

Digital divide in the didactics of basic education teachers: the case of public schools in the city of Chihuahua (Mexico)

Brecha digital en didáctica de docentes de educación básica: caso escuelas públicas en la ciudad de Chihuahua (México)

Exclusão digital na didática de professores da educação básica: o caso das escolas públicas da cidade de Chihuahua (México)

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ARTICLE



Javier Tarango

Autonomous University of Chihuahua (Mexico)

Member of the National System of Researchers (Level II). Doctor of Education from the Autonomous University of Chihuahua, Mexico (UACH). He has master's degrees in Information Sciences (University of Guanajuato, Mexico) and in Organizational Development (University of Monterrey, Mexico). He works as a full time professor-researcher at UACH since 1996 in the master's degree in Educational Innovation and in the doctorate in Education, Humanities and Art. In addition, he teaches a virtual subject in the bachelor's degree in Library Science and Knowledge Management, and in the master's degree in Transparency and Protection of Personal Data at the University of Guadalajara.

jtarango@uach.mx
orcid.org/0000-0002-0416-3400

Victoria García-Prieto

University of Seville (Spain)

Professor at the University of Seville and at the EUSA University Center in Spain. She has a doctorate in Communication from the University of Seville, a master's degree in Communication and Culture and a Bachelor of Journalism. She teaches in the degrees of Journalism, Audiovisual Communication and Advertising, and Public Relations. She has been a visiting researcher at the Universities of Cambridge and Westminster in the UK, and at the Universidade NOVA in Lisbon, Portugal. She is a member of the research group on Media, Communication Policies and Democracy in the European Union, the Comunicar group and the Ibero-American network of researchers AlfaMed.

vgarcia8@us.es
orcid.org/0000-0003-4973-7583

Fidel González-Quiñones

Autonomous University of Chihuahua (Mexico)

He is a member of the National System of Researchers (Candidate Level). He has a doctorate in Social Journalism from the University of Seville, Spain. He has master's degrees in Administration and Marketing (Autonomous University of Chihuahua). He is a full-time professor-researcher at the Autonomous University of Chihuahua in the Bachelor of Information Sciences, the Master of Educational Innovation and the Doctorate in Education, Arts and Humanities. He has more than 15 years working as a strategic studies analyst in disciplinary studies with private and governmental entities at the Center for Strategic Studies of the Autonomous University of Chihuahua, of which he is the leader.

fgonzalez@uach.mx
orcid.org/0000-0002-8404-0098

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Abstract

This descriptive research aimed to diagnose the existing distance in the access, use and appropriation of ICT in teachers. The digital divide in didactics was studied in 152 teachers from 20 public primary schools in the city of Chihuahua (Mexico) and the inequality of possibilities observed by teachers to access the use of adequate information sources, knowledge of other didactic alternatives, was identified and to own training processes through ICT. Through a survey of closed and open questions, the behavioral traits of teachers in relation to ICT were identified, such as: use focused on conventional technologies, low access for academic purposes and high learning needs through training processes.

KEYWORDS

Access to information, Digital divide, Technological disparity, Primary school teacher, Basic education.

Resumen

Esta investigación descriptiva, cuyo objetivo es diagnosticar la distancia existente en el acceso, uso y apropiación de las TIC en el profesora-

do, estudia la brecha digital en didáctica en 152 docentes de 20 escuelas primarias públicas de la ciudad de Chihuahua (México) e identifica la desigualdad de posibilidades que observan los docentes para acceder al uso de fuentes de información adecuadas, al conocimiento de otras alternativas didácticas y a los procesos de formación propia por medio de las TIC. A través de una encuesta de preguntas cerradas y abiertas, el artículo identifica rasgos de comportamiento del profesorado en relación con las TIC tales como: uso centrado en tecnologías convencionales, bajo acceso para fines académicos y altas necesidades de aprendizaje a través de procesos de capacitación.

PALABRAS CLAVE

Acceso a la información, Brecha digital, Disparidad tecnológica, Docente de educación primaria, Educación básica.

Resumo

Esta pesquisa descritiva, cujo objetivo é diagnosticar a distância existente no acesso, uso e apropriação das TIC por professores, estuda a exclusão digital da didática com 152 professores de 20 escolas primárias públicas da cidade

de Chihuahua (México) e identifica a desigualdade das possibilidades observadas pelos professores de acesso ao uso de fontes de informação adequadas, ao conhecimento de outras alternativas didáticas e aos próprios processos de formação por meio das TIC. Por meio de um questionário de perguntas fechadas e abertas, o artigo identifica traços comportamentais dos professores em relação às TIC, tais como: uso

focado em tecnologias convencionais, baixo acesso para fins acadêmicos e altas necessidades de aprendizagem por meio de processos de formação.

PALAVRAS-CHAVE

Acesso à informação, Exclusão digital, Disparidade tecnológica, Professor do ensino fundamental, Educação básica.

1. INTRODUCTION

The objective of educational institutions is to help their students have the possibility of becoming autonomous citizens, acquiring the knowledge, skills, and attitudes that they will put into practice throughout their lives. The position that teachers take in front of their groups depends, among other factors, on the decisions that contemplate the adoption, assimilation, adaptation, management, transfer and development of new strategies that will be definitive for students to be competitive in the digital age and that they do not run the risk of being left behind in the face of the challenges of globalization (Olsson & Hallaberg, 2018).

To achieve these purposes, the role of teachers and the adaptive process they have undergone are essential. Therefore, teachers must increase all possible skills that are related to Information and Communication Technologies (ICT). These digital skills will give students a privileged place once they finish their studies, compared to other citizens. In addition, these are necessary skills to perform in various areas of academic and daily life, being essential for research processes, content generation and consultation of different sources of information (European Training Foundation, 2018).

One of the most compelling characteristics of today is the speed with which changes occur.

Today's economies have been radically transformed, moving from the classic division (agriculture, industry and services), towards considerations such as the knowledge economy. Therefore, those who are currently teaching become knowledge workers. This leads us to reflect on how the daily uses of ICTs contribute to creating frameworks of democratic equality and cultural diversity, through the pedagogical and social inclusion dimensions (Vivanco, 2015). ICTs have undoubtedly contributed to the change in the educational paradigm in general, which implies the integration of the teacher into a cultural and symbolic ecosystem, where new codes and languages are formed (Arcos-Vega et al., 2017).

Although the mere incorporation of ICTs into educational institutions does not necessarily contribute to improving student and teacher performance, schools demand to experience a significant organizational change, based on investment in infrastructure and specialized training (Arcos-Vega et al., 2017). Regarding ICTs, such training must contemplate, without claiming to be exhaustive, the following elements: (1) access and availability, both for students and teachers; (2) inclusion in the curriculum development; (3) daily use to evaluate performance; (4) access to professional development opportunities for teachers; (5) inclusion of school directors; and (6) support for teachers

with examples of good practices (Tarango & Marzal, 2011).

There is a strong demand to train emerging generations of teachers to incorporate new ICT-related learning tools into their classes, which includes the need to acquire extensive knowledge about ways of learning. Different stages of teacher development are observed in terms of technology adoption processes and there is a need for the acquisition of skills in the management of technologies to access the pedagogical content, as well as for joint work and collaboration in the Internet (Hardman, 2019; Mlambo et al., 2020). It is also noted the need to obtain planned training in elements related to the context, culture, vision, leadership, the definition of standards on the expected levels of competence and planning in the technological inclusion in pedagogical processes (Song & Siu, 2017).

In the case of this research, whose data collection took place before the confinement produced by the COVID-19 pandemic, it arises from the assumption that basic education teachers in Mexican public education lack the computer skills to carry out their teaching activities, inside and outside the classroom. This is caused by the low training they receive in this regard and because teaching and learning processes with characteristics of traditional education are prioritized, compared to that focused on innovation. In both circumstances, there is a fundamental concern about the superiority shown by students in the use of ICTs, compared to the performance of teachers and that this causes a cognitive lag, thereby affecting various educational conditions that can be crucial in the training processes.

1.1. INCLUSION OF ICTS IN EDUCATIONAL AND TEACHER TRAINING PROCESSES

The integration of ICTs in the actions of the main educational actors, specifically in the teaching staff, faces a series of conditions, among which stand out:

- a) The training spaces propose new ways of communication between the actors in the process, where ICTs are essential to increase elements related to training and learning, including the “representation of content, carrying out activities, teacher-student and student-student interactions, learning evaluation, among others” (Pérez & Telleria, 2012, p. 87).
- b) The environment in relation to the digital divide faced by teachers must take into account the “internal gap”, that is, inequalities in access to ICTs, especially in developing countries, since it represents a form of social exclusion that impacts on participation in connectivity (OECD, 2019b).
- c) The determination of current public policies related to the access, training and educational use of ICTs favor the presence of these technological elements in the personal and institutional environments of teachers. Therefore, it is necessary for institutions to be clear about the conceptual differentiation between public policies, strategies, and plans, the first being those proposals from governments that promote aspects of access, quality and development of teachers according to specific needs (UNESCO, 2013).
- d) The identification of the levels of digital migration that teachers and students are experiencing or are willing to experience through tangible elements of displacement

towards a highly technical world. It also implies determining how far they are from certain realities, since teachers are entities that generate new individual and collective identities (Piscitelli, 2017).

- e) The substantial differences existing in the teachers' environments, which influence the incorporation of ICTs in education, generate various scenarios as mediating instruments: (1) relationships between the students and the content or learning tasks; (2) relationships between teachers, teaching and learning content or tasks; (3) relationships between teachers and students; and (4) the joint activity of teachers and students when developing teaching and learning activities (Coll, 2017).

According to the previous considerations, the successful integration of ICTs into education implies prioritizing teacher training in their use, "including a transformation of their beliefs and pedagogical practices" (Díaz, 2017, p. 145). Apart from the instrumental use of ICTs, teachers need to integrate them to learn to teach meaningfully, in addition to transforming their beliefs and practices regarding educational, assessment and learning approaches, methods and standards.

The challenge in reducing the digital divide is not only the interference that is made when comparing internal national conditions, nor in relation to those nations that present a socioeconomic level equal to or lower than their own, but the condition observed in the digital divide in developed countries where levels are drastically lower (OECD, 2019a). For example, in the case of the United States and Canada, these countries have reached high levels of availability of computer equipment in the population, also in terms of telephone services and the rest of the ICT-related indicators. Although a country

has low levels of ICT availability in the general population, especially compared to the aforementioned countries, its growth in recent years is surprising, in addition to the efforts made by governments to establish public policies in this regard (González & Ugalde, 2016).

The digital divide usually has multiple characteristics, being that related to didactic processes one of the most precise, since it can be measured through the levels of digital literacy (Londoño et al., 2018), inherent to academic or work processes or activities that are done to find solutions to everyday problems. In this regard, it is also worth studying the problem from the perspective of the different generations in the population, with an apparent difference in the behavior of social groups in relation to ICT. It is noted that it depends on the time in which they were born, differentiating between individuals who were born before the emergence of certain technologies and those who see this phenomenon as something that already existed in society and whose adaptability to ICTs is usually greater (Tarango & Marzal, 2011). It is important to consider the above, compared to current educational concepts and models, such as e-Learning (electronic learning), n-Learning (nomadic learning) or b-Learning (Blended Learning or blended learning), which have come to diverse fields of application, but implying a predisposition to the mobility of the subjects (Cheng & Loke, 2018).

When aspects such as the quality of accesses, the availability of broadband connection or the application of content to solve specific problems are analyzed, access to ICTs is dimensioned differently and measured from a quantitative point of view. The Latin American Integration Association (2003) identifies four qualitative dimensions in relation to the conditions of access and use of technologies: (1) motivation to access; (2) access to certain types of material;

(3) competencies for access; and (4) technological approach for advanced uses. Therefore, the behavioral issues that teachers and students can observe in schools in relation to the importance given to the use of formal information is an aspect of great interest (López, 2017). Of all these aspects, the questions of cultural change in the subjects to identify the importance of ICTs potentially implies costlier processes than the mere acquisition of infrastructure.

Some of the aspects to consider in the development of the digital divide in aspects related to didactics are: (1) a large part of the people are not digital natives; (2) believe that students handle technology better than teachers, which will not necessarily be the true in all cases; (3) imagine that in all contexts there are elements of technology available for academic and work activities; and (4) think that all available content is good and assume that all users know how to differentiate between quality content and those that lack it (Wilson, 2016).

Regarding teachers and their relationship with ICTs, the paradigm is maintained that the solution is to offer only training in the use of tools, but the study of the digital divide and didactics promotes the development of different substantial aspects, such as: (1) teach teachers to use technological tools to integrate them into their work and academic discipline; (2) generate pedagogical appropriation processes in relation to technologies rather than mere acquisition (access or use); and (3) technological tools are forms of access to knowledge and not necessarily forms of knowledge production (Mouza, 2008).

People's relationship with technology can have different views. For the purposes of this research, it is considered pertinent to consider a form of expression that regularly manifests itself in teachers and their students, which is

defined as the particular way of perception that one has of the level of knowledge or development of others, known as "cognitive underdevelopment." This is an expression that seeks to present a way of describing the condition of self-concept, where the lack of belief in personal capacities is often manifested and it is an aspect that is related to cultural factors.

Although the concept of cognitive underdevelopment has been studied in psychology, medicine and even sociology, there is little reference to it in education. However, in the study of ICTs, this has been a concept considered important in relation to the conceptualization that teachers have about the level of technological knowledge that their students possess. The marked cognitive underdevelopment lies in believing, for example, that students have higher and better levels of technological knowledge than they do in relation to the use, application, and appropriation of ICTs.

In education and in research fields on ICTs, it is considered that cognitive underdevelopment even manifests itself as a social or cultural inheritance and is regularly related to less schooling and higher school failure, which is usually associated with individuals who come from underprivileged families (Esping-Andersen, 2008). This may represent the condition of cognitive underdevelopment of a group, institution or country in general.

2. STATEMENT OF THE PROBLEM AND OBJECTIVES OF THE INVESTIGATION

The problem studied in this research is based on the lack of knowledge of the relationship that basic (primary) education teachers have with ICTs in the city of Chihuahua (Mexico), this being the geographical environment in which the researchers of this study work. Likewise,

it is based on the assumption that their level of use and access arises from the initiative of the students and not from the teaching staff themselves, since the former show a direct and constant approach to them. Therefore, an analysis of this nature is problematized from the following aspects:

- a) The massive diffusion of the use of ICT contributes to the transformation of social and economic spheres. By not addressing this situation in a timely manner, educational lags are promoted based on learning limitations in the face of globalization.
- b) The demands of the knowledge society represent a high relationship with the ability of the subject in their relationship with ICTs. When there is no formal and efficient strategy to support the development of skills for its management, limitations are generated in the education of those involved.
- c) The study of the presence and type of use of ICTs allows the identification of real conditions, which potentially would serve to promote academic development and contribute to the generation of changes.

Thus, the general objective of the research is to diagnose the existing distance in the access, use and appropriation of ICTs observed by the teachers of the public primary schools participating in the study. The article aims to identify behavioral traits of the participants, mainly from the configuration of the existing cultural capital, the teaching practice through the use of circulating information and the identification of the conditions of infrastructure and available knowledge.

This purpose is broken down into the following specific objectives:

- a) Identification of existing features in the access, use and appropriation of ICTs.

- b) Definition of elements that distinguish behaviors in relation to the daily use of ICTs in academic and personal activities.
- c) Classification of conceptualizations of the pedagogical use of ICTs.
- d) Knowledge dimension, as well as real and desired experiences in relation to ICTs.
- e) Identification of the conditions of cognitive underdevelopment in relation to ICTs.

3. METHODOLOGY

The research focused on a quantitative approach, based on a non-experimental, trans-sectional and exploratory method, since the essential ideas that were derived from the observations made by the participating subjects from their own situations were described, which corresponded to an empirical analysis. The educational institutions were selected by a convenience sampling, from which data was collected from the teaching staff. These were identified according to the following homogeneous characteristics: (1) location in a sector of medium socioeconomic level, where there are sufficient conditions for both students and teachers to have access to ICTs; (2) location in a residential complex with all basic services (electricity, water, drainage and paving), specifically in the city of Chihuahua (Mexico); (3) offer academic activities in two shifts (morning and evening); and (4) be classified within the range of large schools, with at least five groups per level and per shift. In total, 20 schools were selected.

The measurement instrument consisted of a survey with 20 items divided into three general parts: context, current use and projection, which are described below:

- a) Part I. Context (eight questions). Identifies fixed variables such as gender, age, years completed in the professional practice,

maximum level of studies achieved, name of the institution in which they work, shift and grade in which classes are taught and a diagnostic question that allowed to identify the conceptualizations that participants have about ICTs.

- b) Part II. Current usage (four questions). Identify features of ICT use, type of ICT regularly used and training needs. This section includes an open question where the respondent can indicate if they require any training or advice on the subject.
- c) Part III. Projection (eight questions). It includes the elements of conceptualization of the pedagogical use of ICTs, projects to promote the pedagogical use of ICTs, identification of experiences in the use of ICTs, language access, use of technologies outside the academic environment (by type and purpose) and measurement of the cognitive underdevelopment of teachers in comparison with their students in the use and management of ICTs. This section also allows the respondent to answer open questions in which they express their opinion about the pedagogical use of ICTs and the impact they have had on their academic life.

The construction of the measurement instrument began by writing the items that responded to the research objectives, thus obtaining a first version that was subject to validation by three experts in Information Sciences who were members of the National System of Researchers of Mexico. As a result of this validation, the wording of several items had to be improved and several open questions were also included where the respondent could expand the information provided, thus obtaining a second version of the instrument that served as a pilot questionnaire.

A total of 37 pilot questionnaires were applied, finding confusion only in one question. The wording of this question had to be changed to obtain the final version. It is important to comment that, although the final version of the instrument contains only 20 items, the open questions included by the experts' judgment contributed to increase the response time of the instrument, and it was also considered necessary to apply it with the face-to-face technique, therefore the option of making a sample as small as possible was considered. Finally, and in relation to the measurement instrument, it was ensured that the researcher in charge of its application read, before starting each interaction with the interviewee, an informed consent indicating that the answers are treated completely anonymously and will be used only for academic purposes.

For the information analysis, the categorical and ordinal qualitative variables included were analyzed using the SPSS program. The open questions were analyzed by first performing a manual categorization and finally a systematization of results.

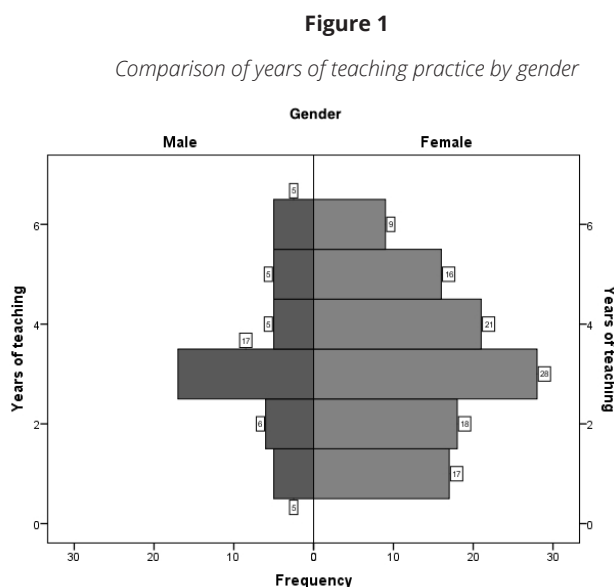
4. RESULTS

The main findings identified in the research are presented according to the structure of the data collection instrument. In each section, the global findings are included and comparisons of the age criteria (presented quantitatively in completed years or qualitatively grouping the data by ranges, as appropriate) and/or gender of the study group are incorporated in some criteria of evaluation.

4.1. PART I. CONTEXT

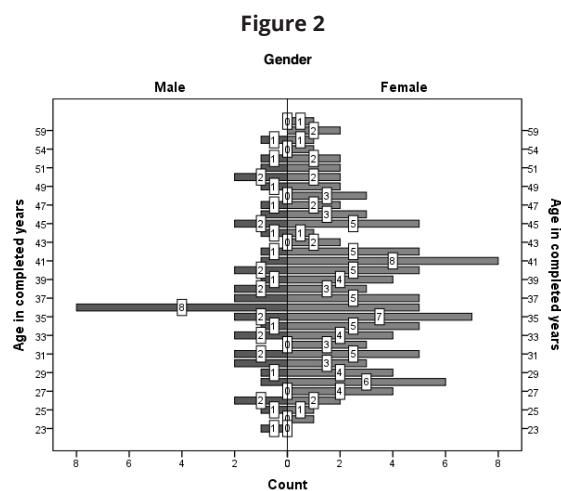
Of the teaching staff participating in the study, 28.3% were men and 71.7% were women. The

arithmetic mean of the average years of teaching practice was 3.28 years (standard deviation of 1.493), with a greater permanence in females compared to males, as shown in Figure 1.



The arithmetic mean of ages of the participating teachers was 38.17 years, the minimum being 23 and the maximum 63, with a standard deviation of 8,108. Figure 2 shows a pyramidal distribution of the age of completed years and relates it to a distribution by gender, observing a more normal distribution behavior in the case of the female sex.

Likewise, the distribution of the maximum level of studies completed identified four types: basic education teachers (trained in Normal Schools, national institutions that are specifically dedicated to the training of teachers for basic education at the primary level, as opposed to those who specialize in middle school, high school or higher education) (11.2%), university degree (71.7%), master's degree (15.8%) and doctorate (1.3%).



Participants in the study were asked to freely express their own conceptualization of ICTs, from which different expressions, mostly concrete and generic, were obtained. These were grouped into six types and one without response (see Table 1), with 85.44% focusing on three particular conceptualizations of 146 participations: technological tools, modes of support for teaching, and daily use of technology.

Table 1

ICT conceptualization

Conceptualizations	Frequency	Percentage	Accumulated percentage
Technological tools	81	55.47	55.47
Modes of support for teaching	28	19.17	75.17
Daily use of technology	15	10.27	85.44
Access to information	10	6.84	92.28
Technological implements and devices	8	5.48	97.76
Technological advances	4	2.73	100.0
Total	146	100.0	

4.2. PART II. CURRENT USE OF ICTS

In this section of findings, it was possible to identify that 90.8% of the teaching staff participating in the study use ICTs, indicating that this use is manifested within their teaching practice in four areas: (1) email (55.90%); (2) websites of their subjects (36.2%); (3) virtual classrooms such as Moodle or Blackboard (5.98%); and (4) websites designed or created by the teacher (1.92%).

Regarding the conditions of knowledge and use of ICTs, teachers were asked if they had any interest or needed to receive training, to which 86.8% expressed interest in participating and 13.2% indicated not being interested, since they considered they had enough knowledge to be functional in this regard. The teachers who expressed interest in training in ICTs indicated 10 topics of interest from 115 teachers, but the majority focused on the use of basic computer programs (see Table 2).

Table 2

Type of ICT in which you would like to receive training or advice

Types	Fre- quen- cy	Per- cen- tage	Accu- mula- ted per- centage
Manejo de programas básicos (Word, Excel, PowerPoint)	53	46.09	46.09
Diseño de sitios Web	23	20.0	66.1
Aulas virtuales	14	12.17	78.3
Uso didáctico de internet	9	7.83	86.1
Plataformas escolares	4	3.48	89.6
Programas computacionales de diseño	4	3.48	93.1
Material novedoso relacionado con las TIC	3	2.61	95.7
Servicio de reparación en las TIC y terminales	2	1.74	97.4
Estrategias de búsqueda de información	1	0.87	98.3
Elaboración de blogs	1	0.87	99.1
Redes sociales	1	0.87	100.0
Total	115	100	

4.3. PART III. PROJECTION

This section includes the future vision of teachers regarding their relationship with ICTs in the pedagogical field. This vision was subdivided into six aspects that are detailed below.

Conceptualization of the pedagogical use of ICTs: the participating teachers were questioned about their own concept of the pedagogical use of ICTs. The result was that 100% registered five concepts from 128 teachers, the most frequent being expressed as “application of technologies in didactic support” with 53.9% (see Table 3).

Table 3

Conceptualization of the pedagogical use of ICTs

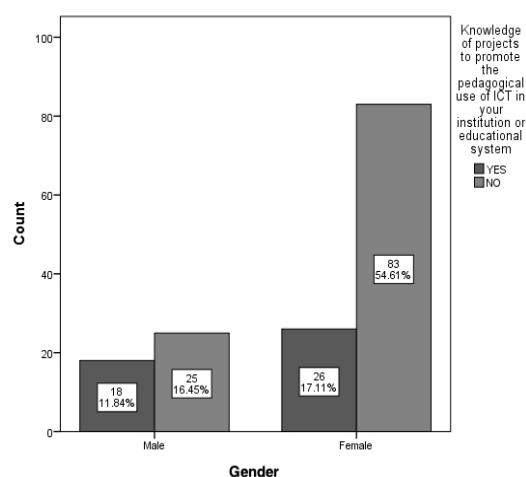
Conceptualizations	Frequency	Percentage	Accumulated percentage
Application of technologies in didactic support	69	53.90	53.90
Tools to improve performance	34	26.56	80.46
Achievement of competencies and skills	11	8.59	89.05
Innovation processes in education	8	6.25	95.32
Access to information sources	6	4.68	100.0
Total	128	100.0	

b) Knowledge of promotion projects on the pedagogical use of ICTs: when questioning the knowledge of government projects generated to promote the use of ICTs in pedagogical practice, 72.3% of those surveyed did not know of any and 29.9% expressed to know at least one, listing the following current programs in the Mexican basic educational context: “Digital Skills for Everyone”, “Tablets for fifth grade students” and “Media classrooms”. In addition, they made some proposals that do not really exist as promotional projects on the pedagogical use of ICTs: “School platforms”, “School network” and official websites. They also mentioned programs out of date, such as “Enciclomedia”.

In addition to the above and according to the results shown in Figure 3, it is possible to observe that, in both genders, the participating teachers lack sufficient knowledge in relation to promotional projects of pedagogical use, which could favor teachers and their didactic activities.

Figure 3

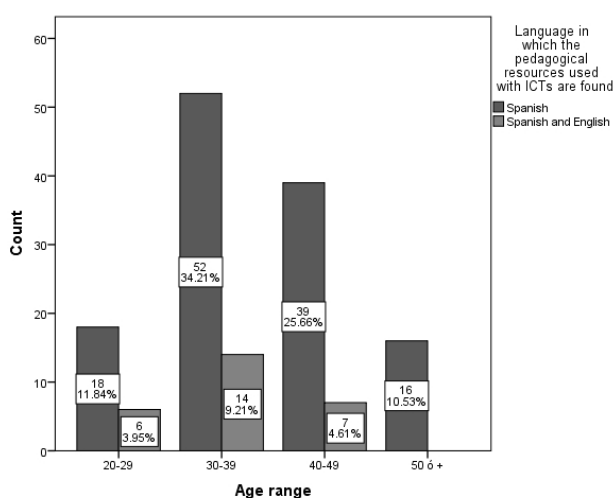
Proportion by gender on knowledge of projects to promote the pedagogical use of ICTs



c) Language used in the consultation sources: the pedagogical resources accessed by teachers consisted of sources in their mother tongue (82.74%) and access to information sources in both Spanish and English (17.76%). Regarding the types of recurring equipment, the participating teachers mention using the following devices for personal matters and not within the pedagogical scope: cell phones, desktop computers, laptops and tablets (see Figure 4).

Figure 4

Comparison of the idiomatic use of query sources with age ranges



d) Identification of experiences in promoting the use of ICTs: the main experiences narrated by teachers in the use of ICTs in terms of their teaching and learning processes were the following: (1) didactic applications developed in pedagogical use; (2) application of previous experiences in the use of ICTs not related to education, of which adaptations were made; (3) development of personal experiments aimed at making ICTs relevant in the subjects they teach; (4) demonstrate time savings in class preparation using ICTs; (5) demonstrate an attitude towards students regarding the pedagogical use of ICTs; and (6) promote the learning of other languages in the students (especially the

English language by using documents in that language).

e) Purposes of the use of ICTs: this aspect was measured by presenting the teachers with a closed list of five options, from which they could only choose the one they considered using most frequently. According to the percentage of responses, the purposes in the use of ICTs can be ordered as follows: (1) seeks relevant information, maintains academic contact with colleagues or as a means of academic learning (55.92%); (2) use ICTs to send emails, chat, search for music and watch news (26.97%); (3) access ICTs out of curiosity or for some aspect related to entertainment (9.21%); (4) make decisions about their personal and work life through ICTs (5.92%), this aspect implies a low level of empowerment with technologies in citizen participation actions, in decision-making and in actions to reduce distance with authorities; and (5) none (1.97%).

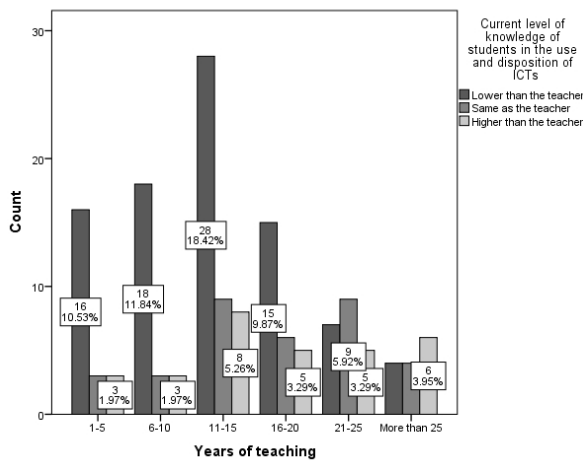
f) Aspects of cognitive underdevelopment: although this indicator may represent an independent theme to develop future research, for this study it was considered relevant, but it was only evaluated through an item that represented the vision that teachers have in relation to their level knowledge about ICTs compared to their students. According to the results obtained, it was observed that: (1) 57.89% of the participants considered that the students have a lower knowledge of ICTs than the teaching staff; (2) 22.37% responded that knowledge in relation to ICTs is the same between teachers and students; and (3) the remaining 19.74% answered that students have superior knowledge in relation to ICTs than teachers. This last percentage would represent, in general, the real measurement of

cognitive underdevelopment in relation to ICTs due to the perception that teachers have about their inferiority in this kind of knowledge.

In Figure 5 it is possible to observe the comparison of cognitive underdevelopment and years of teaching practice. It was found that the longer in the professional practice, the conception that the teaching staff is above the student body in the use and disposition of ICTs decreases. This same behavior is observed if cognitive underdevelopment is compared with the age range, since younger teachers tend to conceptualize that their level of computational knowledge is above that of students and this condition decreases as the age range grows.

Figure 5

Comparison of the level of cognitive underdevelopment and years of teaching practice



5. DISCUSSION

Changes in behavioral traits in specific situations are defined, beyond the teacher's own personal decision, in a pedagogical background based on suddenly imposed educational models where the use of ICTs is determined by a perspective that starts from reality, the conditions of relevance, relevance and possibility; based on government policies, programs and projects, and specifically on educational systems (Avendaño Porra, 2015).

Beyond the interests of the teachers themselves, the incorporation of ICTs in education is based on national policies related to reducing the digital divide, supporting educational modernization and the acquisition of cognitive skills and abilities. But they have been addressed only to students and not to teachers (Sunkel et al., 2013). All this has caused the training of teachers to maintain a marginal or scarce condition.

The results of the study show that there are low intentions towards the priority given to ICTs by teachers, both in the didactic field and in personal matters. For Castro et al. (2007), this is due to the fact that the forms of communication between students-students are very different from the way this process happens between teachers-students, especially manifested through the diversity of ways in which content is produced, consumed and distributed, be verbal or written.

The conditions of irruption of interconnectivity and ICTs happen differently in the so-called digital natives (young people), compared to the population known as digital migrants (adults), where the former show practically innate skills and use technologies in all areas of their life. On the other hand, the latter only resort to its use in imminent, regularly personal, situations whe-

re is not possible to incorporate their access to ICTs in situations that publicly compromise them (Matamala Riquelme, 2016).

This is complemented by proposing that it should be considered that both populations, natives and digital migrants, observe different ways of learning, as well as in the ways of seeking to encourage others to learn (García et al., 2014). The complications of conceptualization of ICTs lie in the fact that they were born as scientific advances in the field of computing and telecommunications, and not necessarily in environments linked to educational processes in the classroom (Cruz Pérez et al., 2019).

The fundamental reasons for considering the recognition of the low level of cognitive underdevelopment of teachers, lies especially in the resource limitations that education systems tend to experience in countries with a developing economy, as is the case of Mexico. This is justified in the vision of Ovejero Bernal (2008), who proposes that people's cognitive acts are conditioned by experience and the forms of ideological, theoretical and empirical reflection, determined by the reality of the environment and their own status of social underdevelopment.

Studying gender as a determining element in the relationship with ICTs may be relative if the perspectives of different authors in this regard are considered. For example, Trejo Sirvent et al. (2015) include the analysis of behaviors according to the gender of the participants, not to find differences, but to identify forms of social interaction. On the other hand, García Guevara (2005) proposes that the study of the participation of teachers according to their gender offers the problem of being studied from different approaches, which regularly generate controversies and even radical positions. In the case of education, it must be taken into ac-

count that there is an apparent lack of public policies applied to reality to improve situations based on gender. Actions occur based on the individual will of the faculty rather than on the government's own actions.

In recent decades, education in Mexico has shown interest in involving teachers in the use and application of ICTs in their teaching activities, since it is considered that priority has only been shown towards activities to favor the student body. There are institutional initiatives that propose to generate innovation processes in education with actions that favor an integral, ethical, aesthetic, scientific and humanistic training through the promotion of the diversity of learning environments in all educational programs and modalities (Rodríguez Armenta & Padilla Muñoz, 2007). These attempts correspond to seeking the increase in digital literacy of teachers, not only based on the frequency with which ICTs are used, but also on measuring teachers' efforts to access knowledge related to the subject in order to strengthen their teaching practice, their perception of the acquired competences and the integration of these technologies in their educational practice (Garzón Clemente, 2012).

6. CONCLUSIONS

In terms of a descriptive research, the study identifies elements that allow defining recurring behavioral traits in the access, use and appropriation of ICTs by the teachers of the public primary schools studied. However, given the dynamism of today's education and society, such situations could change substantially, both positively and negatively.

According to the data analysis, the real experiences manifested by the teachers show that when using ICTs, their application is given

greater importance to solve personal matters (problem solving, leisure and entertainment) over didactic matters. Therefore, teachers do not see the need to change their pedagogical practices, since they consider that electronic processes are not decisive to contribute to the change of their pedagogical practice. This means that students conceive learning as a broader scope and, consequently, teachers continue to ponder as priorities the actions that arise within the classroom by continuing to use conventional resources.

The lack of teachers participating in the study showing difficulty or precision in specific conceptualizations towards the purpose of ICTs seems to be a condition of their little approach to them. This problem is not limiting of this study, but manifests itself in all areas, since even the scientific literature itself observes such a condition where the definitions around ICTs are usually very general and not at all precise. There is the idea that these are means to transform information, use computer equipment and specific ways of storing information

The cognitive underdevelopment studied in this research focuses particularly on identifying the concept that teachers have about their level of competitiveness in the use and management of ICTs in relation to their students. For the case, the low level of cognitive underdevelopment observed through data collection was assessed. However, this becomes marked

in relation to the years of experience within teaching and as the age level of the teaching staff increases.

An essential aspect focuses on the marked difference in results between genders, favoring the female gender in a broad way. This aspect, rather than being linked to gender studies issues, is based on the very nature of the characteristics of men and women in relation to teaching and the approach to ICTs. It should be recognized that Mexican basic education, in general, is attended predominantly by female teachers.

The research presents the limitations of having collected data from a reduced sample and of staying at the level of description of results based on the teachers' self-perception. However, it precisely clarifies the condition experienced in the environment and achieves the proposed objectives. Although experimental processes were not reached at a methodological level, as well as in varied areas and with a wide geographical dimension, it would be advisable to consider it for future research, as long as this is supported by the presence of guidelines and public policies regarding the issue of study.

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