Uso de las TIC en estudiantes de quinto y sexto grado de educación primaria

Use of ICT in 5th and 6th grade students of elementary school

http://dx.doi.org/10.32870/Ap.v9n1.913

Marisol Villegas Pérez*
Sonia Verónica Mortis Losoya**
Ramona Imelda García López***
Elizabeth del Hierro Parra****

Palabras clave
Estudiantes de primaria, uso de las TIC, tecnologías en la escuela

RESUMEN

El propósito de este estudio es identificar la percepción de los alumnos de quinto y sexto de educación primaria, en escuelas públicas, sobre sus competencias en el uso de las tecnologías de la información y la comunicación (TIC) e indagar si existen diferencias en cuanto al sexo y a tener computadora y acceso a internet en casa. La metodología fue cuantitativa no experimental transeccional y la muestra se conformó de 201 estudiantes de escuelas primarias públicas: 51.6% corresponde a alumnos de quinto y 48.4, de sexto; de estos, 52.6 eran niños y 47.4, niñas. Los instrumentos empleados fueron dos encuestas con escala tipo Likert con cinco opciones de respuesta. La primera encuesta midió el uso de las TIC en la vida diaria y la segunda, el uso de las TIC en la escuela. Los resultados muestran que los estudiantes hacen uso moderado de las TIC y no hay diferencias significativas en cuanto al sexo y a tener computadora en casa, o no, pero sí en el acceso a internet. El estudio concluye que los alumnos utilizan las TIC más para actividades de esparcimiento que para labores escolares y que sus competencias al respecto son limitadas.

Keywords
Elementary students, use of ICT, technologies in the school

ABSTRACT

The purpose of this study is to identify the perception of students in fifth and sixth grade public elementary schools on their competencies in the use of Information and Communication Technology (ICT) and investigate whether there are differences based on gender, have a computer and Internet access at home. A non-experimental quantitative methodology transactional was used and the sample was composed of 201 students from public elementary schools where 51.6% are fifth- and sixth 48.4% of which 52.6% were boys and 47.4% girls. The instruments used were two surveys Likert scale with five response options. The first survey measures the use of ICT in daily life and the second survey measures the use of ICT in school. The results show that students make moderate use of ICT and that there are no significant differences based on gender and have or not have a computer but do exist in access to the Internet. It is concluded that the students use ICT more for recreation than for school activities and their competencies in the matter are limited.

Received: May 21, 2016
Accepted: October 21, 2016
Online Published: March 30, 2017

* Master's degree in Educational Research. Professor assistant of bachelor's degree in the Education Department of the Instituto Tecnológico de Sonora [Sonora Technological Institute], Mexico.
** Ph.D. in Education. Professor-researcher in the Department of Education of the Instituto Tecnológico de Sonora [Sonora Technological Institute], Mexico.
*** Ph.D. in Education. Professor-researcher in the Department of Education of the Instituto Tecnológico de Sonora [Sonora Technological Institute], Mexico.
**** Ph.D. in Education. Professor-researcher in the Department of Education of the Instituto Tecnológico de Sonora [Sonora Technological Institute], Mexico.

INTRODUCTION

Currently, there has been considerable debate on the importance of incorporating information and communication technologies (ICTs) into education since they promote learning and foster the active and participative construction of students' knowledge. They are also a means of communication and exchange of knowledge and experiences besides being an instrument that processes information, sources or resources, educational spaces and cognitive development. This is due to the fact that the use of ICTs entails considering the didactic possibilities they offer to facilitate the teaching-learning process in relation to the context of the classroom, the characteristics of the students and the educational purposes and contents. Likewise, they make it possible for the teacher to become a guide that directs the students' learning allowing them to be the main stakeholders of the class and to work autonomously and jointly with their classmates (Gómez and Macedo, 2010; Castañeda, Carrillo and Quintero, 2013).

Likewise, the incorporation of ICTs into education contributes to the development of the digital competence of the students which implies being autonomous, efficient, responsible, reflexive persons with judgment skills in choosing, dealing with and using information and its sources, as well as its technological tools (Area, 2009). Revuelta (2011) explains that "digital competence is based on ITC basic competencies: the use of computers to obtain, assess, store, produce, present and exchange information and communicate and participate in collaboration networks through Internet" (p. 3). Digital competence links the safe and critical use of technologies of the society of information for work, leisure and communication. It is based on ITC basic competencies: the use of computers to obtain, assess, store, produce, present and exchange information and communicate and participate in collaboration networks through Internet" (European Commission, 2007).

Given the importance of developing digital competencies in students and having them use their knowledge as well as enabling them to learn in an effective manner and to live in a world that is becoming increasingly digital, different bodies of experts in the field have established ICT models and standards and classified them under different categories to facilitate their use. Some of these standards have been proposed by the International Society for Technology in Education (ISTE) and the National Educational Technology Standards for Students (NETS-S) Project. The Digital Skills for All Program of the Ministry of Public Education (SEP, Spanish acronym) has adopted the following: creativity and innovation, critical thinking, digital citizenship; besides the ICT operation and concepts (NETS-S, 2007, ISTE 2007; SEP, 2011).

According to ISTE (2007), said standards are as follows:

- Creativity and innovation. This implies showing creative thinking, the development of products and innovative processes using ICTs and knowledge construction.
- Communication and collaboration which require the utilization of digital media and settings that allows the users to communicate ideas and information to multiple audiences, to interact and to work in collaboration.
- Research and information management that implies the application of digital tools that allow the students to gather, select, analyze, assess and use information, process data and communicate results.
- Critical judgment that requires the development of critical thinking skills to plan, organize and make decisions based on information while using digital tools.
- Digital citizenship that needs the comprehension of human, cultural and social issues related to the use of ICTs and the application of ethical, legal, safe and responsible behaviors in using said ICTs.
- ICTs operation and concepts that implies the comprehension of concepts, systems and operation of ICTs in order to select them and use them productively and to transfer the existing knowledge to the learning of new ICTs.

Given the relevance of the use of ICTs and the development of digital competencies that all the participating stakeholders in the teaching-learning process, mainly in basic education, must possess, several authors have conducted studies to analyze and measure their effect. Quintana, Cortada and Riera (2012) pointed out that elementary and middle school students that have greater contact with ICTs, know how to use technology, however, in comparison with their peers, they did not show any difference in seeking information on the Internet. Moreover, all these students showed a better knowledge and control of the computer as well as better web literacy skills.

On the one hand, Ortiz, Peñaherrera and Ortega (2012) surveyed fifth and sixth grade elementary students to know in depth how the incorporation of ICTs occurs in school. Some of the results indicate that students use the computer to play mainly, afterwards to do their homework and lastly, to navigate the Internet. Moreover, all the students use the computer in school and more frequently they do so for foreign language and mathematics assignments.

Aesaert and Van Braak (2015) conducted a research on the relation between the sex of the students and their ICTs competencies. The findings showed that girls had greater mastery at using ICTs. On the other hand, the McKenney and Voogt (2010) examined the access, perceptions and use

of technology outside the school setting of small children of the Netherlands and, they did not encounter any difference between the sexes in regard to the use of computer or in the academic level despite the fact that boys showed a more positive attitude than girls.

Similarly, Volman, Van Eck, Heemskerk and Kuiper (2005) conducted a study with children from families of ethnic minority backgrounds and those of the majority group in the Netherlands, and they found out that, at the elementary school level, the difference between girls and boys in regard to computers seem small, while in middle school, the girls' attitude was less positive than the boys'. Hatlevik (2012) examined the factors affecting the productive use of computers in school of nine graders; his results showed that the parents' education influences the performance of the students with and without equipment. In general, girls had higher levels of productive use of computers in comparison to the boys. This indicates that girls are more successful in school in using computers in class.

Chávez, Cantú and Rodríguez (2016) conducted a study to determine the performance obtained by fourth, fifth and sixth graders when introducing ICTs to develop digital competencies, information treatment and team work. The results showed that the students had a medium-high level of proficiency in digital competencies and in information management or treatment, and had a high level of competence in teamwork skills.

On the other hand, Fajardo, Villalta and Salmerón (2016) conducted a research with fifth graders and third year middle school students. The results showed that the middle school students obtained higher scores than the elementary students in digital skills, reading comprehension and digital reading. They also noticed that the more practice the students have in digital reading assignments, their digital skills and reading comprehension on paper increase.

On the other hand, a research was conducted in Mexico aiming at measuring technological competencies of middles school students in the municipality of Cajeme. The findings showed that the students enrolled in private schools were more competent than those in public schools. Students with computer and Internet at home mastered three of the six competences proposed by the ISTE standards, which are: communication and collaboration, research and information management, ICTs operation and concepts (Mortis, Cuevas, García and Cabero, 2014).

APPROACH TO THE PROBLEM

In Mexico, the Ministry of Public Education (SEP, Spanish acronym) has made many efforts to incorporate ICTs in basic education by implementing different programs:

- The Electronic Computer in Basic Education Program provided support with workshops and computer sciences and information laboratories (1985).
- In 1996, the Academic Network technological proposal was implemented. It fostered collaborative work as well as research and exchange of ideas.
- The Enciclomedia program (2004) equipped fifth and sixth graders with digital tools.
- Habilidades Digitales para Todos [Digital Skills for All] promoted the efficient use of technology in basic education (2009), based on the standards proposed by ISTE and NETS-S.
- In 2013, Mi Compu.Mx program provided every fifth and sixth grader of public schools with a computer. In 2014, the name of the program changed to Programa de Inclusion y Alfabetización Digital [Inclusion and Digital Literacy Program], and which assigned a tablet to the abovementioned graders (SEP, 2013).

It should be mentioned that these were non-profit programs that aimed at reducing the digital gap and promoting a culture of digital citizenship. However its main activity consisted in equipping institution and donating technological resources to elementary students without carrying out a prior diagnosis on the acceptance, knowledge and use of ICTs. As of 2014, a group of researchers of the states participating in Mi Compu.Mx program: Sonora, Colima, Tabasco and Nuevo León, analyzed the impact of the free equipment and put the emphasis on the experiences of the stakeholders participating in the use of the resources of the Inclusion and Digital Literacy Program. The lack of teachers training and the very few digital skills of the elementary students were among the main findings of the research (Díaz, Rodríguez, Sánchez, Rivera and Ramírez, 2015; García, Angulo and Cuevas, 2015; Rocha and Ramírez, 2015).

In this regard, it is important to know the development of the competence of the fifth and sixth graders in the use of ICTs in using computers and electronic tablets since digital competence is related to the constant, safe and critical use of media, digital didactic resources and ICTs. Through the Internet and computers, these students can obtain, assess, store, produce, present and exchange information (Trigueros, Sánchez and Vera, 2012; European Parliament, 2009).

Therefore, by knowing the perception of the fifth and sixth graders in regard to their competencies in using ICTs, and the differences in the perception of the development of said competencies between girls and boys, and having or not a computer or Internet at home, aims at offering an overall view of the requirements of the students that allow them to make most of the resources proposed by PIAD [Spanish acronym for Inclusion and Digital Literacy Program] and, hence, strengthen their competencies in the use of technology.

OBJECTIVES

Identify the perception of the fifth and sixth graders on the competencies in the use of ICTs in order to propose strategies that help them strengthen or develop said competencies.

METHODOLOGY

This is a qualitative research with a trans-sectional non-experimental design with a comparative correlational scope since it aims at determining the relation between two or more variables (Hernández, Fernández and Baptista, 2014), such as in this case, the use of ICTs with some factors such as the sex of the participants, having or not a computer and access to the Internet.

PARTICIPANTS

The participants were fifth and sixth graders of five elementary public schools in the municipality of Cajeme. For convenience, we used a non probabilistic sample and selected an institution for each classification: two federal schools, one state school, one school of the National Council for Educational Development (CONAFE, Spanish acronym) and one indigenous school. Said schools have a total population of 432 children between the ages of eleven and twelve. We chose one group of fifth graders and one group of sixth graders per school. The sample consisted in 201 participants, of which 64.8% were enrolled in federal schools; 29% in state schools; 2.6% in CONAFE schools and 3.6% in indigenous school. The fifth graders represented 51.6% of the sample, while the sixth graders 48.4%. In regards to sex, 52.6 were boys and 47.4, girls.

INSTRUMENTS

We designed two instruments and we obtained the empirical sustainability for both of them by means of a confirmatory factorial analysis. These instruments derived from instruments developed by the researchers who participated in the "Comparative Study of the Development of Digital Competencies within the Mi Compu.Mx Program" research project financed by the National Science and Technology Council (CONACYT, Spanish acronym) and were created in accordance with the Digital Skills for All Program (SEP, 2011), based on the standards proposed by ISTE (2007).

The first instrument deals with the use of ICTs in everyday life and consists of eleven items grouped under a unidimensional structure that measures the use of ICTs in general (example: Can you install and uninstall a program or software?). A Likert type scale with five answer options was used where 1 meant (never), 2 (rarely), 3 (usually), 4 (most of the time) and 5 (always). The adjustments indexes obtained in the confirmatory

factorial analysis (X2=49.602, p=.052; CMIN=1.41; CFI=.97; RMSEA=.047) which show the empirical sustainability of the measurement model abovementioned, i.e., the theoretical and the empirical models are consistent (Cea, 2004).

The second instrument is related to the use of ICTs in school. It is a two-dimension instrument: the use of ICTs to communicate in school which is made up of three items (example: use of e-mail, WhatsApp or Facebook to communicate with my classmates) and the use of ICTs in school with seven items (example: I use digital materials such as maps, audiobooks and videos to do my homework). A Likert type scale with five answer options was used where 1 meant (never), 2 (rarely), 3 (usually), 4 (most of the time) and 5 (always). The adjustments indexes obtained in the confirmatory factorial analysis were (X2=55.331, p=.012; CMIN=1.627; CFI=.97; RMSEA=.057) which show the empirical sustainability of the measurement model abovementioned.

Procedure

We requested the authorization of the academic authorities of each educational institution to collect information. They not only gave us permission but they also provided guidance and advice on how to approach the teachers and ask them to let their students participate in the study. Subsequently, we visited the different campuses to collect data.

In order to obtain the psychometric properties of the instruments, we established evidence of the construct validity by means of a confirmatory factorial analysis. In regard to the results, we conducted a descriptive analysis per instrument and Student t tests to determine if there were any differences among the variables proposed. It is important to clarify that these data are only valid for our sample and cannot be generalized to other settings.

RESULTS

The Use of ICTs in Everyday Life

In this first section, we found that students make a moderate use of ICTs in their everyday life with a 3.23 mean and a 1.10 standard deviation. To determine if any differences between sexes exist, we conducted a t Student test that showed there are no differences between boys and girls. This means that digital competencies do not vary according to sex. However, there is a difference in regard to having or not Internet. We applied a t Student test that revealed significant differences (See Table 1). We resorted to the same statistical test to know if there were any differences among students that do have a computer or a tablet and those that do not. The result showed no significant differences.

The Use of ICTs at School

In regard to the two dimensions of the use of ICTs at school, we also found that students make a moderate use of ICTs to communicate at school. In this case, we obtained a 3.20 means and a 1.44 standard deviation. Likewise, in the second dimension, the students make a moderate use of ICTs at school, with a 3.17 mean and a 1.09 standard deviation. As with the previous instrument, we applied a t Student test to know if there were any significant statistical differences between boys and girls and the result was negative. However, there are significant differences among students that do have or not a computer or access to Internet (See Table 1). Therefore, we observe that the students' competencies in the use of ICTs do vary if they have access or not to Internet.

Table 1. Difference among students that have access or not to Internet at home.

	Sí cuento con acceso a internet N= 118		No cuento con acceso a internet N= 74				Cohen's
	M	*DE*	*M*	*DE*	*d*	*p*	*d*
Uso de las TIC en la vida diaria	3.40	1.07	2.96	1.09	2.76	.00	.40
Uso de las TIC para la comunicación en la escuela	3.74	1.25	2.34	1.29	7.40	.00	1.07
Uso de las TIC en la escuela	3.30	1.06	2.98	1.11	1.97	.05	.28

Likewise, we applied a t Student test to determine if there were any differences among students that have a computer or an electronic tablet or not. We only found significant differences in the dimension on the use of ICTs at school (See Table 2).

Table 2. Differences among students that have a computer or electronic table or not.

	Sí cuento con computadora o tableta N= 162		No cuento con computadora o tableta N= 30				Cohen's
	M	*DE*	*M*	*DE*	*d*	*p*	*d*
Uso de las TIC en la vida diaria	3.28	1.09	2.96	1.10	1.45	.14	
Uso de las TIC para la comunicación en la escuela	3.21	1.42	3.12	1.52	.32	.74	
Uso de las TIC en la escuela	3.24	1.08	2.82	1.10	1.94	.05	.28

In order to determine if there were any differences between the fifth graders and the sixth graders, we applied the t Student test and found out that there are significant differences but only in the dimension of the use of ICTs at school (See Table 3). This means that the younger students see themselves as more competent in the use of ICTs in school since they use them more for academic activities than the sixth graders. This may well be because the use of laptops or electronic tablets for academic purposes is a novelty for fifth graders, and since they can access different digital didactic materials, they feel more motivated and more competent than the sixth graders for whom the use of ICTs in school is no longer a novelty.

Table 3. Differences between fifth and sixth graders.

	Quinto N= 99		Sexto N= 93				Cohen's
	M	*DE*	*M*	*DE*	*t (190)*	*p*	*d*
Uso de las TIC en la vida diaria	3.27	1.18	3.18	1.00	.56	.57	
Uso de las TIC para la comunicación en la escuela	3.05	1.51	3.35	1.34	-1.46	.14	
Uso de las TIC en la escuela	3.41	1.11	2.92	1.01	3.20	.00	.46

Moreover, in the hypothesis tests, we conducted an analysis statistically known as the effect size, i.e., the probability of rejecting a null hypothesis which is really true or accepting an alternative hypothesis as true when it is not. The size of the differences through Cohen's test are at a level that exceeds the small and the large effect sizes, hence, they meet the criterion to claim that the differences between the means of the groups are true (Cárdenas and Arancibia, 2014).

DISCUSSION

This research aimed at inquiring about the perception of the fifth and sixth graders on the use of ICTs, who use computers and electronic tablets in the classroom. We found that, in general, these students make a moderate use of ICTs to communicate in school. These results are not consistent with the findings obtained by Quintana, Cortada and Riera (2012), in that the students that have greater contact with ICTs know how to use technology and, hence, they show better knowledge and control of the computer and posses greater web literacy skills but they do not have the ability to seek information on the Internet.

Likewise, Chávez, Cantú and Rodríguez (2016) findings are not consistent with those of this study since said authors have found that the students' digital competencies and information management or treatment reached

medium high levels, while in our research, they only attained a moderate level. On the other hand, Fajardo, Villalta and Salmerón's (2016) results are consistent with those obtained in ours since in both studies, the students showed having difficulty with numerous basic digital skills. However, the conclusions of Mortis *et al.* (2014) are similar to those of this research since the students positively perceived their knowledge and use of ICTs for seeking and treating information as well as for communicating socially and learning collaboratively.

We also have found in this study that, in general, there are no significant differences between boys and girls in the use of ICTs in school. These results are consistent with those of Volman et al. (2005), who conducted a research on the accessibility and attractiveness of the different types of ICT applications in education for girls and boys and they concluded that there was a slight difference in regard to gender, though not a significant one, especially in elementary students. On the other hand, our results are not consistent with those of Hatlevik (2012) and Aesaert and Van Braak (2015) with elementary students, and those of Mortis *et al.* (2014) with middle school students. These three studies show significant differences between boys and girls in regard to their ICT competencies. The boys perceived themselves less competent than the girls. This indicates that girls are more successful in their studies with the use of computers in school.

In regard to other results of this study, we observed significant differences among the students that have Internet at home or not. However, there was no significant difference among those that have a computer or electronic tablet or not. This is consistent with the conclusions obtained in Villegas, Mortis and Del Hierro's research in 2015 when they found that the digital competencies of the fifth and sixth graders (that had obtained an electronic tablet or a laptop from the Mi Compu.Mx Program) did vary if they had access to Internet at home or not.

On the other hand, these results are not consistent with those of Mortis *et al.* (2014), who claims that having a computer is a decisive factor in regard to the level of technological competencies in basic education students. However, these results are consistent with Villegas, Mortis and Del Hierro's (2015) conclusions. These authors explained that they did not find any significant differences in digital competencies among students that have a laptop or a tablet or not. This may well be because children, at home, use a desk computer or the electronic tablet of a kin.

The abovementioned conclusion proposed by Villegas, Mortis and Del Hierro (2015) could be applied to the students who participated in this study since the majority of these children have access to a computer or a tablet in their home or their friends', since, in general, they use it to play games. Ortiz, Peñaherrera and Ortega (2012) conducted a case study to describe and analyze in depth the use of ICTs in elementary school students. They found that the students use the computer to play mainly; next, to do their homework and lastly, to navigate the Internet.

The fifth and sixth graders perceived themselves as competent in the two first dimensions: the use of ICTs in everyday life and the use of ICTs to communicate in school. These results are not consistent with the findings of Fajardo, Villalta and Salmerón (2016), who point out that the students of the third year of middle school obtained greater scores in digital skills than the fifth elementary graders. However, in the dimension on the use of ICTs in school , the fifth graders perceived themselves as more competent than the sixth graders since these younger students use ICTs more frequently for their academic activities, hence, they perceive themselves more competent than the older students.

These results could be equated to those achieved by Fajardo, Villalta and Salmerón (2016) in regard to the use of Internet, in which the elementary students make a greater use of ICTs for their academic activities, i.e., seek information (80%), followed by online recreational activities (60%), unload music (40%) and watch videos (40%). On the other hand, middle school students resort to the Internet more to socialize and for online recreational activities, i.e., social networks (90%), unload music (90%), watch videos (90%), and play online games (80%), than to do their academic tasks such as; seek information (80%) and reading their e-mails (70%).

CONCLUSIONS

We can infer that the integration of ICTs in classrooms is very important since it implies a change in the educational model which means passing from a model focusing on teaching to another one that pivots around learning. The incorporation of ICTs in the classrooms of elementary education requires including not only better, more attractive and motivating educational resources but also resources that foster the acquisition of some digital competencies and the skill to process information, and above all, encourage a better cognitive development thanks to the informative, communicative and interactive role of ICT resources TIC (Area, 2009; Gómez and Macedo, 2010; Castañeda, Carrillo and Quintero, 2013).

Therefore, we can reflect on the need to do more in depth research in some fields, especially in the way of seeking guidance to find on Internet didactic resources that encourage developing competencies in the use of ICTs since the expectation in incorporating these resources in basic education is to improve communication, the construction of knowledge, the processing of information and cognitive development. As we get closer to our students' reality, educational processes with the use of ICTs will allow significant achievements in the students' learning that, in turn, will help them face current and future challenges of the society of information and knowledge.

Let us remind ourselves that the future programs to foster a culture of digital citizenship in the different states of the Mexican Republic, will need

not only to equip the school of basic education and provide computers to the elementary school students, but also to make prior diagnoses to measure the knowledge and skills of teachers and students in the use of ICT. Moreover, we propose giving training classes to teachers so they may make a better pedagogical use of said resources as educational tools. Likewise, we should train parents to achieve the adequate use of these resources in their homes.

Furthermore, in future studies, it would be convenient to measure the development of the teachers' digital competence since they are a core figure in students' learning, and to conduct research that would comprise all the digital competencies in students. These can be those proposed by ISTE, preferentially those more updated, since the results of our study were obtained through self-reporting instruments that measured only the students' opinion on their competence in the use of ICTs.

Acknowledgement

We wish to acknowledge the support received from CONACYT for this "Comparative Study of the Development of Digital Competencies of Mi Compu.Mx Program" research project, as well as from PROFAPI 2016-0018 of the Instituto Tecnológico de Sonora for the "Digital Competencies in Elementary School Students" project. The results of our study were obtained thanks to the financial contribution of both institutions.

REFERENCES

Aesaert, Koen & Van Braak, Johan. (2015). Gender and socioeconomic related differences in performance based ICT competences. *Computers & Education*, vol. 84, pp. 8-25. http://dx.doi.org/10.1016/j.compedu.2014.12.017

Area, Manuel. (2009). *Introducción a la tecnología educativa*. Islas Canarias, España: Universidad de La Laguna. Recuperado de https://campusvirtual.ull.es/ocw/file.php/4/ebookte.pdf

Cárdenas, Manuel y Arancibia, Héctor. (2014). Potencia estadística y cálculo del tamaño del efecto en G*power: complementos a las pruebas de significación estadística y su aplicación en psicología. *Salud y Sociedad*, vol. 5, núm. 2, pp. 210-224. Recuperado de https://dialnet.unirioja.es/servlet/articulo?codigo=4945415

Castañeda, Arturo; Carrillo, Jesús; Quintero, Zaira. (2013*). El uso de las TIC en la educación primaria: la experiencia Enciclomedia*. México: Redie.

Cea, María. (2004). *Análisis multivariable. Teoría y práctica en la investigación social*. Madrid: Síntesis.

Chávez, Flor; Cantú, Maricarmen; Rodríguez, Catalina. (2016). Competencias digitales y tratamiento de información desde la mirada infantil. *Redie*, vol. 18, núm. 1, pp. 209-220. Recuperado de http://redie.uabc.mx/redie/article/view/631

Díaz, Diana; Rodríguez, Monserrat; Sánchez, Wendy; Rivera, Nohemi; Ramírez, María. (2015). *Competencias digitales en el marco del programa Mi Compu.Mx: estudio piloto en Colima, Sonora y Tabasco*. Memorias del Segundo Congreso Internacional de Innovación Educativa, México, DF. Recuperado de http://repositorio.itesm.mx/ortec/handle/11285/575398

García, Ramona; Angulo, Joel; Cuevas, Omar. (2015). *Mi Compu.Mx: opinión de padres de familia, docentes y directivos sobre su aplicación y desarrollo*. Memorias del XIII Congreso Nacional de Investigación Educativa, Chihuahua, México. Recuperado de http://hdl.handle.net/11285/575957

Gómez, Luz y Macedo, Julio. (2010). Importancia de las TIC en la educación básica regular. *Investigación Educativa*, vol. 14, núm. 25, pp. 209-226. Recuperado de http://sisbib.unmsm.edu.pe/bibvirtual/publicaciones/inv_educativa/2010_n25/pdf/a12v14n25.pdf

European Commission. (2007). *Key competences for lifelong learning. European reference framework*. Luxembourg: Office for Official Publications of the European Communities. Recuperado de https://www.erasmusplus.org.uk/file/272/download

Fajardo, Inmaculada; Villalta, Ester; Salmerón, Ladislao. (2016). ¿Son realmente tan buenos los nativos digitales? Relación entre habilidades digitales y la lectura digital. *Anales de Psicologías*, vol. 32, núm. 1, pp. 89-97. Recuperado de https://dialnet.unirioja.es/servlet/articulo?codigo=5292592

Hatlevik, Ove. (2012). Analyzing factors influencing students productive use of computers: A structural equation model. *The International Journal of Technology, Knowledge and Society*, vol. 7, núm. 4, pp. 11-27. Recuperado de http://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?sid=81c39e63-0eea-4ff4-95d1-773c8c7a7ced%40sessionmgr103&vid=0&hid=120

Hernández, Roberto; Fernández, Carlos; Baptista, Pilar. (2014). *Metodología de la investigación educativa*. México: McGraw-Hill.

International Society for Technology in Education (ISTE). (2007). *ISTE Standards students*. Recuperado de http://www.iste.org/standards/iste-standards/standards-for-students

McKenney, Susan & Voogt, Joke. (2010). Technology and young children: How 4-7 year olds perceive their own use of computers. *Computer in Human Behavior*, vol. 26, núm. 4, pp. 656-664. http://dx.doi.org/10.1016/j.chb.2010.01.002

Mortis, Sonia; Cuevas, Omar; García, Imelda; Cabero, Julio. (2014). Competencias tecnológicas en alumnos de secundaria. En Sonia Echeverría, María Fernández, Eneida Ochoa y Dora Ramos (comps.). *Ambientes de aprendizaje y contexto de desarrollo social* (pp. 117-119). México: Pearson.

National Educational Technology Standards for Students (NETS-S). (2007). *Estándares nacionales (EEUU) de tecnologías de información y comunicación (TIC) para estudiantes: la próxima generación*. Recuperado de https://www.iste.org/docs/pdfs/nets_2007_spanish.pdf?sfvrsn=2

Ortiz, Ana; Peñaherrera, Mónica; Ortega, Juana. (2012). Percepciones de profesores y estudiantes sobre las TIC. Un estudio de caso. *Edutec-e*, núm. 41, pp. 1-15. http://dx.doi.org/10.21556/edutec.2012.41.352

Parlamento Europeo. (2009). *Competencias clave para el aprendizaje permanente*. Recuperado de http://www.europarl.europa.eu/meetdocs/2004_2009/documents/am/609/609485/609485es.pdf

Quintana, María; Cortada, Meritxell; Riera, Jordi. (2012). Internet navigation and information search strategies: How do children are influenced by their participation in an intensive ICT project. *International Journal of Technology & Design Education*, vol. 22, núm. 4, pp. 513-529. http://dx.doi.org/10.1007/s10798-011-9158-4

Revuelta, Francisco. (2011). Competencia digital: desarrollo de aprendizajes en mundos vitales en la escuela 2.0. *Revista Electrónica de Tecnología Educativa*, núm. 37, pp. 1-14. http://dx.doi.org/10.21556/edutec.2011.37.397

Rocha, María y Ramírez, María. (2015). *Los sujetos y objetos que inciden en el desarrollo de competencias digitales en el marco del programa Mi Compu.Mx: caso escuela rural de Colima*. Memorias del XIII Congreso Nacional de Investigación Educativa, Chihuahua, México. Recuperado de http://hdl.handle.net/11285/575878

Secretaría de Educación Pública (SEP). (2011). *Acuerdo número 592 por el que se establece la articulación de la educación básica*. Recuperado de https://www.sep.gob.mx/work/models/sep1/Resource/9721849d-666e-48b7-8433-0eec1247f1ab/a592.pdf

Secretaría de Educación Pública (SEP). (2013). *Dotación de equipos de cómputo portátiles para niños de quinto y sexto grados de escuelas primarias públicas*. Recuperado de http://www.basica.primariatic.sep.gob.mx/descargas/TIC_DOTACION_BAJA.pdf

Trigueros, Francisco; Sánchez, Raquel; Vera, María. (2012). El profesorado de educación primaria ante las TIC: realidad y retos. *REIFOP*, vol. 15, núm. 1, pp. 101-112. Recuperado de http://www.aufop.com/aufop/uploaded_files/articulos/1335399123.pdf

Villegas, Marisol; Mortis, Sonia; Del Hierro, Elizabeth. (2015). Competencias digitales de alumnos de educación primaria participantes en el proyecto Mi Compu.Mx. En Raquel García, Sonia Mortis, Jesús Tánori y Teresa Sotelo (comps.). *Educación y salud: evidencias y propuestas de investigación en Sonora* (pp. 152-165). México: Fontamara.

Volman, Monique; Van Eck, Edith; Heemskerk, Irma; Kuiper, Els. (2005). New technologies, new differences. Gender and ethnic differences in pupils' use of ICT in primary and secondary education. *Computers & Education*, vol. 45, núm. 1, pp. 35-55. http://dx.doi.org/10.1016/j.compedu.2004.03.001