their interests and educational needs.
e) I develop projects with students where I encourage them to collaborate with their peers in the creation and combination (remixes) of content and digital resources, considering different media. I also work with practical productions or activities that involve programming with my students.

DIGITAL CITIZENSHIP

RESPONSIBLE USE

Be able to make and promote the ethical and responsible use of technology (cyberbullying, privacy, digital identity, and legal implications).

12. How do I use my knowledge about the responsible and ethical use of digital technologies?

a) I have little or no knowledge about Internet privacy and I don't know security criteria for accessing sites or opening emails.
b) I have public profiles on social networks and I am careful about everything I access and share. However, I know that I should protect my privacy even more.
c) I take care of my digital identity by paying attention to the ethical and legal aspects of everything I access on the Internet and share on social networks. I am careful when sharing personal information such as my address and phone number.
d) I act cautiously about who I connect with on social media and manage my profiles according to the goals and target audiences of each digital environment I use. I know how to use settings that allow me to control the privacy of my personal information and the content I share, always taking into account ethical, legal, and interpersonal aspects.
e) I have control over my digital footprint and privacy in digital environments and I take the necessary steps to protect it. I create and share materials that support the ethical and responsible use of digital technologies.

13. To what extent do I promote the responsible use of digital technologies among my students??

a) I have little to no knowledge to guide my students on the responsible use of digital technologies.
b) I search for content on the Internet to alert students about issues related to the responsible use of technologies, presenting ways of interacting with the virtual world and the risks of exchanging images, audios, and videos that they would not like to be shared and published.
c) From time to time, I develop research projects with students and undertake debates and interactions with them to encourage them to reflect on how to live and communicate ethically and responsibly in various digital environments, including social networks. I also guide them about the care of sharing personal data on the Internet.
d) I often integrate into my planning activities work created and developed by students themselves, such as videos or texts in digital media, and I talk to them about topics such as cyberbullying, privacy, and presence on networks. I encourage them to share their experiences and reflect on the process.
e) I involve my students, parents or legal guardians, and other people from the educational community in activities in the virtual world, promoting online spaces for exchanges of knowledge and experiences related to the legal implications of the use of technologies, digital identity, and privacy on the Internet.

SAFE USE

Be able to make and promote the safe use of technologies (data protection strategies and tools).

14. How do I use my knowledge to ensure the security of my data in the use of digital technologies?

a) I have little or no knowledge about the safety of using digital technologies. I need help with basic care.
b) I know the importance of taking basic precautions for the safe use of the Internet, but I don't know how to take the necessary security measures such as identifying sites and links that are not secure, creating complex passwords, having different passwords for different sites, keeping the security system updated, etc.
c) I seek the security of my data by taking some concrete measures, for example, having multiple complex passwords that are not saved in the browser, and I know how to identify when a site, email, or link is not trustworthy.
d) I am proactive in adopting safe use best practices to ensure my privacy. For example, I regularly change my passwords, identify scams and risky situations, use advanced privacy settings, keep the security system activated, etc. I also know how to file complaints in case my privacy is violated.
e) I use and disseminate to colleagues and students measures for safe use of data, such as the use of reliable programs, the management of passwords and the implementation of constant backups. I provide support to make complaints when students feel their rights have been violated. I am also wary of personal data that may be collected by the sites I visit and the platforms I use.

15. To what extent do I promote the safe use of digital technologies in my pedagogical practices?

a) I have little or no knowledge about the safe use of the Internet and I need help from a colleague to develop activities with my students that involve this topic.
b) I talk to my students about Internet safety, guiding them to take basic care in the use of technologies, such as paying attention to the sites they enter and the time of use, so as not to compromise their physical and psychological well-being.
c) I look for content and reference materials on the safe use of digital technologies to teach my students safety strategies when using technological resources inside and outside of my classes. I work on the importance of antivirus and the use of complex passwords.
d) I always include in the planning of my classes various activities in which students can develop work by themselves, such as the preparation of videos, texts in digital media, etc. about their own reflections on data protection strategies and tools for the safe use of the Internet.
e) I involve my students, other teachers, and the educational community in activities on the importance of care in the use of digital technologies. I propose the incorporation of the topic in the school's guiding documents as a way to implement policies and strategies for the safe use of technologies.

CRITICAL USE

Be able to make and promote the critical interpretation of the information available in digital media.

16. To what extent do I manage to use digital technologies critically?

a) When I receive some content sent or published on social networks, I usually trust the sharer and do not make a critical judgment of their content. If I have any doubts, I ask a colleague for help.
b) I do my research on the Internet through search engines such as Google or Bing. Generally, I have doubts when I receive information in image format or videos with content that seems exaggerated or sensational.
c) When I use digital technologies to search for content, I prioritize results from educational, academic, or journalistic sites.
d) I always use digital technologies to search for content in trusted environments, contrasting multiple sources. I critically analyze the news and information I receive, looking for fact-checking sites and various reliable sources so as not to consume or spread fake news.
e) When I use digital technologies to search for content, I evaluate the reliability of sources by looking at things like low number of ads, whether the author is credited and prestigious. I seek to contextualize the information I find, for example, by reviewing the date of publication and the presence of scientific and statistical data.

17. How do I promote the critical use of digital technologies among my students?

a) I am not used to working on this topic in class and, when I do, I need help from a more expert colleague.
b) I develop specific activities with my students based on news and content that I select on the Internet, guiding them about the importance of selecting sites, analyzing publications and news, and verifying if they are reliable and real.
c) I promote activities where my students read and critically interpret information published in digital media to identify prejudiced, offensive, or false content, such as educational portals, sites, blogs, etc.
d) I promote with my students activities that contribute to critical reading and interpretation, stimulating them to produce and share information and content in digital media, paying attention to the context and the target audience, and avoiding disseminating prejudiced, offensive or false content.
e) I develop activities that stimulate my students, other teachers, and the educational community to create materials and do critical reading in various formats using digital technologies. I review and implement policies for the critical use of technologies in the educational center.

INCLUSION

Be able to use technological resources to promote inclusion and educational equity.

18. To what extent do I use digital technologies to promote inclusion and equity in education?

a) I have little knowledge and I am not used to using digital technologies to adapt activities to those students with diagnosed difficulties. I need help doing that.
b) I have some knowledge about digital technologies and that helps me propose specific activities in my classes for the inclusion of students with disabilities or learning difficulties. For example, I sometimes use text editing programs (e.g., Word) to expand font sizes for students with special visual needs.
c) I select and use technologies (with or without accessibility) to adapt activities and promote the inclusion of my students with disabilities or learning difficulties. I use digital resources to promote reflections by students about the differences between people.
d) Whenever applicable, I include in my planning the use of digital technologies (with or without accessibility) that allow for the participation of each student in individual or collective projects, according to their needs, promoting the development of learning and digital social participation.
e) I involve my students in the search for solutions and in the construction of inclusive content and tools, promoting projects that contribute to autonomy. I also encourage the integration of students in discussions on the topic, both in the school and in the community, and I collaborate with my colleagues on the use of these digital resources with their students.

PROFESSIONAL DEVELOPMENT

SELF-DEVELOPMENT

Be able to use digital technologies in continuing education and professional development activities.

19. To what extent do I use digital technologies to support my professional development?

a) I know the possibility of using digital technologies to complement my training, but I have never taken a course where these tools are used. I need help taking online courses or using virtual learning environments.
b) I use digital technologies to participate in ongoing online or bimodal (virtual and face-to-face) training opportunities, and to seek information and courses that promote my professional upgrading. I select the topics related to my specialty and offered to me by my educational center or the Ministry of Public Education.
c) I use digital technologies to participate in face-to-face, online, or bimodal courses (virtual and face-to-face) to perfect my knowledge and pedagogical strategies, seeking to integrate what I learned into my planning. I interact with other teachers to exchange ideas and to build knowledge collaboratively.

d) I use digital technologies to participate in personal and professional training courses. I produce and share content and training materials in order to support the transformation of the pedagogical practice of the other teachers in the school.
e) I propose the inclusion of the topic of self-development in the school's guiding documents.

SELF-ASSESSMENT

Be able to use digital technologies to evaluate their teaching practices and implement actions to improve them.

20. How do I use digital technologies to evaluate and improve my teaching practice?

a) I am not used to making a digital record of my planning to review and analyze it later in order to evaluate my practice and plan new activities.
b) I record my planning and review it quarterly to analyze what has been done and plan how to achieve the curricular objectives in the following quarter.
c) I use digital technologies frequently to record and review my teaching planning and my students' outcomes, and based on this, I evaluate and adapt my pedagogical practices.
d) I plan strategies to improve my pedagogical practices based on systematic self-assessment. In addition, I take into account the evaluation of other colleagues in relation to my teaching performance to reflect on my professional development and define an action plan with the aim of improving my work.
e) I use digital technologies to produce teacher assessment instruments (such as quizzes) and support other teachers. I promote moments of collective reflection to evaluate the team's practices or for students to evaluate teaching practices and, based on that information, I propose joint action plans that improve teaching processes.

SHARING

Be able to use technology to participate and promote participation in virtual learning communities and peer-to-peer exchanges.

21. How do I use digital technologies to participate in virtual learning communities?

a) I do not participate or need help from my colleagues to participate in virtual learning communities.
b) Sporadically, I enter virtual learning communities that are offered by my school or the Ministry of Public Education.
c) I know and use virtual learning communities to look for opportunities other than those offered by my school or the Ministry of Public Education.
d) I actively participate in various virtual learning communities to expand and exchange knowledge and pedagogical practices.
e) I engage students and other teachers in virtual learning communities.

22. How do I use digital technologies to share my knowledge associated with teaching?

a) I don't use or need help using virtual environments, sites, or portals to share content or digital resources.
b) From time to time, I share activities, content, and news that I consider relevant with other teachers through social networks.
c) I participate and motivate my colleagues to participate in virtual dialogues and debates to share their productions, ideas, and content.
d) I frequently use and seek digital technologies to produce and share content and pedagogical materials aligned with the curriculum, in addition to disseminating good practices in virtual spaces.
e) Together with my colleagues, I use and create virtual pages to share ideas and information with the educational community, including good individual and collective practices carried out in our educational center.

COMMUNICATION

To be able to use digital technologies to maintain active, systematic, and efficient communication with the actors of my educational community.

23. How do I use digital technologies to communicate with actors in the educational community?

a) I don't use digital technologies to communicate or use social media to chat with other teachers or my school management.
b) I use digital technologies to communicate with teachers and other actors in my educational community such as students and their guardians (parents or legal guardians), transmitting guidance and information.
c) I use digital technologies to communicate and share knowledge and information with other teachers and interact with my students, sending and receiving information about activities and projects.
d) I frequently use digital technologies to maintain active communication with the entire educational community, seeking to integrate digital media and tools to share information, content, and knowledge in a way that is aligned with the curriculum.
e) I use digital technologies in my day-to-day life and build experiences aligned with the curriculum that involve active communication and information sharing with students, colleagues, management, and the educational community. In addition, I teach my colleagues how to communicate through digital technologies efficiently, ethically, and legally.

Appendix 2. Teacher Registration Questionnaire: Comparative Table of the IDB and ProFuturo Questionnaires

IDB	ProFuturo
NAME	**NAME**
DATE OF BIRTH	**DATE OF BIRTH**
GENDER **Select an option:** · Female · Male · Other · I prefer not to say	**GENDER** **Select an option:** · Female · Male · Other · I prefer not to say
EMAIL	**EMAIL**
COUNTRY	**COUNTRY**
GEOGRAPHIC LEVEL 2	**GEOGRAPHIC LEVEL 2**
GEOGRAPHIC LEVEL 3	**GEOGRAPHIC LEVEL 3**
GEOGRAPHIC LEVEL 4	**GEOGRAPHIC LEVEL 4**
EDUCATIONAL INSTITUTION	**EDUCATIONAL INSTITUTION**
STAGES OF EDUCATION **Select one or more options:** · Early education · Primary education · Secondary education	**LEVEL OF EDUCATION YOU TEACH AT THE SCHOOL** **Select an option:** - Early childhood education (initial, preschool, pre-school) - Primary education (Primary education I and II, Basic education cycle I) - Secondary education first stage (Basic education cycle II) - Secondary education second stage (baccalaureate, middle school, upper secondary education) - Non-tertiary post-secondary education (Complementary Baccalaureate, technical-vocational secondary education) - Tertiary education Short cycle (technical, higher technical) - Bachelor's degree in tertiary education (university: bachelor's degree, bachelor's degree or equivalent)

- Master's degree, specialization or equivalent (postgraduate, master's)
- Doctorate or equivalent
- Not classified elsewhere

AREA OF KNOWLEDGE/ CURRICULUM COMPONENT

Select one or more options:

- Art
- Computer Science
- Communication
- English
- Health Sciences
- Humanities
- Mathematics
- Natural Sciences
- Physical Education
- Social Sciences
- Spanish
- Technology
- All or most subjects
- Other

AREA OF KNOWLEDGE/ COMPONENT OF THE CURRICULUM YOU TEACH

Please select an option:

- I teach most areas of knowledge/components of the curriculum
- Art
- Science
- Citizenship
- Physical Education
- Language
- Mathematics
- Technology/Computer Science
- Other

WHAT IS YOUR HIGHEST DEGREE OF STUDIES?

Select an option:

- High school diploma
- Bachelor's degree
- Technical (tertiary)
- Postgraduate course
- Master's degree
- Doctorate

WHAT IS YOUR LAST LEVEL OF EDUCATION ATTAINED?

Select an option:

- Early childhood education (initial, preschool, pre-school)
- Primary education (Primary education I and II; basic education cycle I)
- Secondary education first stage (Basic education cycle II)
- Secondary education second stage (baccalaureate, middle school; upper secondary education)
- Non-tertiary post-secondary education (complementary baccalaureate, technical-vocational secondary education)
- Short-cycle tertiary education (technical, higher technical)

- Bachelor's degree in education tertiary (university: bachelor's, bachelor's degree or equivalent)
- Master's, specialization or equivalent (postgraduate, master's)
- Doctorate or equivalent
- Not elsewhere classified

YOUR INITIAL TEACHER TRAINING WAS IN:

Select an option:

- Initial education
- Primary education
- Secondary education

HAVE YOU HAD ANY DISCIPLINE OR CONTENT FOR THE USE OF TECHNOLOGY IN TEACHING AND LEARNING IN YOUR INITIAL TEACHER TRAINING?

- Yes
- No

HAVE YOU DONE OR ARE YOU DOING ANY TRAINING IN INNOVATION AND TECHNOLOGY?

- Yes
- No

(For those who answered "Yes" to the previous question)

LEVEL OF EDUCATION ACHIEVED IN INNOVATION AND TECHNOLOGY

Select an option:

- Continuing education completed
- Continuing education in progress
- Post-secondary non-tertiary education in progress (complementary baccalaureate, technical vocational secondary school)
- Non-tertiary post-secondary education completed (complementary baccalaureate, technical vocational secondary school)

- Short-cycle tertiary education in progress (technical, Higher technical education)
- Completed short-cycle tertiary education (technical, higher technical)
- Completed tertiary education degree (university: bachelor's degree, bachelor's degree or equivalent)
- Ongoing tertiary education degree (University: bachelor's degree, bachelor's degree or equivalent)
- Master's/master's degree, specialization or equivalent
- Completed
- Master's/master's degree, specialization or equivalent
- In progress
- Doctorate or equivalent
- Completed
- Doctorate or equivalent
- In progress
- Not classified in other part

Appendix 3. Distribution of Teachers in the Five Levels of Development within the Framework of the Edutec Guide's Self-assessment of Digital Teaching Competencies

FIGURE A3.1. Percentage of Teachers Surveyed by Level in the Three Digital Competency Areas (Averages of the six participating countries)

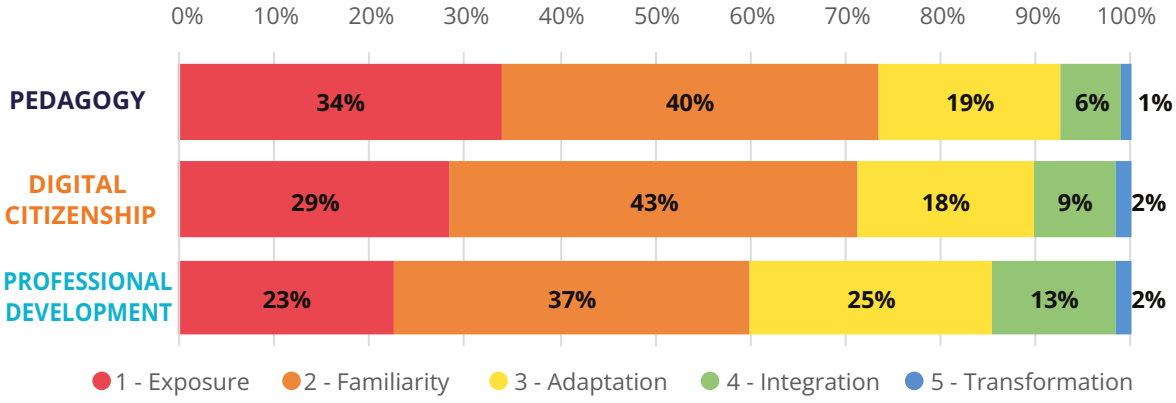


FIGURE A3.2. Percentage of Teachers Surveyed by Level in the 12 Digital Competencies (Averages of the six participating countries)

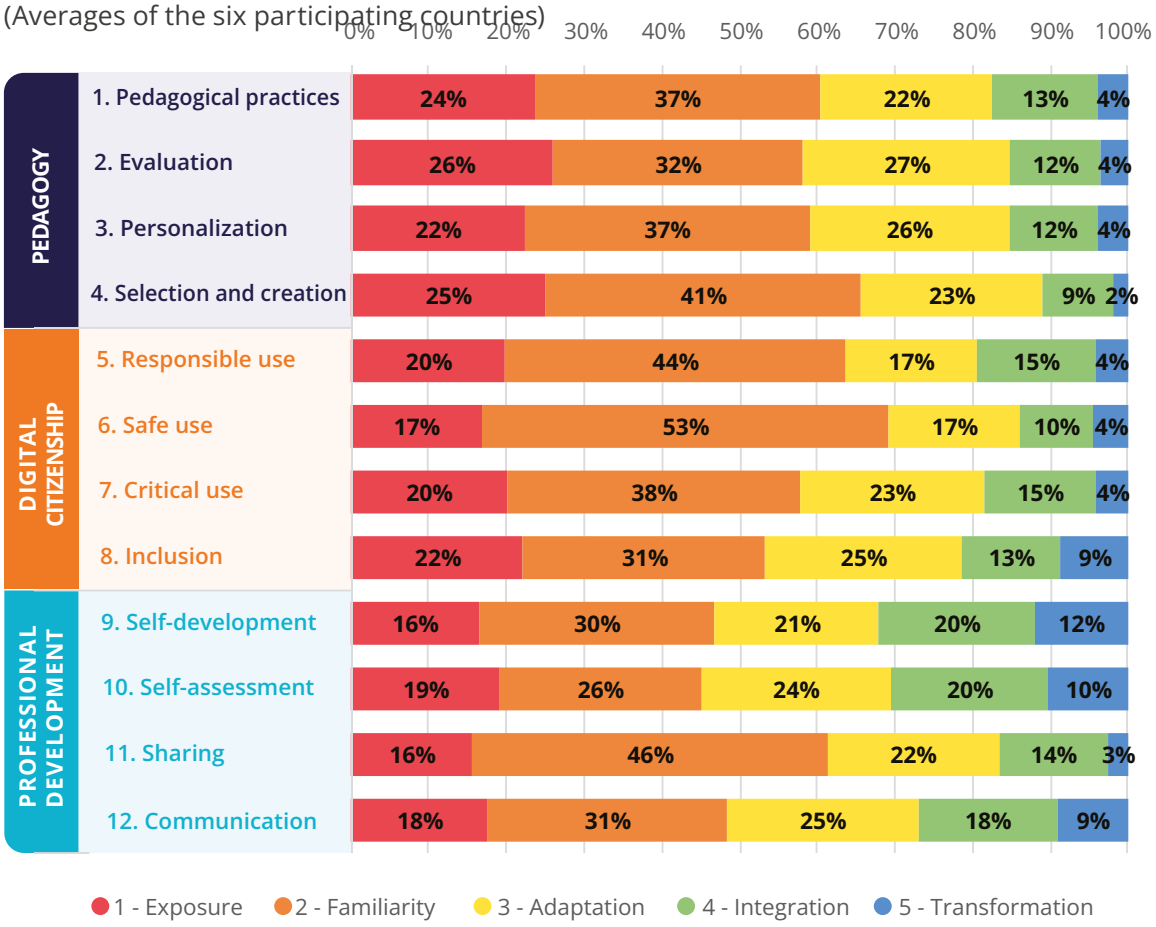


FIGURE A3.3. Percentage of Teachers Surveyed in Each Country by Level in the Three Digital Competency Areas

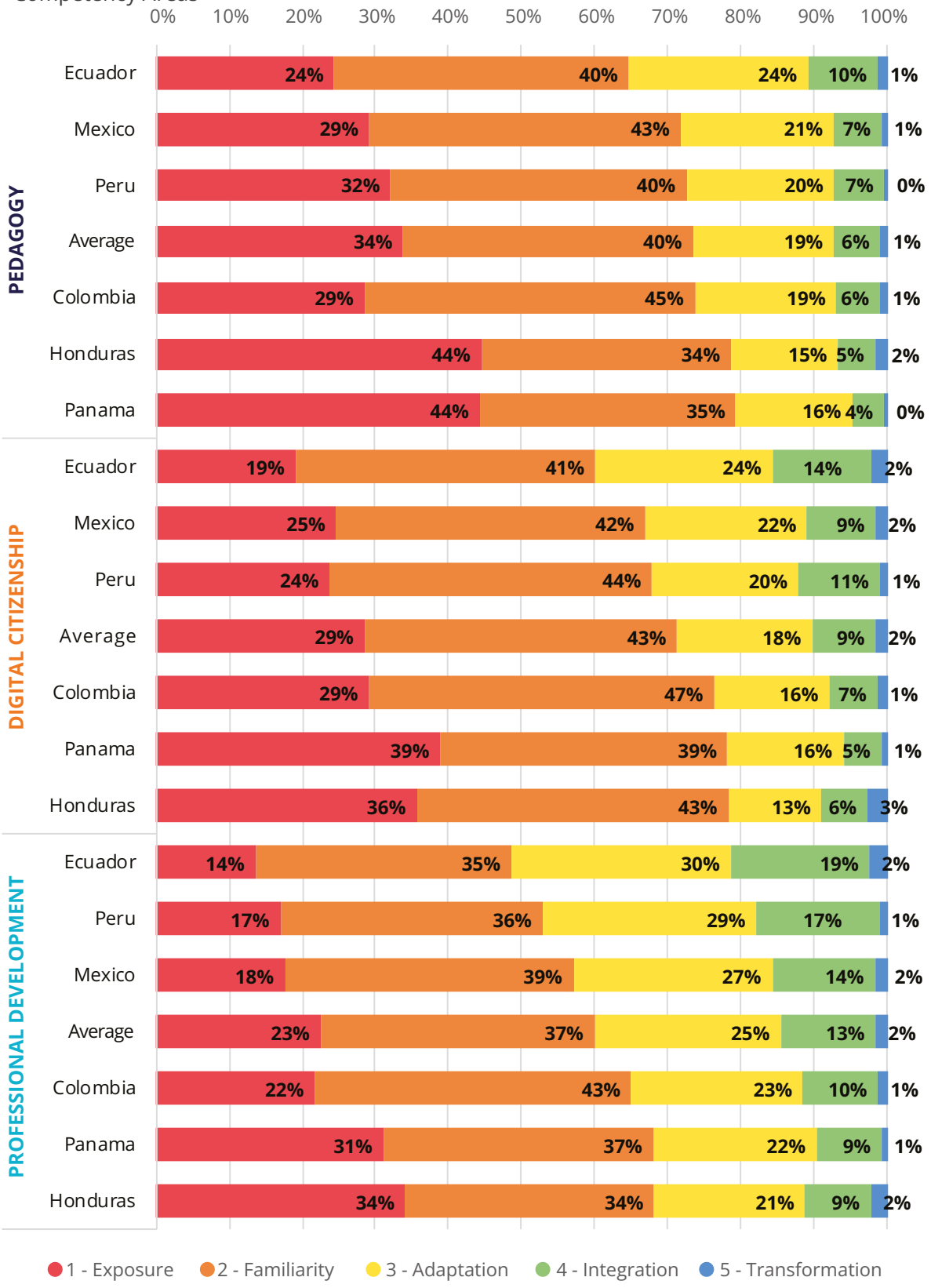


FIGURE A3,4. Percentage of Teachers Surveyed by Level, according to Their Age Range

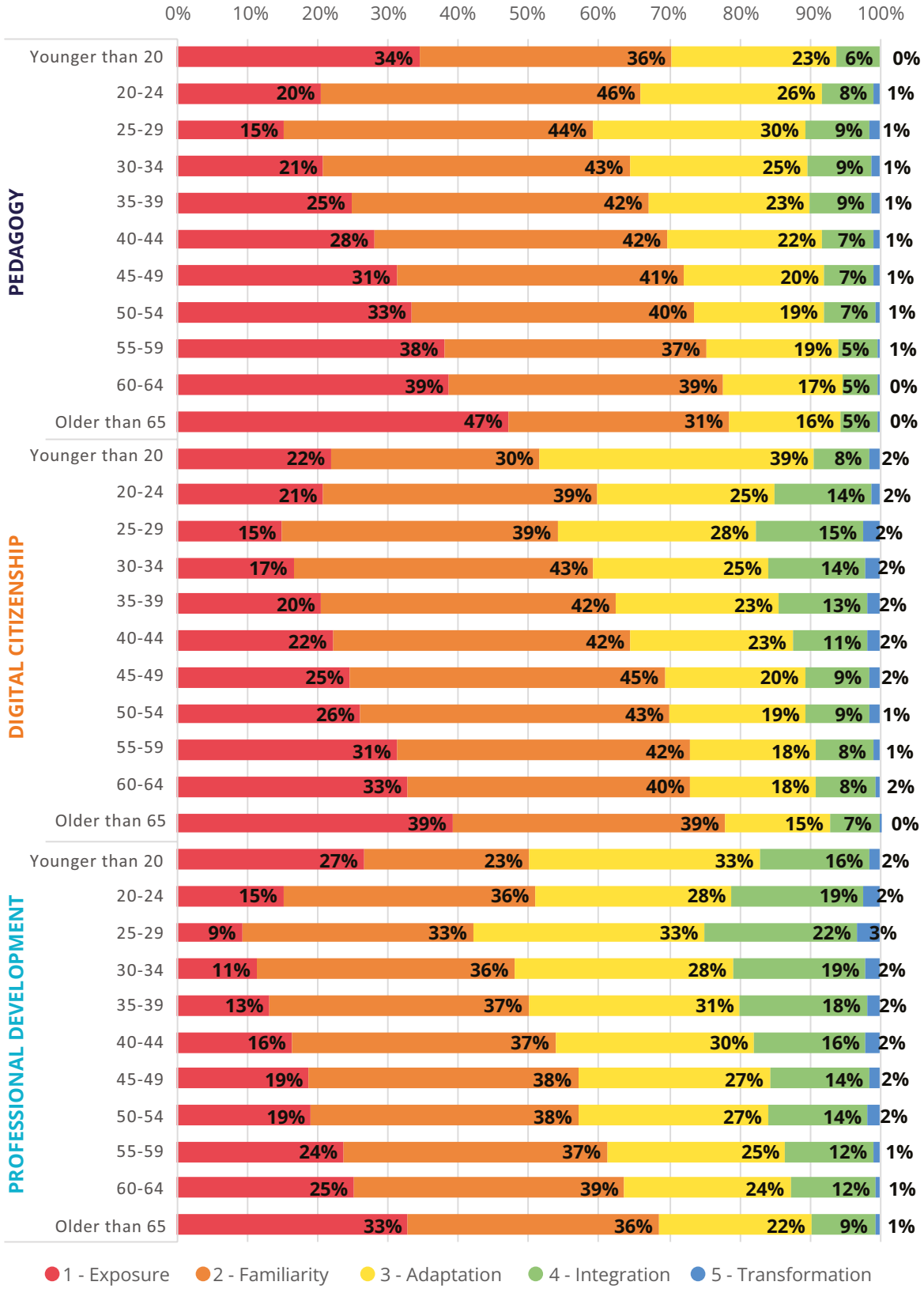


FIGURE A3.5. Percentage of Teachers Surveyed by Level, according to Gender

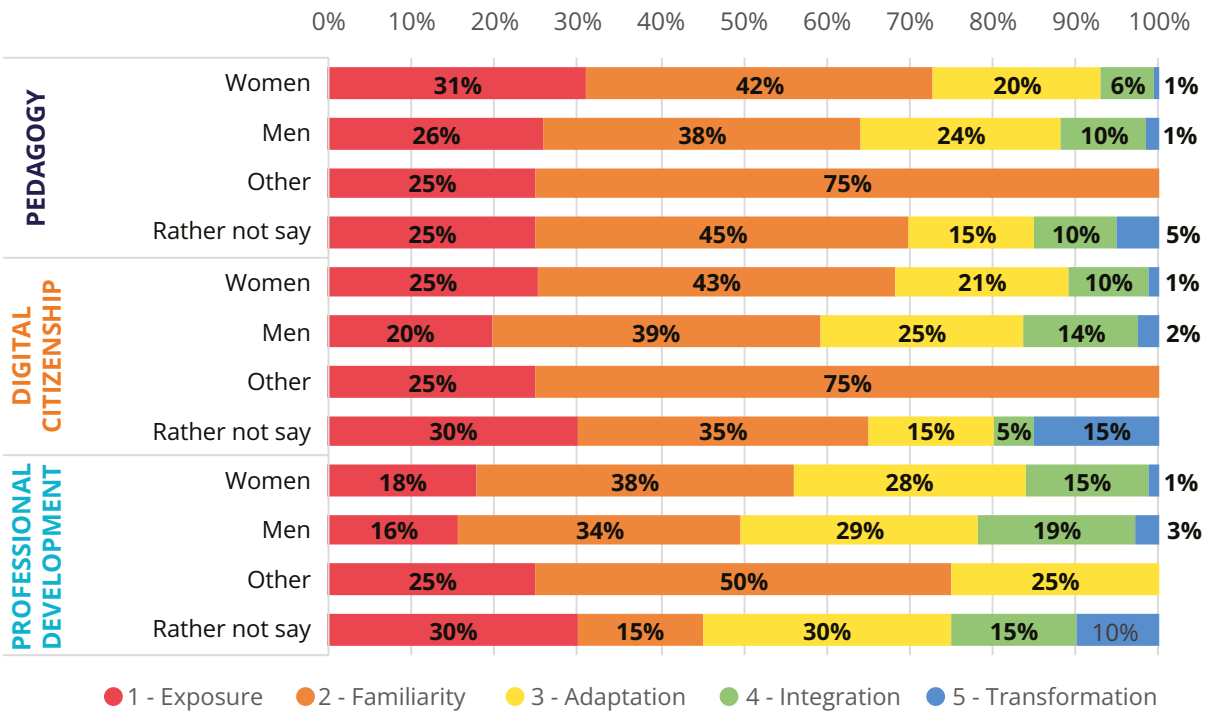


FIGURE A3.6. Percentage of Teachers Surveyed by Level, according to Their Last Level of Studies Achieved

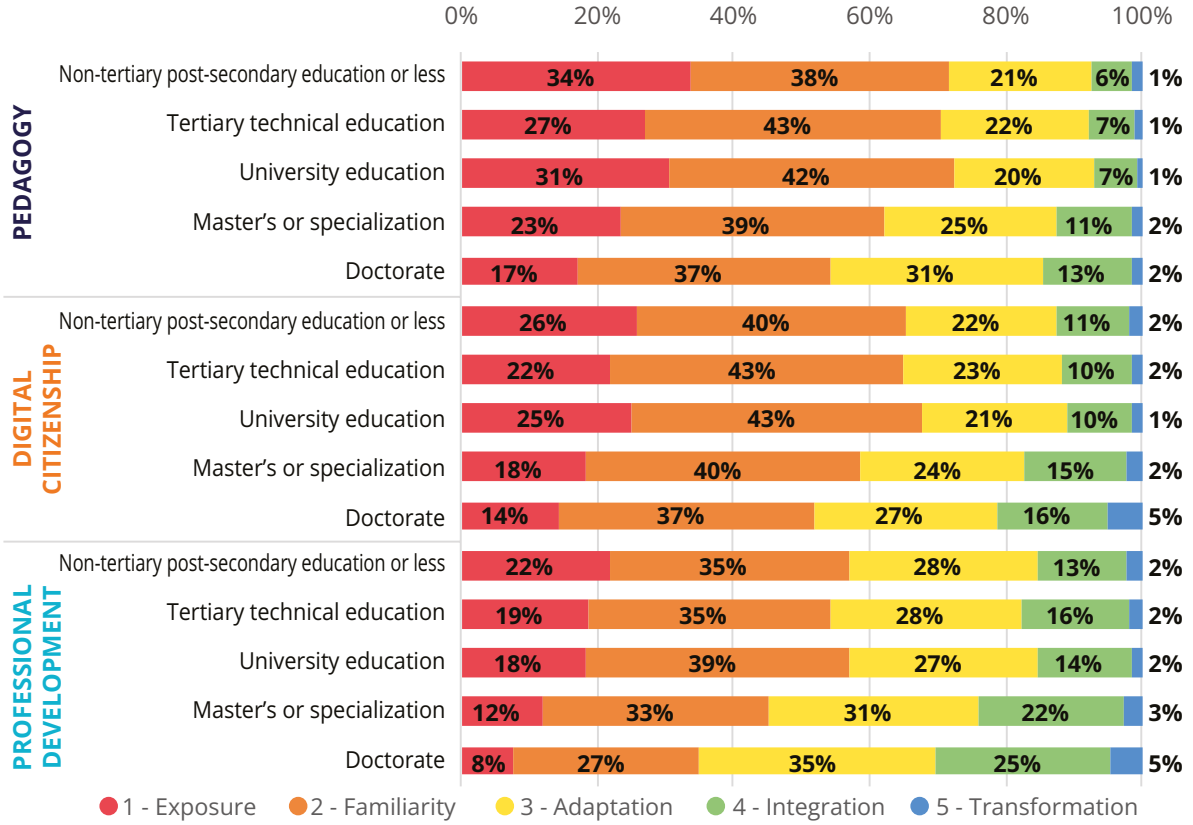


FIGURE A3.7. Percentage of Teachers Surveyed by Level, according to Whether or Not They Have Training in the Use of Technology

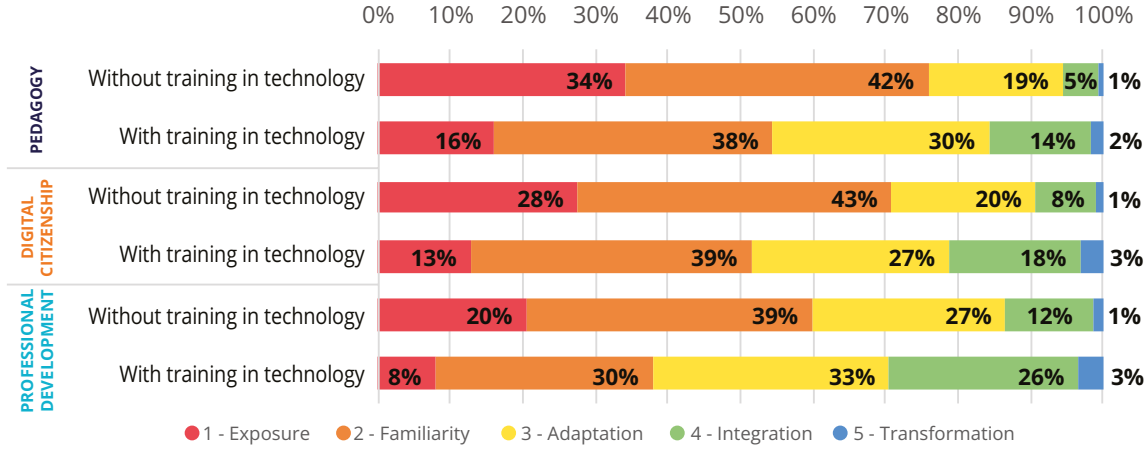
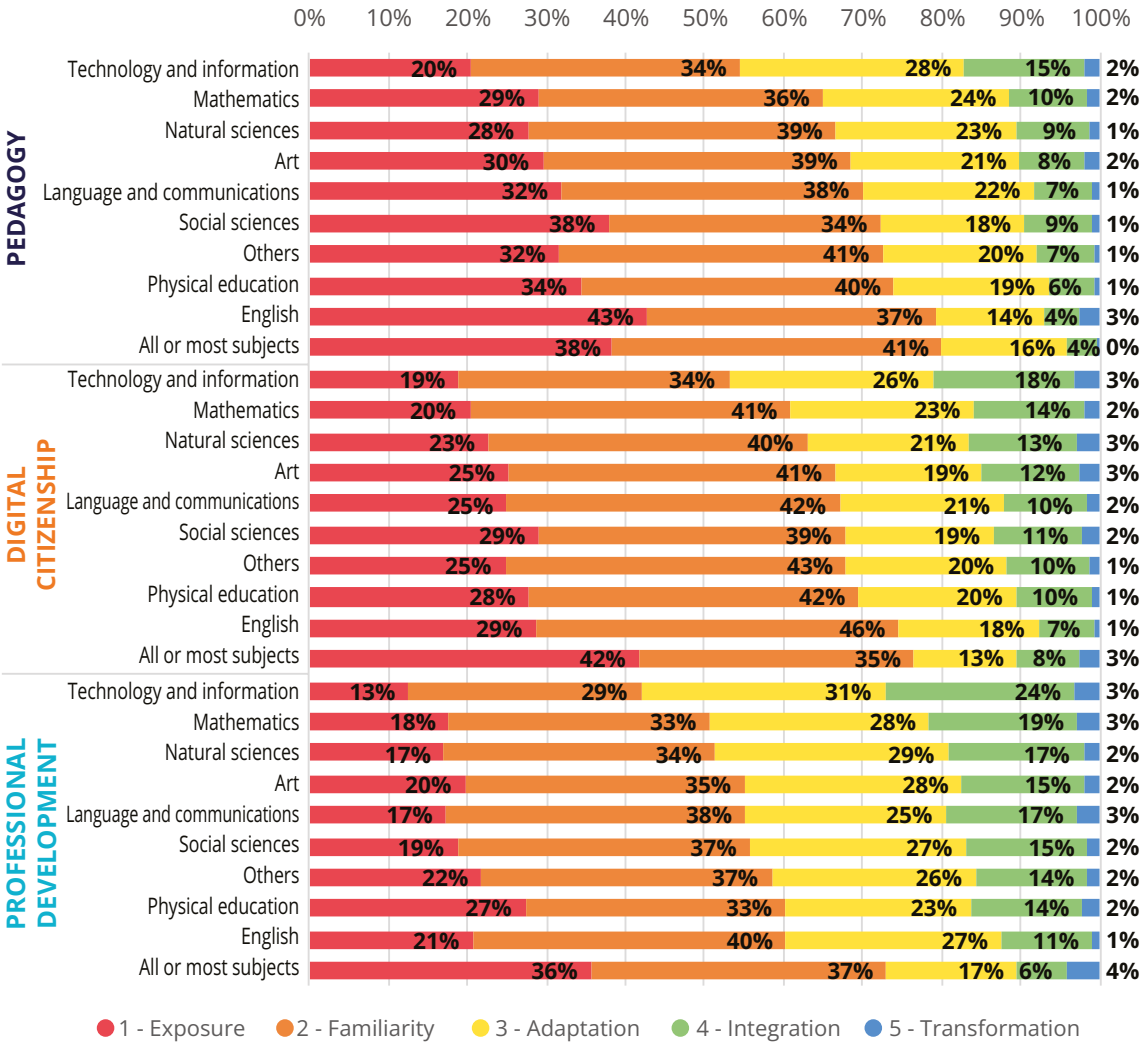


FIGURE A3.8. Percentage of Teachers Surveyed by Level, according to Their Teaching Area



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