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Capacitation and Educational Level and their Relation with the Teacher's Digital Skills

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Abstract

The objective was to identify the perception of full-time school teachers (ETC, for its acronym in Spanish) about the development of their digital skills and their relationship with the capacitation variables in the pedagogical use of information and communication technologies (ICT) and the educational level of the teacher. The approach was quantitative with a cross-sectional survey research design for two or more groups. The non-probabilistic sample was integrated by 88 teachers who teach classes in fifth and sixth grade of 32 public schools in two cities of Sonora. With a test of analysis of variance (Anova) of repeated measures it was found that the digital skills of critical thinking, problem solving and decision making, digital citizenship and operations and concepts of ICT, were significantly more developed than communication and collaboration; creativity and innovation and research and information management. On the other hand, the carried out statistical tests revealed significant differences between the different digital skills in terms of the variables capacitation in the pedagogical use of ICT and the teacher's educational level. It is concluded that is necessary to promote schemes of continuous capacitation and professional improvement, as well as strategies that support teachers to develop digital skills.

Digital skills, basic education, teachers, information and communication technologies, full-time schools

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Introduction

Choosing ICT as a topic of study acquires a strategic perspective when this represents better opportunities for individuals and communities (Britos, Cáceres, & Acosta, 2012). The ubiquity that characterizes them is a duality that presents both opportunities and challenges, and at the same time, imposes the task of finding meaning and use to achieve greater inclusion and social impact, a reduction of the digital gap and higher levels of development (United Nations Educational, Scientific and Cultural Organization [Unesco], 2014).

Due to the above, many countries make economic efforts to incorporate ICT in the social space, particularly in education (Pulfer, 2014; Unesco, 2014), as the only way to ensure that students, their families and communities can have access to them (Vacchieri, 2013) and thereby achieve more and better education for the population (Pulfer, 2014). However, the gaps that persists in relation to who access the technologies, who has connectivity and who use them significantly, are just some examples of the magnitude of the efforts that must be made when incorporating ICT into the education system (Cabero 2015a; Pulfer, 2014).

Faced with this, reasons of both social and pedagogical relevance justify the importance of their inclusion in education and, consequently, their development and research (Pedró, 2011, Poggi, 2014). The first, because it serves the democratization of knowledge, greater social justice and quality education; and the second, because it opens the opportunity generated by ICT for the revision and transformation of educational practices in accordance with the requirements of the 21st century (Poggi, 2014).

On this last statement, Unesco (2008) argues that continuous use of ICT in educational processes allows students to acquire skills to be competent in the search, analysis, evaluation of information, in the approach, problem solving and decision making. It also enables them to be creative, innovative, and capable of communicating, collaborating, publishing and producing knowledge.

In this order of ideas it is necessary to explore, in addition to the issues of availability of equipment and connectivity, those that have to do with the development of the digital skills of teachers and their impact on learning (Unesco, 2014). However, some researches report that teachers of primary education have a low level of ICT skills or a limited development of technological and pedagogical competences (Almerich, Suárez, Jornet, & Orella, 2011;

Suárez, Almerich, Gargallo, & Aliaga, 2010); as well as a low development of digital competences, mainly for communication with students, simulation of scenarios and advanced ICT actions (Vargas-D'Uniam, Chumpitaz-Campos, Suárez-Díaz, & Badia, 2014). In Mexico at least two studies identified at national level corroborate this, one for elementary school teachers who are located at a level of "none and little knowledge of ICT" (Ramírez, 2012) and another one for junior high school teachers who feel digitally competent in the Instrumental and Cognitive factors and not competent in the Didactic-Methodological (Mortis, Valdés, Angulo, García, & Cuevas, 2013).

For the above, and to deepen these results, some studies include the identification and analysis of sociodemographic, academic or contextual variables that relate or influence to the development of digital skills.

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Emphasizing that age, sex, frequency of use of the computer, educational level, use of a media classroom, Internet and capacitation received in the use of ICT; among others, they present significant relationships (Almerich et al., 2011, Suárez et al., 2010, Ramírez, 2012, Mortis et al., 2013, Villegas, Mortis, García, & del Hierro, 2017).

In this context, Unesco, the International Society for Technology in Education (ISTE) and the Ministry of Education of Chile, among others, have developed standards in the use of ICT for teachers, students, administrators and directors. For this reason, the Secretary of Public Education (SEP, for its acronym in Spanish) in Mexico believes that no educational reform can evade digital skills standards as they become "descriptors of the knowledge and know-how of students when they use technology and are the fundamental basis to develop competences throughout life and promote insertion in the knowledge society "(SEP, 2011, p.57).

Therefore, the SEP presents a proposal of digital skills standards aligned with organizations such as ISTE and Unesco and specifies a description that refers to: a population that uses digital media and environments to communicate ideas and information and interact with others, this implies understanding of concepts, systems and operation of ICT; in other words, use digital tools to solve different types of problems and organize them into six categories: a) creativity and innovation, 2) communication and collaboration, 3) research and information management; 4) critical thinking, problem solving and decision making; 5) digital citizenship; and 6) operations and concepts of ICT (SEP, 2011).

In the same direction, the ETC program deploys a line of work called digital skills development, with the intention of making the most of the technological resources available to schools, analyzing the advantages they offer to support the treatment of learning content and developing life skills. The purpose is that each time the teacher chooses an ICT to work with the students, its use and purpose from the pedagogical point of view is analyzed in order to reach the digital skills standards promoted for basic education in Mexico (Rodríguez & Ramírez, 2009).

In order for the ETC to promote what has been said in advance and to be able to account for a transformation that makes a difference in relation to a normal working day school, its teachers and the school itself will have to develop their capacities and potential (Poggi, 2009). Mainly because the full-time day becomes an option for the school community to try learning opportunities with ICT and make better use of what they have. In this regard it is emphasized that basic education schools have resources and technological tools to expand and strengthen children's learning, develop digital skills and create more attractive, interesting and flexible scenarios for teaching the different subjects that make up the national curriculum. (Martínez, 2009; Tenti, 2010).

Regarding the last statement the state of Sonora, according to data from the National Institute for the Evaluation of Education (INEE, for its acronym in Spanish, 2015), maintains a privileged position over other states of the Mexican Republic because 76.7% of public basic education schools have at least one computer for educational use and 81.2% of them have Internet connectivity. In both cases the value obtained for the 2013-2014 school year is much higher than that achieved at the national level, which is 39.6% for the first indicator and 37.0% for the second (INEE, 2015).

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Additionally, Sonora was selected in 2013 to participate in the Digital Inclusion and Literacy Program (PIAD, for its acronym in Spanish) through the Mi CompuMx project, through which portable computer equipment with pre-loaded educational materials is distributed to all students and teachers on the fifth grade sixth grades; as well as to the directors, supervisors and heads of zone. In addition it is accompanied by strategies for teacher capacitation (SEP, 2014a). With this same program, in 2014 a digital tablet is delivered to all teachers and students of the fifth grade and is provided with a solution for the classroom that includes: a router, a dongle, a white board and a projector (SEP, 2014a, 2014b). On the other hand, the schools receive: a server, a switch and an energy support team (SEP, 2014b). In this continuum and in order to make the study processes more effective and personalized, in 2015 tablets are added as a didactic resource, as well as textbooks and other educational materials (SEP, 2015).

With this panorama, addressing the issue of teachers' digital skills is very relevant, firstly because empirical studies in the Mexican context, and in the State of Sonora, are scarce for primary education and especially for ETC. Every time we have as starting point the inclusion of the digital skills standards in 2011, the incorporation to the PIAD in 2013 and the rebound of the ETC program in the same year. For this reason and four years after the implementation of two important initiatives to promote the development of digital skills, the ETC program and the PIAD, arises the need to identify: What is the perception of ETC primary teachers about the development of their digital skills: creativity and innovation; communication and collaboration; research and information management; critical thinking, problem solving and decision making; digital citizenship and operations and ICT concepts and in which of these dimensions are statistically significant differences presented?

Are there statistically significant differences between teachers' perception of the development of their digital skills and the variables: capacitation in the pedagogical use of ICT and the teacher's educational level?

Consequently, the general objective is to identify the perception of elementary school teachers of ETC on the development of their digital skills and their relationship with the variables capacitation in the pedagogical use of ICT and educational level.

The article is organized in the following sections: the first is the methodology; where the research design is described, the study participants, the instrument, its validity and reliability; the second is the procedure followed to recover the information; the third is the analysis of data, where the type of statistics used, the tests and the support software for the processing of the data are described; the fourth is the results, where the findings are presented and a proposal to contribute to the development of digital skills of elementary education teachers; the fifth, and last, are the conclusions and discussions, where the results are compared with those of other authors and the main findings are concluded.

Methodology

Research design

A cross-sectional survey research design was used to compare two or more groups on the development of teachers' digital skills and their dimensions, based on the capacitation received in the pedagogical use of ICT and the educational level of teachers, in order to be able to make inferences about the data (Creswell, 2012).

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Participants

The population of the study was composed of 120 teachers of fifth and sixth grade of 35 primary schools of general modality and complete organization, belonging to the cities of Obregón and Navojoa of the state of Sonora, who were registered for at least one year in the ETC program from the 2015-2016 school year.

The sample consisted of 88 teachers from 32 ETC and was selected through a non-probabilistic sampling of voluntary participation (Hernández, Fernández-Collado, & Baptista, 2014). Its main characteristics are presented below:Of the participants 55.7% (49) were women and 44.3% (39) were males, the ages ranged from 24 to 52 years with an average of 35 (7.66) and 87.5% (77) indicated having a fixed work place, while a 12.5 % (11) internship.

Regarding the variables of interest for the study, 68.2% (60) placed their educational level in undergraduate and 31.8% (28) in postgraduate. For its part, the capacitation received in the pedagogical use of ICT in the last two years referred a minimum of zero and a maximum of eight courses, with an average of 2 (1.43).

Measures

Teachers' digital skills (TDS). The scale was developed for the study from the set of standards and competences ISTE's ITC (2008), established by the SEP (2011) and Unesco (2011). In this self-report instrument the professors referred their perception about their digital skills. It consisted of two sections, one with 18 items of general data and the other with 29, which reflected a set of assessment criteria for the use of ICT as a tool for teaching and learning; these were answered with a Likert scale with five response options: 1 (*never*), 2 (*almost never*), 3 (*sometimes*), 4 (*almost always*) and 5 (*always*) and structured in six subscales:

1. Creativity and innovation. Use of ICT to stimulate students' creative thinking and the development of innovative products (example of indicator: "I assign my students the creation of short animations about characters created by themselves").

2. Communication and collaboration. Use of digital media and environments to communicate and interact with students, teachers and parents. Encouragement of collaborative work among students (example of indicator: "I use digital media to communicate with my colleagues").

3. Research and information management. Use of digital tools to support students in the search, selection, analysis, evaluation of information, data processing and communication of results (example of indicator: "I support my students to organize and systematize the information selected for research using digital tools").

4. Critical thinking, problem solving and decision making. Use of ICT to support students to develop critical thinking to plan, organize and carry out research, manage projects, solve problems and make decisions based on information (example of indicator: "I guide my students so that localized information on the Internet allow them to answer the fundamental question of the problem").

5. Digital citizenship. Support the students in the understanding of human, cultural and social issues related to the use of ICT and in the application of ethical, legal, safe and responsible behavior related to their use (example of indicator: "I pose to my students topics on real situations of the use of technology related to authors' rights and intellectual property ").

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6. Operations and concepts of ICT. Support students in the understanding of concepts, systems and operation of ICT to use them productively and to transfer their knowledge to learning new ICT (example of indicator: "I support my students to access the Internet on their tablet").

Validity

The instrument was subjected to a process of content validity through the trial of five experts, which was based on the proposal of Escobar-Pérez and Cuervo-Martínez (2008). It was decided to keep 30 out of 49 items, taking into account concordance between judges with content validity coefficients (CVC) greater than .80. The questionnaire reached a total CVC of .92 considered excellent for values greater than .90 (Hernández, 2012).

Reliability

Reliability was measured using the Cronbach's Alpha coefficient; it was concluded with 29 items and a global index of .94. The data by dimension were: creativity and innovation (.86, 4 items), communication and collaboration (.89, 6 items), research and information management (.88, 5 items), critical thinking, problem solving and decision making (.83, 4 items); digital citizenship (.82, 4 items) and operations and concepts of ICT (.88, 6 items).

Process

For the TDS scale administration, authorization was requested to the directors for access to the institutions. The professors were invited, who were informed of the purpose of the study, the importance of their participation and the confidentiality of the information they contributed.

Data Analysis

Descriptive statistics were used by means of frequencies, means and standard deviations to know the characteristics of the sample. For the validity of the instrument the CVC was used (Hernández, 2012) and for reliability the Cronbach's Alpha coefficient (Bojórquez & López, 2013). Finally, to establish the differences between groups were worked with inferential statistics, using the Student's t-test for independent samples and one-way Anova and repeated measures with post-hoc Bonferroni test. Analyzes were carried out with the support of the statistical package SPSS 22.0 and Excel 14.6.1.

Results

To identify the perception of the teachers' digital skills the TDS scale was used, which was designed for the study and by means of an one-way Anova of repeated measures, the scores obtained in the six dimensions were compared.

The results suggested statistically significant differences in the perception of the development of the diverse digital skills of the teachers (F [5,82] = 171.30, p <.001, η^2 = .82); therefore, through Bonferroni's post-hoc test a better development in critical thinking was identified, problem solving and decision making; digital citizenship and operations and concepts of ICT, since the means were significantly higher than those of the other dimensions without showing differences between them. In addition, research and information management showed a medium and significantly greater advance than creativity and innovation and, in turn, communication and collaboration, the latter obtaining the lowest means and the least development, see tables 1 and 2.

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Dimensions	*M*	*DS*
Creativity and innovation.	2.47	0.64
Communication and collaboration.	1.77	0.59
Research and information management.	3.46	0.87
Critical thinking, problem solving and decision making.	4.10	0.69
Digital citizenship.	4.07	0.74
Operations and concepts of ICT.	4.05	0.80
General	3.32	0.57

Table 1 Means and standard deviations of the TDS scale dimensions

Reference dimension	**Compared dimension**	**Difference of means**	***p***
1	2	0.70*	<.001
	3	-0.98*	<.001
	4	-1.63*	<.001
	5	-1.6*	<.001
	6	-1.58*	<.001
2	1	-0.70*	<.001
	3	-1.68*	<.001
	4	-2.33*	<.001
	5	-2.30*	<.001
	6	-2.28*	<.001
3	1	0.98*	<.001
	2	1.68*	<.001
	4	-0.64*	<.001
	5	-0.61*	<.001
	6	-0.59*	<.001

Note: 1 = creativity and innovation; 2 = communication and collaboration; 3 = research and information management; 4 = critical thinking, problem solving and decision making; 5 = digital citizenship; 6 = operations and concepts of ICT.
*p< .05

Table 2 Comparisons of means by pairs of the dimensions of the teachers' digital skills, through Bonferroni's post-hoc test

Likewise, to identify differences between the teachers' digital skills in relation to the number of capacitation courses received in the last two years in the pedagogical use of ICT and the teachers' educational level the one-way Anova and Student's t tests were used, respectively. For the first variable of contrast, three groups of teachers were considered from the average obtained (2 courses). The first included those who reported less than two courses (low capacitation); the second to those who indicated two (average capacitation) and the third to those who participated in more than two (high capacitation).

The test suggested statistically significant differences in the dimensions of creativity and innovation; research and information management; and operations and concepts of ICT. Therefore, a Bonferroni's post-hoc test was conducted that showed that in creativity and innovation; and operations and concepts of ICT, the low capacitation group was the one that established the differences with a lower mean compared to the other two groups (1<2, 3). For research and information management, the low-capacition group showed a significant difference with the high-capacition group (1<3). In all cases, the average was higher for teachers who took two or more courses, respectively, on the pedagogical use of ICT (see table 3).

D	**Low capacitation**			**Medium capacitation**			**High capacitation**		***F* (2,85)**	***p***	**η^2**
	M	*SD*		*M*	*DE*		*M*	*DE*			
1	2.16	0.67		2.55	0.58		2.73	0.56	6.42	.003	.13
2	1.61	0.46		1.76	0.58		1.98	0.70	2.69	.074	.06
3	3.12	0.89		3.49	0.85		3.82	0.71	4.76	.011	.10
4	3.93	0.66		4.16	0.68		4.23	0.73	1.50	.228	.03
5	3.90	0.79		4.09	0.73		4.24	0.69	1.41	.251	.03
6	3.65	0.88		4.20	0.69		4.34	0.65	6.69	.002	.14

Note: D = dimension; 1 = creativity and innovation; 2 = communication and collaboration; 3 = research and information management; 4 = critical thinking, problem solving and decision making; 5 = digital citizenship; 6 = operations and concepts of ICT.

Table 3 Comparisons of teachers' digital skills scores through capacitation in the pedagogical use of ICT

For the second variable, the first group included teachers with a bachelor's degree and the second with a postgraduate degree. The test revealed statistically significant differences in three of the dimensions of digital skills. In all cases, the average obtained was higher for teachers with postgraduate studies (see table 4).

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D	**Bachelor's degree**			**Postgraduate degree**		***t (86)***	***p***	***d***
	M	*SD*		*M*	*SD*			
1	2.37	0.67		2.69	0.52	2.27	.026	.54
2	1.70	0.57		1.92	0.61	1.62	.108	.37
3	3.31	0.87		3.75	0.79	2.26	.026	.53
4	4.06	0.68		4.17	0.73	0.65	.514	.15
5	3.95	0.75		4.32	0.68	2.25	.027	.52
6	3.98	0.82		4.19	0.76	1.16	.250	.27

Note: D = dimension; 1 = creativity and innovation; 2 = communication and collaboration; 3 = research and information management; 4 = critical thinking, problem solving and decision making; 5 = digital citizenship; 6 = operations and concepts of ICT.

Table 4 Comparisons of teachers' digital skills scores by educational level

Based on the previous findings, and in order to contribute to the development of the digital skills of the fifth and sixth grade teachers of the ETC, a strategy called: Padagogy Wheel V5.0 for Android in Spanish was proposed (Carrington et al., 2016), which can be consulted at http://bit.ly/AndroidSPAV5Print. This strategy was intended for the teacher to use support from planning to implement their activities in the classroom with the specific use of the Android tablet delivered by the PIAD.

The Wheel is composed of a series of concentric circles and organized from the third in the six categories of Bloom's taxonomy for the digital age, reviewed by Anderson and Krathwohl (2001). In the fourth and fifth circle there are 185 action verbs and 107 activities, respectively, for the digital age, proposed by Churches (2008). In the sixth, 188 Android applications linked to Google Play are presented and the seventh relates the previous levels to the Substitution, Increase, Modification and Redifinition (SAMR) model of Puentedura (2014a, 2014b). This tool was developed and valued by a group of national and international researchers and from the 2017-2018 school year it was deployed through capacitation to teachers through the Teaching Formation Institute of the State of Sonora (Ifodes). Work is currently being done to assess how it is contributing to the development of teachers' digital skills.

Conclusions and Discussion

The objective of this study is to identify the perception of ETC elementary teachers about the development of their digital skills and their relationship with the variables capacitation in the pedagogical use of ICT and the teacher's educational level.

Regarding the first research question: What is the perception of ETC primary teachers about the development of their digital skills and in which of these dimensions are statistically significant differences? It is found they are digitally skilled in the development of critical thinking, problem solving and decision making; digital citizenship and functioning and ICT concepts.

The findings that are found on critical thinking, problem solving and decision making, differ partially from what Almeida (2014) presents by placing teachers at null and basic levels, however, it stands out as the second dimension with the highest proportion of professors between the intermediate and advanced levels. The differences between the two investigations can be associated to the period of time between the delivery of equipment by the SEP program and the teachers' self-reports of their digital skills, which can serve as a favorable element in the levels reached (Sáez, 2012).

The results on the skills to operations and concepts of ICT; coincide with the previous study by Mortis et al. (2013), who find professors competent in the Instrumental factor (examples of indicators: "use of basic software and hardware components", "free educational software" and "Internet browsing") and with those of Santiago and Sosa (2012), which expose on the development of technical skills, mainly the instrumental type of ICT.

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On the other hand, the findings for digital citizenship are similar to those presented by García, Cuevas, and Ruíz (2015), where teachers show an excellent command in the dimension of computer ethics (examples of indicators: "know and apply rules of digital etiquette" and "manages the Internet responsibly and ethically").

Research and information management is the dimension in which teachers perceive themselves in a medium development of their digital skills, a fact that coincides with the work of García et al. (2015) and Pérez and Rodríguez (2016). In the first case, the teachers show a good command in the dimension of search and management of electronic information (example of indicators: "search information on the Internet about class topics"). And in the second, the participants are located at a level of sufficient (above the average) in the information competence (examples of indicators: "identifies and searches for information in search engines, meta search engines, databases" and "organizes and analyzes digital information to evaluate its purpose and relevance").

Although part of a development in this dimension, it is important to strengthen it in the context of an abundance of information on the Internet, which needs to be used critically and responsibly to transform it into knowledge (Vivancos, 2014). Therefore, it is important to establish differentiated capacitating strategies (Mortis, et al., 2013) and / or to develop teacher support mechanisms that allow them to easily incorporate technology (Luque, 2013).The dimension of creativity and innovation, which exhibits low development, shows a similar behavior to previous studies. Almerich et al. (2011) places teachers slightly above 2 points; that is, with little attention to integrate ICT in the creation of environments and innovation, meanwhile Almeida (2014) places the 71% amid the null and basic levels.

The foregoing confirms Area's (2010) approach to the fact that the inclusion of ICT in schools does not necessarily generate a pedagogical innovation in the practices of teachers. Cabero (2015b) reports that ICT are still used to reproduce what was previously done without them instead of being used in innovative learning practices. Therefore, it is very important to promote strategies to strengthen the development of these skills because, as Kozma (2008) points it out, as advances are made in the capacities to use ICT the teachers will demand preparation in higher skills, transcending the instrumental ones.

For the dimension of communication and collaboration the situation is different because the development of this skill is practically null. This finding supports other studies that indicate an insufficient proficiency level of teachers in the communication section (Ramírez, 2012); collaboration and communication is null and basic (Almeida, 2014) or lower proportion of the use of ICT to enhance communication by technological means (Sigalés, Mominó, Meneses, & Badia, 2008).

Although it is necessary to deepen the subject, the above may be due to the lack of Internet service in schools and the limited capacitation received in the pedagogical use of ICT, both problems reported by Beltrán, García, and Ramírez (2015a, 2015b) and Almeida (2014). The importance of the dimension of communication and collaboration is seen in the study by Cabero (2015b), who positions ICT as instruments for participation and collaboration between teachers and students, broadening the perspective of learning from an individual to a social vision, where you learn in community and you are able to interact and collaborate to build knowledge. Whereas learning is increasingly ubiquitous it is essential that the school and teachers advance to a more focused approach to connectivity, where teachers design their own learning spaces using technology as a mediator.

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Likewise, Pedró (2015) states that social contexts to communicate and collaborate promote the development of more complex competencies than when working individually, promoting the emergence of dynamics of comparison, analysis, discussion, critical thinking and decision-making, among other.

For the above reasons, it is a priority not only to advance in sustainable connectivity schemes for basic education (SEP, 2016a) (since without Internet service in the classroom, teachers and students are limited to generating changes in pedagogical practices for the construction of knowledge and social interaction) but also in the implementation of mechanisms or strategies that support the teacher to empower students in the use of technology they have.

For the second research question, are there statistically significant differences between the teachers' perception of their digital skills and the variables: capacitation in the pedagogical use of ICT and the teacher's educational level? The following was found:

The capacitation variable in the pedagogical use of ICT supports the importance it has for the development of the digital skills of teachers. The statistically significant differences are identified for the dimensions of: creativity and innovation; research and management of information and operations and concepts of ICT, being for all cases the highest average for those who received more capacitation. These findings are similar to those of Mortis et al. (2013) who reported significant positive relationships with the number of courses taken in the teacher's cognitive skills.

Due to the above, it is convenient to implement relevant strategies that increase teacher capacitation, considering that this points towards elements that allow students to promote the skills of the 21st century (Binkley et al., 2012), mainly for those dimensions that showed less development; creativity and innovation, implicit in the potential of ICT (Coll, n.d.), and communication and collaboration, which contribute to the development of more complex competencies (Pedró, 2015).

In this sense, the SEP (2016b) indicates that the capacitation that is carried out should be on the equipment used by the teachers, timely, totally practical and preferably with accompaniment models. Similarly, Severín and Capota (2011) argue that the support strategies must be consistent with the electronic devices used and the pedagogical methods of using technology at the classroom level.

For the contrast variable educational level of the teacher, statistically significant differences are found for the dimensions: creativity and innovation; research and information management and digital citizenship. It should be noted that the investigation of Mortis et al. (2013) also show differences and higher scores in the digital competences of professors with postgraduate studies; like the one of Díaz-Maroto and Casales (2015) and Ramírez (2014) for professors with master degree.

These results point to assess the importance of continuing education and professional improvement of teachers of basic education as a means to achieve the goals of citizens prepared for the 21st century (Vacchieri, 2013) as they become one of the main strategies for develop new knowledge in professional practice.

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Continuous training through capacitation addresses innovations in the education system; among these are the technological ones, which include, for example, the program of digital skills for all (HDT) and PIAD. The professional improvement, through specialty, masters and doctorate, are destined to reach higher levels of habilitation. Therefore the problems that arise in this area must be address; such as limited supply and endogamic character, among others (SEP, n.d.), since Díaz (2014) and Johnson et al. (2013) point out that teacher training continues to be one of the biggest challenges to be solved in order to incorporate ICT into the education system.

It is concluded that even when there is a greater development in the digital skills of critical thinking, problem solving and decision making, digital citizenship and operations and concepts of ICT, there are still dimensions that need to be addressed. The variables communication and collaboration and creativity and innovation stand out prioriety, and to a lesser extent, research and information management. In two of the three cases, the capacitation in the pedagogical use of ICT and the teacher's educational level (except in communication and collaboration) are statistically significant to a greater number of courses and educational level obtained by the teacher.

Therefore, first of all, it is necessary to investigate what elements are involved in the low development of the aforementioned digital skills and secondly to strengthen the continuous capacitation and professional improvement in order to advance in the development of these digital skills. Although the study provides relevant information about the development of digital skills in ETC elementary teachers, it also has limitations that make these results should be taken with caution.

In the first place, the sample size is limited, which makes it difficult to analyze the validity of the internal structure of the TDS scale and the generalization of the results; therefore, it is recommended for future investigations to expand the size of it. Secondly, other variables that can affect the development of teachers' digital skills are not considered in the study, this implies the need to include aspects such as technological equipment, connectivity and barriers to the integration of technologies in ETC, among others, this will undoubtedly allow the investigations to move towards the use of multivariate statistical methods.

It is considered that with the above suggestions, the instrument will be strengthened and the topic of teachers' digital skills can be addressed simultaneously from different variables. Likewise, it is suggested that the proposal be followed up in such a way that alternatives are still sought to contribute to the development of digital skills in elementary school teachers.

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