

Formación en TIC y competencia digital en la docencia en instituciones de educación superior públicas

Teaching training in ICT and digital competences in Higher Education System

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RESUMEN

Palabras clave

Competencia digital, educación superior, formación docente, TIC

En la actualidad, las tecnologías de la información y la comunicación (TIC) se han convertido en herramientas indispensables en la práctica académica; sin embargo, su uso en el proceso de enseñanza-aprendizaje se ha centrado solo en digitalizar el acervo educativo, lo cual conserva las metodologías tradicionales en lugar de aprovechar los ambientes colaborativos y otras bondades que ofrece la Web 2.0. Por ello, esta investigación, que corresponde a un diseño cuantitativo-descriptivo correlacional, por una técnica de encuestas, tiene como objetivo analizar, en cuanto a percepción, la formación en TIC de los docentes y estudiantes en relación con la competencia digital y el uso de las TIC en ambientes Web 1.0 y 2.0; esto, en referencia a algunos factores contextuales en instituciones de educación superior públicas de carreras del área de ciencias administrativas de la zona metropolitana de la ciudad de Querétaro. El estudio encontró que existe relación de la competencia digital en cuanto a la formación en TIC, así como un vínculo directo del uso de las TIC entre docentes y estudiantes. Lo anterior influye en el rendimiento académico y muestra que el uso innovador de las TIC tiene efecto favorable en la práctica académica de los estudiantes.

ABSTRACT

Keywords

Digital competence, higher education, teacher education, ICT

Currently, Information and Communications Technologies (ICT) have become essential tools in academic practice; however, its use within the teaching-learning process has focused only on digitizing educational acquiris, while educational practice still preserves traditional, methods, instead of using collaborative environments and other benefits offered by the field of Web 2.0. Thus, this research, which corresponds to a quantitative-descriptive correlational level, it has been done through survey methodology. Its aim is to analyze the ICT training of teachers and students in relation to digital competence and the use of ICT in Web 1.0 and 2.0 in academic practice, in reference to some contextual factors in Higher Education System in administrative sciences in the metropolitan area of the city of Queretaro. It was found that there is a relation between of digital competence and teaching training in ICT, as well as a direct relation of the use of ICT among teachers and students. This affects academic performance, showing that the innovative use of ICT has favorable effect on student academic practice.

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INTRODUCTION

The processes of teaching-learning in institutions of higher education (IHEs) have not undergone any great transformations in terms of educational culture, because traditional structures have tended to persist. However, significant changes have occurred in the way in which students learn today, owing largely to the use of technology (Pittinsky, 2006). Batson (2010) mentions the existence of a variety of factors causing educators to have difficulty adapting to the opportunities presented by information and communication technology (ICT), particularly the functionalities of the Web 2.0. Among these reasons are the following:

- The students who attend the IHEs still expect traditional classes, because the new methods require greater effort.
- The evaluation processes designed by the institutions and applied to the students by educators neither favor nor recognize ICT-related innovation.
- Programs or written curricula reflect traditional teaching methods, among others.

All these factors combine to slow down innovation in educators, motivating them to cling to traditional, rigid, and sequential methodologies and to adapt their information to the new technologies in only the most routine or superficial way.

Although Latin America has already been the scene of significant advances toward educational change, it still has a long way to go. There are still low levels of efficacy, efficiency, and pertinence; and the level of quality that has been attained by educational systems does not fulfill all of society's expectations related to the inclusion of ICT (De Pablos, 2009; OEI, 2010; Castellanos, 2015).

On the other hand, one notes that the students of IHEs are very active subjects, having many computer resources at their disposal, and that, despite the educational system being unidirectional and rigid, they are not satisfied by receiving information from a lone source. To the contrary, students today have a wide range of possibilities for evaluating and investigating the information they receive should they feel unconvinced of its veracity. Thus, the rigid and sequential teaching processes that persist in IHEs are not in harmony with the students' real needs and the actual nature of their lives (Lévy, 2007).

From the foregoing comments, it is easy to deduce that digital competency among educators is relatively low and it is not always developed in the service of cutting-edge pedagogical models (Area, 2009). This generalized low level of technological capability has given rise to educators focusing on the digitalization of information, with the hope of introducing

technological changes that stimulate greater innovation, as shown in a study by Pedraza, Fariás, Lavín, and Torres (2013), which revealed competencies in the handling of word processors and presentations ranging from quite good to sufficiently good, while abilities to handle multimedia material or web design were stuck at low levels.

From the above, we can conclude that a major investment must be made in preparing educators to effectively use ICT in the classroom (Brun, 2011); also, to close the gap and integrate themselves into this new digital environment, there ought to be development of a variety of different technological and didactic capabilities (Small and Vorgan, 2008), which implies that professors be prepared to utilize technology with sufficient naturalness, in order to understand the contribution of digital resources to learning and to gestate teaching in an innovative way (SITEAL, 2014).

From these facts there spring forth the following questions: What is the level of digital capability and preparation in ICT that both students and educators have derived from ordinary activities? How does the level of preparedness in ICT influence digital competence and the use of ICT in Web 1.0 and 2.0 environments and in the academic practice of educators and students? How and in what percentage are educators and students using ICT in academic practice? It is not for nothing that Wilson, Grizzle, Tuazon, Akyempong, and Cheung (2011) point out the need to train educators in the use of ICT so that students will receive their own training in a sufficient and adequate way.

In the context of Mexico, according to the statistics from the third quarter of the National Labor and Employment Poll (INEGI, 2015), professionals in economics and administration have the highest levels of employment, underscoring the utility of engaging in this research which is geared toward channeling actions that integrate ICT into the public IHE Administration Sciences programs. The objective of these efforts is to increase the efficiency and efficacy in the education of future alumnae, responding to their needs as they prepare to enter a world of undisputedly technologized labor.

Our research seeks to analyze, in terms of its perception, the relationships among factors such as the ICT training of educators and students, digital competence, the use of ICT in Web 1.0 and 2.0 environments and its influence in terms of academic results, within the context of Administration Sciences career training in the public IHE programs of metropolitan area of the city of Querétaro.

THEORETICAL FRAMEWORK

In Mexico, universities have made an important investment by joining in with the technological challenge presented by the society of knowledge (Guzmán, 2008; López, 2007; Valerio and Paredes, 2008; Vera, Torres, and Martínez, 2014; Zenteno and Mortera, 2011). However, there is a

consensus that the penetration of ICT in university education has been superficial at best and that, where it is present, it has been tied to traditional and non-innovative pedagogical models (Díaz-Barriga, 2010; Torres, 2011). Additionally, most professors who utilize ICT essentially do so only in preparing their classes, rather than by working directly with students (European Commission, 2013). One possible cause for this is that the ICT formation of professors has also been negligible, hit-or-miss, or excessively oriented toward the mere instilment of technical capacity (López and Chávez, 2013; Vera, Torres, and Martínez, 2014; Zubieta, Bautista, and Quijano, 2012). In fact, faculty members often feel unprepared and have requested specific training that will enable them to assume new challenges in the exercise of their profession (Prendes and Castañeda, 2010; Predraza et al., 2013).

At root, of course, is the question of improvement in the learning experience of the students. The numerous investments that have been made to date may appear to have been unproductive, owing to the reported results showing relatively little penetration (Rosario and Vásquez, 2012; Valerio and Paredes, 2008); however, a study undertaken by Pozuelo (2014) has shown that increased capacity in digital competence among faculty members is key in giving impetus to methodological change among educators, and makes clear that the educators who enjoy the highest levels of technological training utilize ICT with greater frequency, introduce more innovation, and promote ICT competence among their students.

Del Moral, Villalustre, and Neira (2013) show that educators perceive a positive impact from the inclusion of ICT in the classroom, not only because of the different competencies acquired but also because of its effect on learning. Nevertheless, they also indicate they have found weaknesses on the supply side, related to the training available to faculty members. Similarly, Avello, López, and Vásquez (2016) make clear that, because of continual change and development in technology, a permanent process of ICT training for educators is necessary, as well as its inclusion in the process of teaching-learning, whether by formal or informal means.

Area (2008) adds that the process of change can be seen in professors deciding to implement new technologies in their teaching, since it indicates they are proposing new goals and challenges, which implies knowledge, abilities, change of attitudes, and time. Such behavior and investment of time is not a spontaneous or chance-based process; rather, it has to do with an educational model involving the processes of teaching-learning, the institution, the students, and the educators.

In our research, we evaluate these changes from the perspective of the use of the internet and of knowledge about computers in the academic context of the Web 1.0 and 2.0. In this case, we define the term “Web” as an environment of development and execution of programs or services through a form of a graphic interface for users. This environment may take the form of Web 1.0, which exhibits information in a unidirectional form

and therefore permits neither interaction nor instantaneous contributions from its users, or that of Web 2.0, which allows for such interchange, contribution, and the storage of contents by the final users (Peñalosa, 2013).

The concept of teacher training refers to the formal or informal process of professional preparation for the exercise of pedagogical practice and is closely linked to experience in the classroom (Alves, 2003). This process includes obtaining a title and taking courses to update capabilities. Referring to ICT training, Salinas, De Benito, and Lizana (2014) mention the crucial nature of developing communicative competencies for new scenarios, where educators contribute to their students' comprehension of what is required and where both teachers and students appropriate and master the new landscape.

It is necessary for educators to organize the resources of learning and for them to feel at ease and able to work collaboratively in the new spaces defined by communications technologies generated by institutions, individuals, and society. For this reason, Correa, Fernández, Gutiérrez, Losada, and Ochoa-Aizpurua (2015) argue that digital collaboration ought to nourish and support classroom learning and offer knowledge to students that enables them to express themselves through electronic and audio-visual media, which incorporate social networks, videos, and the tools of collaborative work.

One of the principal potentials of ICT is the development of technological, digital, and informational competencies, since its use by educators facilitates the generation of such competencies in their students (Area, Hernández, and Sosa, 2016; Mirete, 2016). Today, the new educational paradigm is centered in the student and in learning, which implies changes in the professional tasks of the educator. Therefore, educators must adapt their professional profile to the requirements of this new context, with special attention to those derived from ICT (Pozos and Mas, 2012).

Cabero, Duarte, and Barroso (1999), as well as different leaders of international organizations, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2008) and the Organisation for Economic Co-operation and Development (OECD, 2012), indicate that it is necessary for educators to develop different digital competencies, which are defined as the secure and critical use of the technologies of the society of information (TSI) for work, play, and communication. It is sustained by the basic competencies in ICT:

the use of computers for obtaining, evaluating, storing, producing, presenting, and exchanging information, and for communicating and participating in collaborative networks by means of the internet. (European Parliament and Council of the European Union, 2006, pp. 394/15)

The National Institute of Educational Technologies and Faculty Training (Spanish acronym: INTEF, 2013, p. 10) indicates that digital competence also requires attitude and defines it as “the creative, critical, and secure use of ICT to reach goals related to work, employability, learning, free time, inclusion and participation in society” and it can be grouped into five areas: information, communication, content creation, security, and problem solving.

To measure digital competence in educators and students in the Administration Sciences programs of the IHEs which were the subjects of this investigation, we utilized the techniques of review and comparison proposed by Ramírez and Casillas (2014), taking into consideration eight aspects of computer knowledge and two informational ones, which are then grouped according to the abovementioned areas: information (manipulation of files and digital literacy); communication (communication, socialization, and collaboration); content creation (creation and manipulation of contents such as texts, data, and multimedia); security (digital citizenship); and problem solving (administration of devices and handling of programs and information systems specific to the discipline).

Claro (2010) mentions that understanding the relationship of the use of ICT with learning requires observation of the types of use that students give of these technologies. Such an approach sees students as hoping for greater personalization and collaboration, as well as a closer relationship between their formal learning and the more informal kind associated with ICT (Roblizo and Cózar, 2015; European Commission, 2013). As far as the knowledge and use of ICT by educators is concerned, mention is made of their employing resources that have to do more with the management and treatment of information, and, to a lesser degree, with the creation of didactic materials and social interaction (Mirete, 2016).

Regarding the factors that impact academic performance, which justify this research, González (2003) indicates there are various aspects, which can be personal or contextual, that influence such performance. In our study, we consider only the contextual ones, which refer to variables that are socioenvironmental (the specific economic status of the individual), institutional (the IHEs and teacher training), and instructional (academic content, teaching methods, assignments, and new technologies). For Garbanzo (2007), academic performance is the sum of numerous and complex elements that influence the person being schooled and is determined with a value that is attributed to the student's success with academic work. Most commonly, this is measured by way of the academic grades achieved, based on a system of quantitative valuation (Tournon, 1984).

ICT, together with the professional training of the educator, fosters change by improving student achievement, promoting collaborative labor, and augmenting work performance (UNESCO, 2008; Rodríguez, Sánchez, and

Márquez, 2011). However, some research has demonstrated the opposite (OECD, 2015). That said, the goal of the present study is to analyze the relationship between the formation of ICT, digital competence, and the academic performance of students, and thereby to give impetus to proposals for ICT training methods that better accord with the needs of IHE students enrolled in Administration Sciences programs.

METHODOLOGY

The research corresponds with a quantitative-descriptive design that is correlated to a population of 5,775 students and 334 educators in five public institutions of higher learning which offer professional career programs in Administration Sciences in the metropolitan area of Querétaro, Mexico.

SAMPLE SIZE

The selection of the sample was realized by means of a probabilistic sampling, stratified by groups at 95% reliability, with 361 interviews conducted among students. In the selection of teachers, we utilized the criteria of the central limit theorem (Kish, 1995) by means of an aleatory, stratified sampling that considered 100 educators.

EVALUATION INSTRUMENT

For the collection of data, we made use of the technique of survey evaluation; we began with the instruments developed by Gisbert, Espuny, and González (2011) and by Zubieta, Bautista, and Quijano (2012), as well as the questionnaire on the availability and use of ICT in the home (INEGI, 2013), all of which served as the basis for constructing the instrument of measurement and obtaining the data regarding the variables under consideration.

The variables refer to the perception of digital competence in educators and students, as well as the contextual characteristics. For the teachers, these latter variables are: age, gender, institution, seniority, ICT training, perception of access, availability of ICT in the institution, and perception of use of ICT in educational activities within Web 1.0 and 2.0 environments. For the students, they are: institution, average grade for the scholastic period reported by each student surveyed, level of studies, perception of ICT training, use of the internet for academic activities, and assignments given by their teachers in Web 1.0 and 2.0 environments.

DATA COLLECTION

Once we had selected the questions for the surveys, the questionnaires were transcribed to electronic format utilizing the formulae of the Google Drive suite. The resulting questionnaires were given a trial run to determine their reliability and condition for application. For this, we used

Cronbach's alpha, with which we obtained 0.82 for the teachers and 0.78 for the students, in contextual characteristics, as well as 0.78 and 0.73, respectively, in digital competence, results that indicate a high value of reliability (García, 2006).

ANALYSIS OF RESULTS

After having applied the questionnaires in the institutions during the first semester of 2015, we processed the data for its codification of numeric values according to the categories and alternatives for response. For each dimension of the perception of digital competence, we made a deliberation on a scale of 0-to-100, thereby obtaining the average of the five dimensions and thus derived the value for digital competence. The registered data were transferred to a file for analysis via Minitab and the statistical tools of Excel, which facilitated the first, basic, descriptive statistical analysis and the analysis of the behavior of the determined variables.

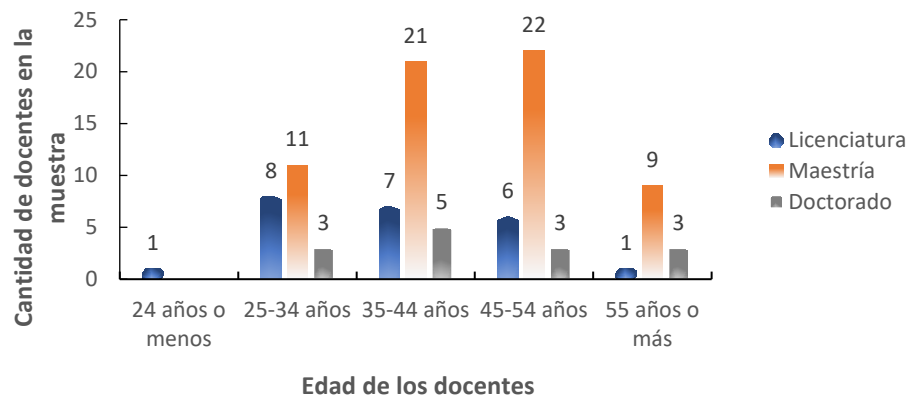
In order to determine the differences in digital competence utilizing Web 1.0 and 2.0 according to its contextual variable, we applied the methodology of standard normal deviation or "Z-value". To calculate the correlations of the dimensions of specific digital competence with respect to ICT training, we employed Spearman's correlation. As far as the relationship of the uses of ICT between teachers and students, we calculated a coefficient value of .05 using Pearson's correlation.

RESULTS

Of the questionnaires sent, the final resulting real sample size was 100 from teachers and 370 from students.

CONTEXTUAL DATA FROM TEACHERS

Concerning age and academic level, we saw that the majority (63%) of teachers were concentrated at the level of holding a master's degree and (64%) were within the range of 35–54 years of age (see Graph 1).



Graph 1. Age and academic degree of teachers.

As far as gender and seniority of the teachers in the sample, we found that 55% are women and 45% are men, with 53% having ten years or less experience teaching and 47% having eleven years or more.

In terms of a formal foundation in ICT, 32% of the sample report having had at least some training in the past three years, while 68% have had no formal training or do not recall.

CONTEXTUAL DATA FROM STUDENTS

The sample selected for students was 62.9% female and 37.1% male. There were 28.9% under the age of nineteen, 59.7% between twenty and twenty-four, and 11.2% older than twenty-five years of age. With respect to academic levels, 43% were in their first year of study, 20% their second year, 33% in their final year, and 4% were studying at the postgraduate level.

The ICT training of the students refers to the perception that they themselves have regarding their acquisition of ICT knowledge, compared to the examples of their teachers or expert counselors in such technologies. 8% were registered as having a very high level, 22% with a high level, 36% with a medium level, 26% with a low level, and 7% with no perception of acquisition of knowledge from their professors or experts in ICT.

FORMATION IN ICT AND DIGITAL COMPETENCE OF TEACHERS IN INSTITUTIONS OF HIGHER EDUCATION

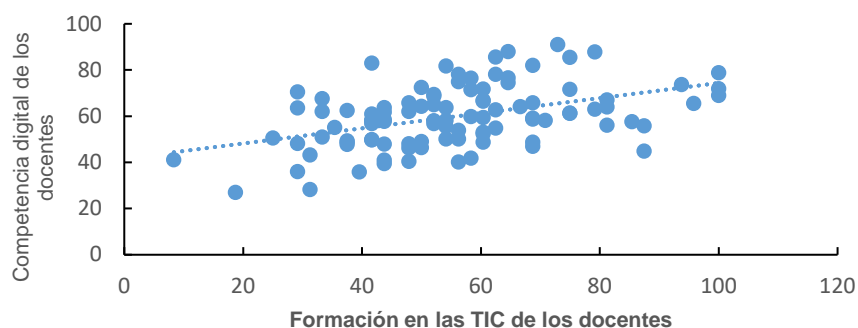
We calculated the digital competence and formation in ICT and determined their descriptive statistic, which corroborates an intermediate level of digital competence and ICT formation (see Table 1).

Table 1. Descriptive statistic of digital competence and ICT formation of teachers.

	Competencia digital	Formación en TIC
Media	59.9	55.8
Desviación estándar	13.3	18.4
Prueba de normalidad (Anderson-Darling)	.23	.48
P-valor	.81	.23

P-value $\geq .05$ therefore satisfying proof of normality.

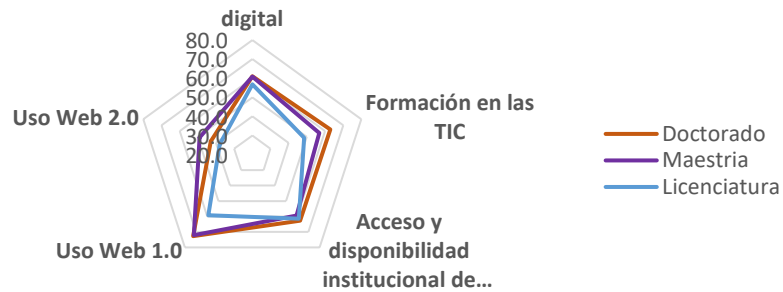
With the foregoing data we calculated the correlation between the perception of digital competence and ICT formation of the teachers in the sample, observing that the relation that exists is also intermediate, since the correlation was .45 with $p < .01$ (see Graph 2).



Graph 2. Correlation of digital competence with respect to ICT formation.

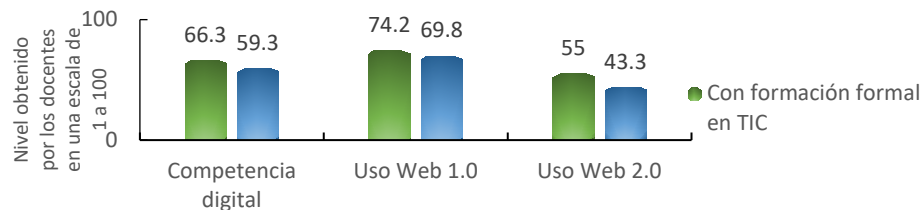
In analyzing the information pertaining to gender, academic level, institution, seniority, and age, we became aware that the age factor has the lowest value and the highest in relation to digital competence, and there is a meaningful correlation of ICT formation and digital competence of $r = .70$ with a $p < .01$ in the age group of fifty-five years and older. This indicates there is a strong relationship between ICT formation and digital competence among teachers in this age range.

With respect to seniority in teaching, in the range of one year or less, we find the lowest value of ICT formation, and the highest value is encountered in relation to the institution; in terms of academic level, it is noteworthy that the bachelor's degree level shows a lower value in almost all categories (see Graph 3).



Graph 3. Academic level of teachers with reference to various aspects of ICT.

The analysis of digital competence as a function of formal and informal ICT training corroborated that there is a significant difference in the digital competence and use of systems and programs in the Web 1.0 and 2.0 environments: when there has been greater preparation in ICT, increased digital competence and ICT usage shows up as well. We observed and demonstrated that the use of ICT in the Web 1.0 environment continues to be dominant (see Graph 4 and Table 2).



Graph 4. Digital competence and ICT use in Web 1.0 and 2.0 among teachers.

Table 2. Proof “z” with and without ICT training in teachers

	Valor z	p
Competencia digital	3.39	< .01
Uso de las TIC en ambiente Web 1.0	2.04	.02
Uso de las TIC en ambiente Web 2.0	2.74	< .01

Value $z > 1.96$ and $p < .05$, thus a significant difference exists.

We carried out a factorial analysis to identify which elements are principally determinative for ICT use in Web 2.0 and we encountered the existence of diverse factors, such as the use of the internet for academic activities in the Web 1.0 environment, digital competence, access and

availability of ICT in the institution, and ICT training; the highest correlation was with all four of these factors combined (see Table 3).

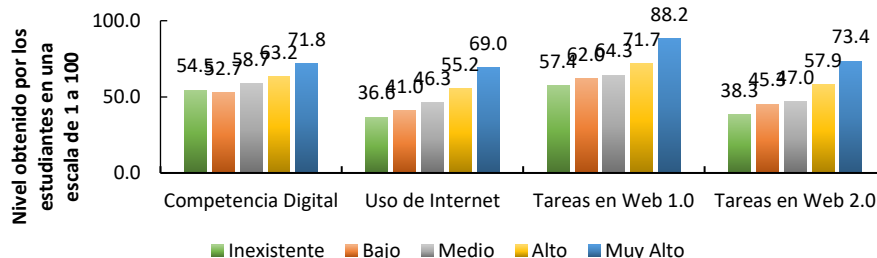
Table 3. Factors related to the use of ICT in the Web 2.0 environment

Factor	Coefficiente de correlación de Pearson en referencia al uso de TIC en Web 2.0	<i>P</i>
Formación en TIC	.320	.14
Uso de internet en actividades docentes Web 1.0	.642	<.01
Competencia digital	.531	.02
Acceso y disponibilidad institucional de TIC	.428	<.01
Múltiple (R)	.761	<.01

In examining the different factors in Table 3, according to the level of ICT training we find that, when there does not exist any training there is no significant relationship of the factors mentioned and the level of digital competence is low; on the contrary, in accordance with increased levels of training, the correlation between factors is increased, as does digital competence, becoming greater when the factors are combined than when they are considered separately. In the case of high training level, the correlation multiple was $R = .913$, $p < .01$.

FORMATION IN ICT AND DIGITAL COMPETENCE OF STUDENTS

In this section we also analyzed digital competence of students as related to their perception of the ICT knowledge they acquired from teachers or experts; we observed that the perception of digital competence, internet use, and the realization of scholastic assignments in Web 1.0 and 2.0 environments increased as a function of the increased perception of such ICT knowledge. Again, the use of ICT in the Web 1.0 environment for academic activities is notable among students, but not that of ICT in the Web 2.0 environment, which attains a higher level (see Graph 5).



Graph 5. Perception of ICT formation by students.

With the previously mentioned data, and by means of Spearman's correlation, we determined the relationship between each dimension of digital competence in teachers and students with respect to ICT formation. The dimension that in both cases has most to do with ICT formation is competence in problem solving. In addition, the relationship of ICT formation in students is higher than in teachers, which reaffirms the importance of educators' digital competency, since it impacts all dimensions (see Table 4).

Table 4. Correlations of the dimensions of digital competence in teachers and students

Dimensiones de la competencia digital	Correlación de Spearman respecto a la formación en TIC	Correlación de Spearman respecto a la formación en TIC
	Docentes	Estudiantes
Información	.52	.88
Comunicación	.71	.92
Seguridad	.73	.76
Creación de contenido	.61	.73
Resolución de problemas	.92	.95

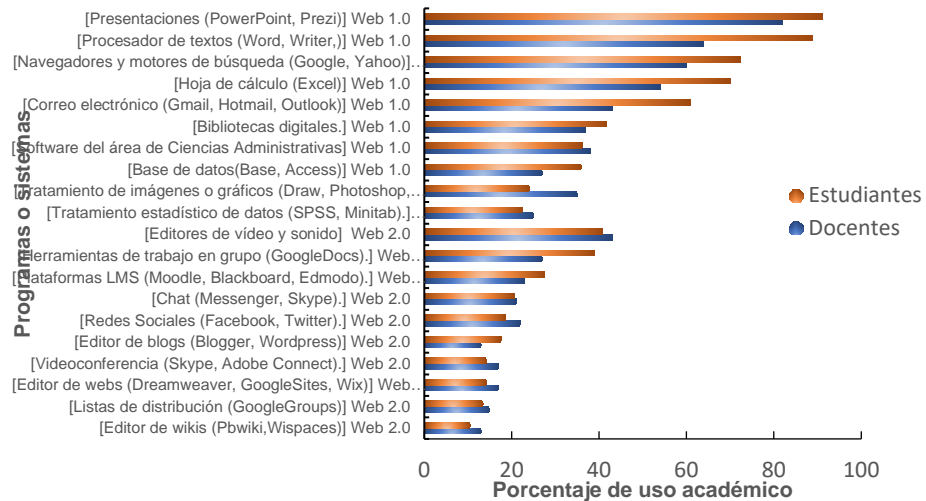
In the analysis of information which considers the contextual variables of academic grade, scholastic level, and institution, we noticed that the level of postgraduate study is that which presents the least activity of assignments in Web 2.0, with a value of 31.3, when $M = 50.3$. For the variable of the institution, there is a significant difference in all aspects of

one of the institutions, which indicates that the institution is a determining factor; additionally, across all contextual variables we verified the greatest use of ICT in Web 1.0 for scholastic activities.

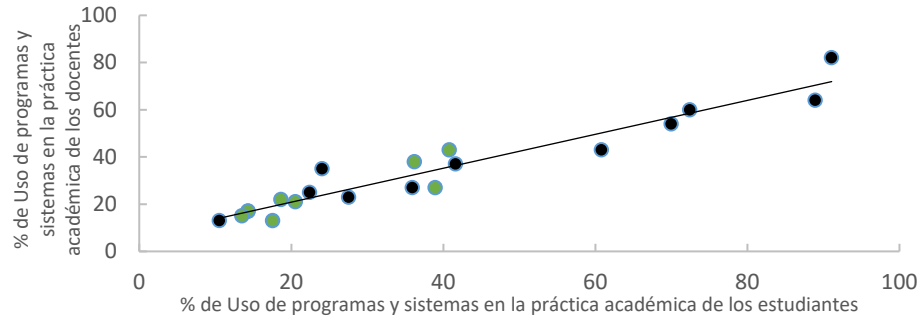
PERCENTAGE OF ICT USE IN STUDENTS AND TEACHERS IN DIFFERENT ASPECTS OF COMPUTER KNOWLEDGE

Regarding the percentage of ICT use, we observed there is an average level of 48% of ICT use by teachers and 56.4% by students in the Web 1.0 environment, while in Web 2.0 the use is 22.4% and 23% respectively (see Graph 6).

In relation to the percentage of ICT use for academic purposes by students and teachers, there is a very high correlation of $r = .959$, $p < .01$ of the programs and systems that the teacher reports utilizing with respect to that which the student does (see Graph 7), and also a very high correlation of $r = .978$, $p < .01$ for the programs and systems that both groups do not know or do not utilize (see Graph 8), in which the proofs of significance are conclusive.

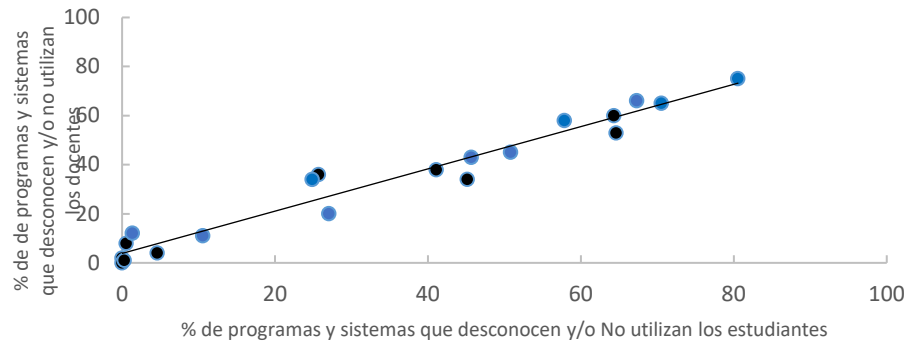


Graph 6. Percentage of ICT use in academic practice.



Graph 7. Correlation of programs and systems utilized by students and teachers.

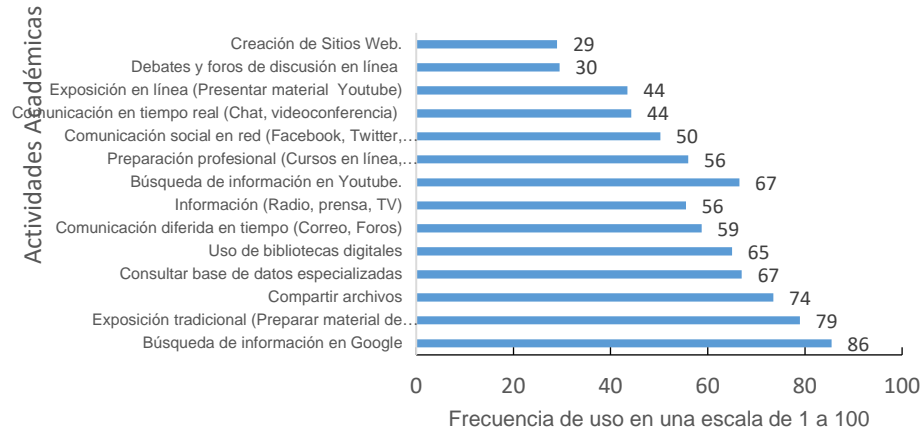
Note: programs and systems of the Web 2.0 environment are shown in green; those of Web 1.0 are shown in black.



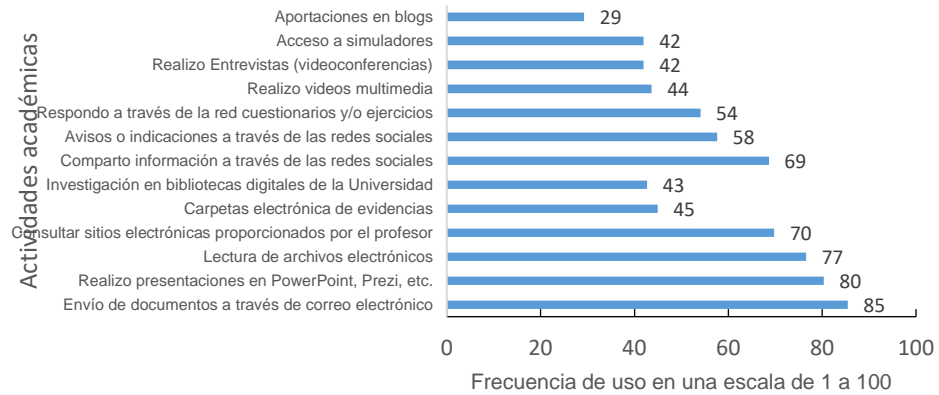
Graph 8. Correlation of programs and systems that are unknown or unused by students and teachers.

Note: those coinciding with Web 2.0 are shown in blue; those corresponding to Web 1.0 are shown in black.

As far as utilization in academic practice, the activity that the majority of the teachers engage in is searching for information on Google (see Graph 9); in the case of the students, it is sending e-mails (see Graph 10).



Graph 9. Use of ICT in Web 1.0 and 2.0 in the academic practice of teachers.



Graph 10. Use of ICT for work in Web 1.0 and 2.0 in the academic practice of students.

Similarly, we evaluated the frequency of use in academic practice in Web 1.0 and 2.0 by students and teachers; utilizing Spearman's correlation, we verified the relationship between scholastic average in each institution and confirmed that the scholastic average currently has a direct link with ICT use in the Web 1.0 environment among teachers, in contrast with the students, among whom it relates more often to the use of the Web 2.0 environment (see Table 5).

Table 5. Spearman's correlation between scholastic average and the use of ICT in Web 1.0 and 2.0.

Institución	Observaciones en estudiantes	Calificación promedio por institución	Uso Web 1.0 Docentes	Uso Web 2.0 Docentes	Tarea Web 1.0 Estudiantes	Tareas Web 2.0 Estudiantes
A	215	8.54	69.9	49.8	64.3	49.4
B	39	8.68	68.0	43.9	72.9	48.9
C	42	9.32	77.4	46.4	73.2	56.9
D	50	8.95	68.2	40.1	74.6	52.6
E	24	8.61	64.0	40.2	49.5	44.6
Correlación Spearman			.798	-.020	.564	.891

CONCLUSIONS

In accordance with the results and the proposed objective, we concluded that the changes in the formation of the faculty in the use of ICT in Web 2.0 reveal a favorable effect; in particular, the analysis of the use of systems or programs in the different web environments indicate that in the same proportion that teachers utilize Web 2.0, students will also do so; this, in turn, will result in a marked scholastic advantage, since a high degree of relationship exists between average grades and activities in Web 2.0.

However, the results that permit responding to the question of what use teachers and students give to the ICT resources available to them are not quite so positive. In this sense, there is better penetration of ICT, but it is not generalized; in any case, it tends more toward practices linked to Web 1.0 than to Web 2.0 (much more in tune with a constructivist model of learning, and therefore more recommendable).

Additionally, one of the relevant contextual variables for the strategies of faculty training is age, since the teachers who are fifty-five years of age or older depend more on formal ICT training. On the other hand, we corroborated that such training is very fruitful, given that when they are offered increased levels of formal training, teachers believe they have greater digital competence. Finally, the grade of academic studies is a determining factor, since there is a notable difference in digital competence the lower the level of academic study.

It is worth emphasizing that the aspects of digital competence most related to educational training, for both teachers and students, coincide with problem solving skills. For this reason, it is important to reinforce formal preparation in such skills, given that this dimension, in our research, relates directly to the efficient use of ICT resources and to the ability to handle computer systems in the Administration Sciences.

In trying to bring into focus this whole discussion, we confirm, in agreement with the authors we have cited in this study, the need to increase efforts in the formation of educators. If one of the causes of the low level of penetration of ICT in the IHE is the scant training of educators, which in turn generates insecurities in them and dissuades the use of ICT in their practice, that points to the fact that there is work that must be done precisely in this area (Prendes and Castañeda, 2010; Pedraza et al., 2013). Such an emphasis is not gratuitous, because it demonstrates its value: for one thing, Pozuelo (2014) indicates that investing in training is key for effectuating real methodological change in the university; for another, the data obtained in this study not only reveal that the collectives which feel themselves to be better prepared are those that most tend to use the Web 2.0 (Wilson et al., 2011), but also that the institutions that are the most advanced in this regard are those which obtain the best results from their students (Area, Hernández, and Sosa, 2016; Mirete, 2016). For this reason, now is the right time for the IHE to lay out specific plans, from base to pinnacle, that will enable them to provide themselves with teams of innovative and solid (self-assured, well-trained) educators, so that they can become true motors of methodological change at the service of the betterment of the education of the university student body (Hernández, González, and Ordaz, 2016).

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