How to cite this article in bibliographies / References

EP Álvarez-Flores, P Núñez-Gómez, C Rodríguez Crespo (2017): "E-skills acquisition and deficiencies at the university in the context of the digital economy". *Revista Latina de Comunicación Social*, 72, pp. 540 to 559.
http://www.revistalatinacs.org/072paper/1178/28en.html
DOI: 10.4185/RLCS-2017-1178

E-skills acquisition and deficiencies at the university in the context of the digital economy

Erika Patricia Álvarez-Flores [CV] [ORCID] http://orcid.org/0000000302790854 [GS] https://scholar.google.es/citations?hl=en&imq=Erika+P.+Alvarez-Flores&user=bkqe3TUAAAAJ Full Professor. Universidad Estatal de Sonora (UES) / State University of Sonora (M´wxico). ericka.alvarez@ues.mx

Patricia Núñez-Gómez [CV] [ORCID] http://orcid.org/0000000200732020 [GS] https://scholar.google.es/citations?hl=es&user=hqiRHYsAAAAJ Full Professor. School of Information Sciences. Universidad Complutense de Madrid (UCM) / Complutense University of Madrid (Spain). pnunezgo@ccinf.ucm.es

Carlos Rodríguez Crespo [CV] [ORCID] http://orcid.org/0000000321875845 [GS] https://scholar.google.es/citations?hl=es&user=cYYVJhoAAAAJ&view_op=list_works Researcher. School of Information Sciences. Universidad Complutense de Madrid (UCM) / Complutense University of Madrid (Spain). carlor08@ucm.es

Abstract

Introduction: The academic qualifications and skills demanded by the e-economy are forcing universities to incorporate academic strategies that facilitate the learning of the technology requirements that enhance individual opportunities of employability. This article evaluates the digital skills of future professionals according to the business requirements emerging in Europe and Latin America. **Methods:** The study is based on a validated survey questionnaire that investigates five key areas of digital skills among Spanish and Mexican undergraduate students. The statistical analysis involves descriptive and correlation stages. **Results and conclusions:** This research study has confirmed that undergraduate students lack digital skills in the areas of communication, safety and problem solving. It has been demonstrated that students do not acquire the skills required by the current context of digital transformation during the course of their university degree programme.

Keywords
Digital skills; digital context; degree programme; employability; comprehensive education; innovation.

Contents

Translation by **CA Martínez-Arcos**
(PhD in Communication, University of London)

1. Introduction

With the consolidation of the *Internet Economy* (OECD, 2005), technological innovation affects products and processes and has an impact on the entire productive sector, which prompts the rapid obsolescence of the competencies contemplated by bachelors' degree programmes and demands the formulation of education and training frameworks that are flexible enough to prevent a gap between the knowledge required by businesses and the knowledge offered by universities, which in turn complicates job creation and economic growth. Various reports, such as the Proposal of Actions for the Formation of Electronics, Informatics and Telecommunication Professionals (PAFET VII, 2011) and more recently the White Paper for the Design of University Degrees in the context of the Digital Economy (MIET, 2015), highlight the importance of considering this changing environment to define educational and training policies.

Advanced digital technologies such as mobile communication, social media, cloud computing, massive data analysis, smart devices, connected objects and sensors, and the revolution brought about by the Internet of things (IoT), are changing work, recreational and private habits (*European Schoolnet* & DIGITALEUROPE, 2015:8). Thus, there is a need to provide people with new skills tailored to the impact of the technological innovation on the economic activity, which is manifested not only in the professional field but also in a generic sense (information management, team work and generation of new knowledge), as pointed out by UNESCO, and the *Institute for Information Technologies in Education* (2011). In this sense, the report *Digital Literacy in education. Policy Brief* (2011 UNESCO) indicates that digital literacy increases job opportunities.

Considering the importance of digital skills in the current international context, this article presents the most important results of a research study focused on identifying the digital competencies that future professionals need to strengthen, within a context of educational innovation, in two bachelor's degree programmes offered by universities in Spain and Mexico. The results will allow us to identify the skills that must be enhanced in undergraduate programmes in order to enhance employability, that is, students' chances of joining the work market in a digital economy.

To this end, this article first offers a review of the academic literature related to digital skills and of the international organisations' technical reports on how to be full citizens in both the professional

and personal realms in the 21st century. Subsequently, the article describes the methods used to determine whether final-year students of two bachelor's degrees have acquired their digital skills during the course of their academic programme. Finally, the article presents the results and conclusions obtained from the sample of the two aforementioned countries.

2. Theoretical framework

The European Commission has launched programmes to stimulate the opportunities of the global information economy since before 2008. However, it is the Europe 2020 strategy which reflects a qualitative change in the importance attached to the hyper-sector of the Information and Communication Technologies (ICT) and the digital transformation. The flagship initiative *Europe 2020, Europe's growth strategy*, which inspires the public-private *Grand Coalition for Digital Jobs*, specific campaigns such as *e-skills for digital jobs*, and the 2014 Forum of Strategic Policies in the field of Digital Entrepreneurship, are expressions of the interest of the Council and the Commission for this information economy. *Europe 2020* recognises the shortage of digital literacy and digital skills and calls universities to exploit the potential of ICTs, analysing the relationship between them and employment in three dimensions: professionals, users and entrepreneurs. Statements on media literacy and information in the Digital Age urge international organisations and educational authorities from around the world to promote the introduction of media and informational literacy as a core competence in the formal and informal education programmes (Pérez-Tornero and Varis, 2010). Meanwhile, Pirzada and Khan (2013) highlight that in the current economy, digital skills combined with higher education are linked to high-level jobs and that to improve employability our efforts should focus on training focused on digital skills.

In Spain, the opportunities offered by ICTs have gained strength in public actions, as indicated by the Digital Agenda for Spain and the *Pledge of Spanish Grand Coalition for Digital jobs*, which was launched in 2013 to improve digital competencies, establishing a series of priorities in the field of training, certification, learning and innovative teaching, mobility and promotion to attract young people to the productive sector. In the case of Mexico, programmes such as *Prosoft*, *ProMexico* and *MexicoFirst* seek to encourage such opportunities. Projects such as *Conecta 2020*, which links the Latin American and European communities, illustrate the importance that the authorities of both continents have granted to this type of transnational initiatives, based on the idea that greater collaboration between them will allow the exploitation of the possibilities offered by the digital future.

In a complementary way, the campaign *e-Skills* tries to promote the sensitivity of society, by promoting the use of these technologies and the safe use of the Internet, facilitating technological vocations and helping the unemployed to re-join the labour market through training in ICT. For its part, the Regional Bureau for Education in Latin America and the Caribbean (2013) stresses that training in digital skills is increasingly important in the field of education as a necessity for inclusion in the knowledge society. Under its criteria, and according to the ideas of other authors (Moeller *et al.*, 2011), ICTs are not only powerful resources for learning, but are also increasingly relevant tools for life.

In this sense, coupled with strategies to improve people's employability, ICTs foster the evolution of traditional teaching models into more flexible, open and participatory models, such as *computer-*

mediated communities and *Personal Learning Environments*, which facilitate the acquisition of digital skills necessary for the incorporation into the labour market (Fundación Telefónica, 2012).

Other contributions are aligned, among others, to the development of key competencies (Rychen and Salganik, 2008), the promotion of students' reflective and autonomous capacity (Boisvert, 2004), the challenges posed by the emergence of the *net generation* for education (Hargittai, 2010), the teaching of digital natives (Prensky, 2011), business training in virtual environments (Reinoso, 2012), the role of online university education in the recruiting of talent for the integration of the knowledge society (Freire and Schuch, 2010), the map of digital skills (Ala-Mutka, 2011), invisible learning (Cobo and Moravec, 2011), and the new learning paradigms and technologies (Esteve and Gisbert 2011). Including, the training of creative thinking for entrepreneurship (Byrge and Hansen, 2013; Elliot and Nakata, 2013).

Strengthening the digital skills is thus an area of priority intervention for EU institutions and a challenge that should be faced by higher education institutions in order to ensure correspondence between the demand for qualifications and competencies by the hyper-sector after the digital revolution. As Perlado and Rubio-Romero (2015) and Armendáriz (2015) point out, education plans must be reconciled and adapted to a new professional reality, as it has also been shown in other studies (Torres, Santa and Pueo, 2013; Martin-del-Peso, Rabadán and Hernández-March, 2013; Arias, Torres and Yáñez, 2014; Torres-Coronas and Vidal-Blasco, 2015; García-Valcárcel and Martín, 2016). On the other hand, when defining digital competencies, the European Commission understands them as one of the eight core competencies that individuals should use in the knowledge society (Punie and Cabrera, 2006), this is the safe and critical use of the society of technological information for work, leisure and communication. The OECD, for its part, defines them as something more than knowledge and skills, and proposes that they must "include the ability to meet complex demands through the use of psychosocial resources (including skills and attitudes) in a particular context" (OECD, 2005:4).

In this sense, it can be said that many of the so-called *digital natives* (Bennett, Maton, and Kervin, 2008) are familiar with technology, but it is also necessary to have digital literacy since, as Pérez-Rodríguez and Delgado (2012:27) point out, "having information does not automatically produce knowledge", since "transforming information into knowledge requires reasoning skills to organise it, link it, analyse, synthesise it, and make inferences and deductions of different levels of complexity; ultimately, understanding and integrating it into the previous schemes of knowledge".

Thus, universities must improve the recognition of their academic programmes by adapting them to a system of digital competencies based on the Framework of ICT competencies, to reduce the gap between workforce supply and demand and stimulate entrepreneurship (The *Startup Europe* programme). These capabilities will optimise students' learning and will promote their individual opportunities of insertion in the job market (Camacho and Lara, 2011). But the University of the 21st century should also promote civic values (European Parliament and the Council, 2008) not only in the digital realm.

The use of technologies in teaching innovation also favours co-creation in interactive teaching methods between teachers and students through the creation and participation in communities of interest in the network (Ortega and Gacitúa, 2008) and, according to Gómez, Roses and Farías (2012:132), in this way it faces "the challenges of higher education from both the technical and

pedagogical points of view". In fact, the new learning cultures and their impact on higher education gain increasing relevance (Escofet, García and Gros, 2011).

3. Methods

The method used for this analysis is a validated survey questionnaire. The survey was applied to a representative sample of students of the bachelor's degree programmes in International Commerce and Advertising and Public Relations of the State University of Sonora (Mexico) and the Universidad Complutense de Madrid (Spain), respectively. Based on the analysis of the digital competencies of undergraduates in terms of knowledge, skills and attitudes required for different job positions, this study quantitatively describes the digital culture level of students, taking into account basic elements required by individuals such as professional skills, which allows us to explore the risks and opportunities to respond to the need for adaptation and change required in the job market of the 21st century society.

The specific objectives of this research are: 1) test whether final-year students possess the digital competencies required for the digital economy according to the technical reports of reference; 2) identify whether there is a significant difference in terms of digital competencies between first-year and final-year undergraduates; 3) determine whether Spanish students have greater skill acquisition in comparison to Mexican students, regardless of the subjects included in their degree programmes. The contribution of this study is to highlight the possible deficiencies according to the requirements of the digital economy. The study goes beyond detecting the digital competencies of students and identifies the technological inadequacies that should be mitigated in the academic system to facilitate students' insertion in the workplace.

To be precise, this research aims to answer the following questions: 1) what is the digital culture level of students to respond to the need for adaptation and change required in the 21st century society? 2) What digital areas should be strengthened at the University to facilitate students' insertion into the economic sphere? 3) Is there an evolution in terms of digital competencies between first-year and final-year undergraduate students.

3.1. Statistical analysis

The statistical analysis involved descriptive and inferential phases performed with SPSS V. 16. The inferential phase consisted of measuring the Pearson's correlation coefficient, accepting a confidence level of α=0.05, under the assumptions of normality, homoscedasticity and linearity. The correlation analysis will allow us to determine whether the competencies are acquired during the undergraduate degree programme or have been previously acquired.

3.2. Sample's properties and data collection techniques

Data collection was performed during the 2015-2016 academic year, in which 675 students were enrolled in the BA in International Commerce, including 133 final-year and 186 first-year students. To maintain a balance in the distribution of participants by countries in the sample, we used a simple random method to choose 326 students from the same years from the BA in Advertising and Public Relations. Not all the selected students answered the questionnaire, resulting in a non-response rate of 0.023%. Hence the study population is composed of 630 students aged 18 to 25 years, distributed

in the following way: 50.8% (n=320: 141 final-year and 179 first-year) from the Complutense University of Madrid (Spain) and 49.2% (n=310: 133 final-year and 177 first-year) from the State University of Sonora (Mexico). 35.88% of the respondents were men and 64.12% were women. The selection of students of these years and degree programmes aims to highlight differences between freshers and final-year students. It is assumed that students at the complete their academic education are more likely to be trained digitally in a more efficient way in comparison with fresher university students. In relation to the degrees, the analysis focuses on degrees that are related to the Digital Economy.

Table 1: Digital Competence Framework

AREA	COMPETENCE
1. Information	1.1. Browse, searching and filtering data 1.2. Evaluating data, information and content 1.3. Information storage and feedback
2. Communication	2.1. Interaction through digital technologies 2.2. Sharing through digital technologies 2.3. Participation in online communities 2.4. Collaboration through digital media 2.5. Netiquette 2.6. Managing digital identities
3. Content creation	3.1. Developing digital content 3.2. Integrating and re-elaborating of content 3.3. Copyright and licenses 3.4. Programming
4. Safety	4.1. Protecting devices 4.2. Protecting personal data 4.3. Protecting health and well-being 4.4. Protecting the environment
5. Problem solving	5.1. Solving technical problems 5.2. Identifying needs and technological responses 5.3. Creatively using digital technologies 5.4. Identifying digital competence gaps

Source: European Commission (Ferrari, 2013).

An online self-answered questionnaire of 63 items was used to collect the information and assess the skills of students. This questionnaire included a set of items specifically designed to measure the use of technologies and the level digital competences, as well as a set of 8 questions about general aspects of participants. The descriptors of the questions that seek to identify the degree of digital culture are based on the variables of the conceptual framework DIGCOMP (*Digital Competence*) proposed by the European Commission (Ferrari, 2013). These variables have been used recently in the development of evaluation models in ICTs (Cejas, Navío and Barroso, 2016). This framework identifies 21 digital competencies divided into 5 areas, as shown in Table 1. Each competence includes a series of blocks of knowledge, skills and attitudes, which allows us to use three levels for the measurement of the questions: Basic A Level ("the person is aware and understands how it is done"), Intermediate B Level ("the person is capable of using and making") and Advanced C Level ("the person participates actively in it as a practice"). The degree of digital culture that students possess in each area depends on the knowledge, skills and attitudes they have in relation to each competence.

The elements that comprise the framework that informs the questionnaire and the questionnaire itself have been validated and applied by various international academic experts (Fraillon *et al*, 2014; Ala-Mutka, 2011; Ferrari, 2012; Janssen and Stoyanov, 2012). However, we carried out two pre-tests on groups of 10 students from both universities to confirm the questionnaire was understandable.

4. Results

4.1. General analysis of competencies in the digital economy framework

The analysis of data indicates that young people have a solid understanding of information browsing, search and control, evaluation, storage and feedback (area of Information). 81.4% of students tend to show high levels of expertise and advanced skills (58.1% has an intermediate level and 23.3% an advanced level) to find a wide range of information sources expressing their needs in search engines, databases, and linked references. Many of them (71.7%) possess a set of skills to compare different sources of information, be critical to check and evaluate their validity and credibility by remove information from sources whose nature is unclear. 66% has the capacity to store content and information and can apply strategies to retrieve and manage information that has been stored under different formats into folders set on hard drives or the cloud. This would allow them to unify information of interest for companies that has been disseminated across different digital sources.

In the area of communication, 95% of the participants can interact with others through various tools such as mobile phones, VoIP, social networks and email. 77.8% has an intermediate or advanced level. This is favourable in a context where almost half of the companies use social networks to recruit potential candidates (Campos and Alonso, 2015) and where the Internet enables two-way communication and the business development, marketing and public relations of companies. While the results show that 95% of students are capable of sharing files and content through email or other simple technological applications (54.4% also share information in online communities), the figures suggest that young people have a tendency to decrease their active participation in social networks, online communities and collaboration platforms in order to share frequently knowledge and discuss confidently in collaboration with others. In fact, only 18.3% do so.

It is striking that 35.1% of students has never participated or has no interest in participating in online spaces or services, although they claim they are aware of the existence of these spaces. Thus, it can be seen a weakness for some of these young people. According to Pirzada and Khan (2013), some employers indicate that communication skills in these media are highly required for a well-paid job. For a professional in International Commerce it is favourable to maximise the different customer-attraction channels and to know the tools for attracting new opportunities for global business in the field of the Digital Economy, where there is a proliferation of *eCommerce* (which involves different conditions on the process such as communication and brand management) and the legislative mechanisms to export and import products, which are now digital, etc. On the other hand, in the case of work related to advertising, this is one of the areas that is experiencing the most changes. Personnel trained in digital competencies related to *online* communication (*e-books*, social networks, newspapers and online magazines, digital kiosks, blogs, etc.) are required to achieve an optimal and maximum dissemination of messages in the media. Hence, "the interactivity of the user in digital applications, on the internet and in social networking sites is of utmost importance" (MIET, 2015:116), as shown in the new professional profile of communication exposed by Armendáriz (2015).

More than half of the participants (52.4%) showed a lack of knowledge in netiquette: they only know its basic form or are not aware of it. In this sense, they have confirmed that they are not able to develop strategies to discover inappropriate behaviour on the Internet. Another barrier is the management of digital identities. Only 15.1% knows how to properly protect their digital reputation according to the context and purpose. This implies that workers could create give a bad image and a bad online reputation through the improper activities on social networks, digital media and virtual communities in general. The analysis shows that young people have not been trained or they have not been interested in developing advanced knowledge in all areas of the digital competence. It would be appropriate for the traditional degrees to take into account these sets of knowledge and skills so that they can offer "education that is closer to the area of the Digital Economy and enjoy a good reception in the labour market" (MIET, 2015:75).

With regards to the area of content creation, 94.6% of the participants can produce or improve digital content in different formats, including multimedia content, through software that allows them to generate presentations, images, audio and video in creative ways. 14.7% of these participants also have skills to use digital media to create representations that transmit knowledge (mental and conceptual maps and diagrams) and 20.1% can create content in movie formats. This is one of the requirements related to the development of multiplatform audiovisual content, which favour employability (MIET, 2015) as it is identified as one of the most valued competencies in the area of advertising (Monge and Etxebarria, 2017). Although most respondents believe they make an effective use of digital technology for content creation, only 14.3% felt they properly understand how copyright and licensing rights are applied to the information and resources they use and develop. Taking into account the profiles of students, it was expected they tend to show very low skills to code and program in several languages. Only 7.2% understands the systems and functions behind the software they use, despite the reports on future professional profiles require a multidisciplinary character (MIET, 2015) regardless of the area of specialisation.

In addition, the analysis of participants reveals that most of them are not committed to using technology safely and effectively. Only 41.2% knows how to protect personal data and privacy online. 94.6% says they use anti-virus or passwords to protect their devices, while 16.5% updates

them frequently and acts when the device is in danger (malware, virus, etc.). 89.9% know how to prevent cyber bullying, but only 23.3% understand the proper use of technologies to prevent health problems (from ergonomic aspects to technology addiction). In this sense, Bremer (2013) says that a job does not only require the ability to identify and evaluate options, but also the ability to correctly known how to maintain a safe and healthy work environment, and to adapt successfully to changing situations.

When asked about solving (technical and conceptual) problems, most participants (91.4%) stated they can identify technical issues to ask for specific help and support when technology fails or when they have a new device. 54.8% have skills to solve simple technical problems arising from the use of technology and 11.8% of them can solve a wide range of them. 93.2% use certain technologies to solve problems, but for small tasks. They are capable of making decisions when choosing a digital tool for common practice. 45.5% says they can solve non-routine tasks through the exploration of technological possibilities and select the appropriate tool according to the purpose, and that they are able of evaluating their effectiveness.

There is a striking lack of knowledge among participants (11.1%) on how to use digital media and technologies to solve conceptual problems and contribute to the generation of knowledge by participating with others in creative and innovative actions. Students show an important gap in this regard according to Green *et al.* (2007), who point out that those employees who can make an appropriate use of ICTs and analyse complex problems in depth, plan activities, persuade and influence others in the workplace better salary benefits. This same aspect is reflected in the studies of Monge and Etxebarria (2017), who highlight the need for professionals with analytical skills for the development of campaigns in digital media.

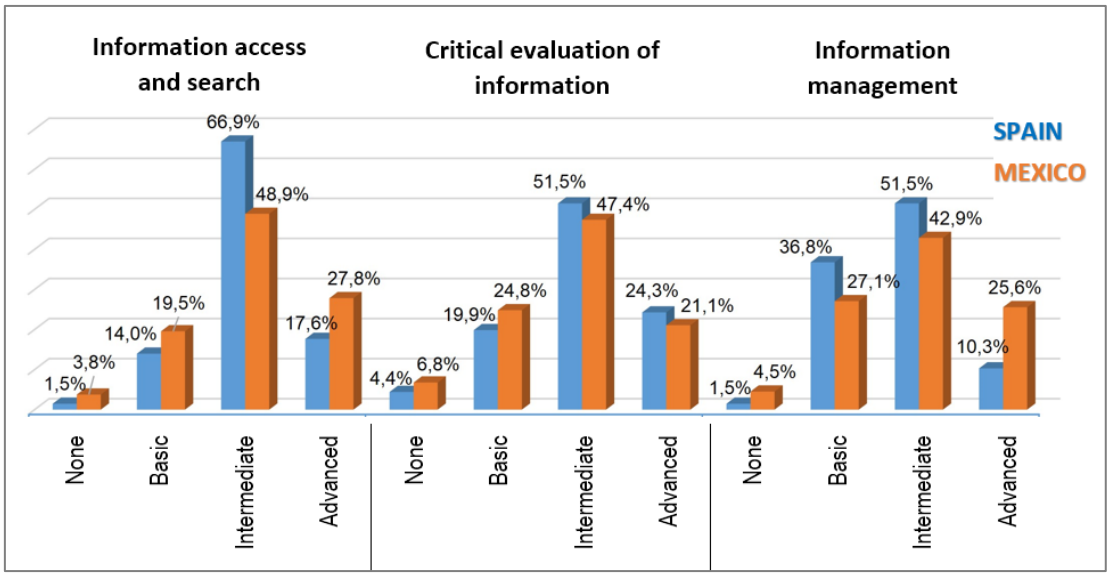
Participants seem to be aware of their limitations to use of technologies, but only 9% of them update take online courses (at least once a year) to update their knowledge on digital competencies and new applications.

Continuous technological changes increase the complexity of the skills required in the workplace and, based on the results, it seems that employment opportunities decrease for those students who fail to meet the skills required in a job or industry (Bremer, 2013).

4.2. Comparison of Spanish and Mexican university students

As shown in Figure 1, with regards to the digital skills acquired in the area of information, Mexican students show a higher rate of advanced skills to access, search and manage information. While Spanish students have better attitude to carry out a critical evaluation of information. An important finding in this regard is the smaller share of Spanish participants with deficiencies in knowledge and skills with respect to this area.

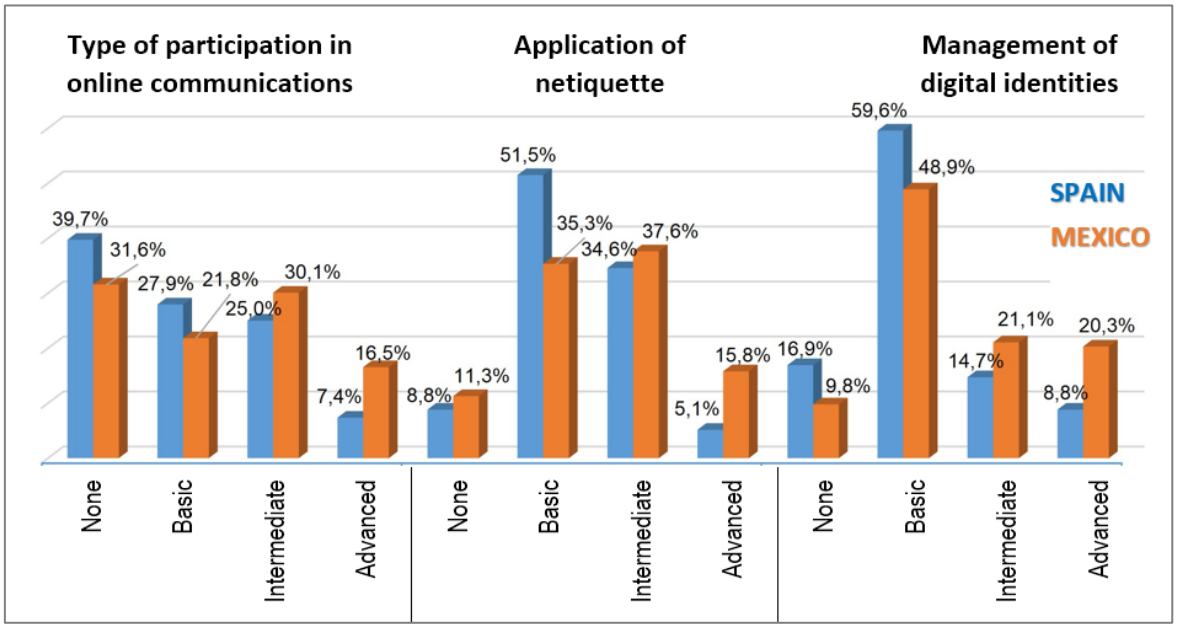
Figure 1. Degree of knowledge, skills and attitudes in the area of digital information



Source: Authors' own creation

Regarding the area of digital communication, despite most students use social networking and other communities online, the rates detected suggest that their skills are still basic, as shown in Figure 2, which presents the preponderance of the basic level on the application of netiquette and digital identities. These percentages contrast with those in the area of information. However, Mexican students had a better performance than their Spanish counterparts in this area.

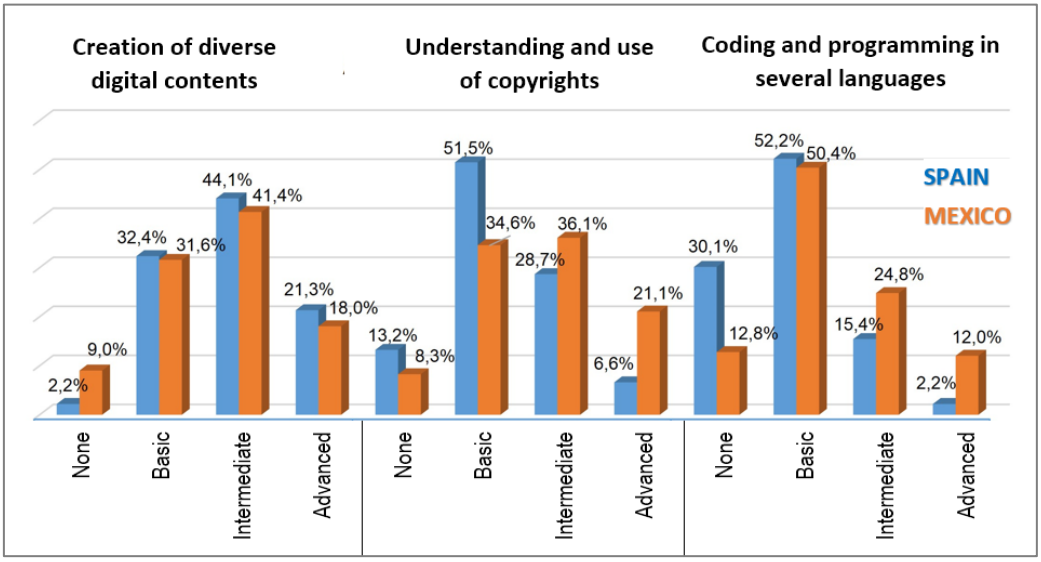
Figure 2. Degree of knowledge, skills and attitudes in the area of digital communication



Source: Authors' own creation

With regards to the area of content creation, there are significant differences between Mexicans and Spaniards, as shown in Figure 3. Spanish students have developed greater digital skills for the creation of various digital elements. Although the basic level is predominant in some skills in this area, Mexicans show better understanding of how copyright and licensing rights are applied to information, as well as a greater understanding in coding and programming languages.

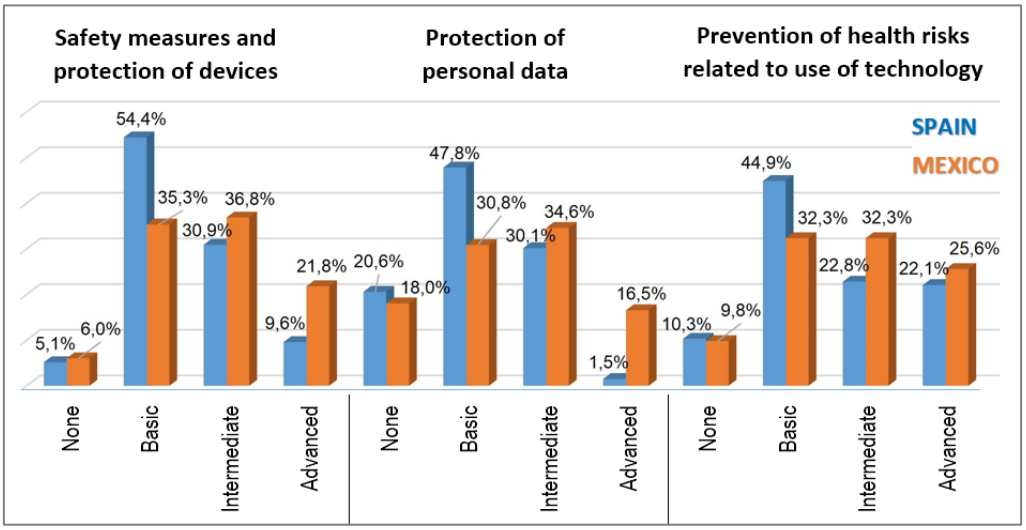
Figure 3. Degree of knowledge, skills and attitudes in the area of digital content creation



Source: Authors' own creation

The crossing of data from the area of safety shows that Mexicans have a better attitude, knowledge and skills to use technologies more safely than Spanish students. As we can see in Figure 4, the basic level for this is significantly higher among Spanish students.

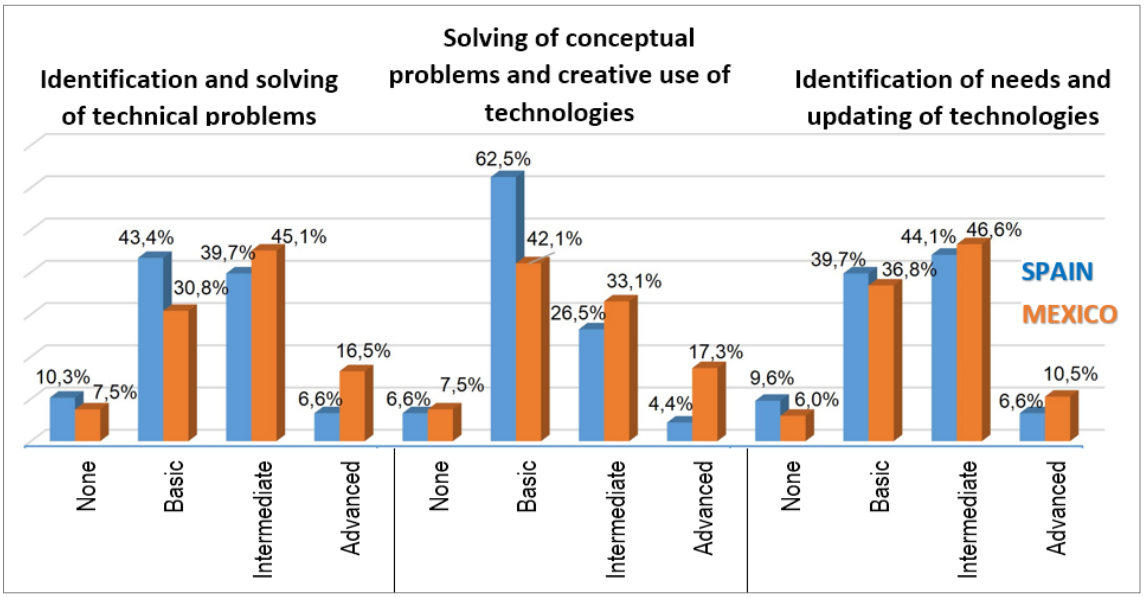
Figure 4. Degree of knowledge, skills and attitudes in the area of digital safety



Source: Authors' own creation

Similarly, when comparing the categories of problem solving, the results show significant differences between countries once again. Despite this is the area with the lowest values (Figure 5), the acquisition of these skills among Mexican students is more effective than among their Spanish counterparts.

Figure 5. Degree of knowledge, skills and attitudes in the area of technical and conceptual problem solving



Source: Authors' own creation

If we consider that the degree of digital culture depends on a variety of reasons (knowledge acquired prior to university, the acquisition form, the needs according to requirements of teachers, interest developed in digital content, etc.), the difference between countries may be influenced by the fact that most Mexicans participants (94.7%) acquired some digital skills through academic activities in previous schools; 41.4% learnt through trial and error; 36.8% through friends; and 44.4% through videos and tutorials. This contrasts with Spanish students, who showed a higher index of independent training: 55.9% learnt through trial and error and 45.6% through videos and tutorials. 48.5% was previously trained in other schools and 53.7% learnt from friends. Another element to be highlighted, although it does not offer guarantees of the difference between countries, is that 35.3% of the Mexican students have participated in some innovation or research experience at the university, compared to 28.7% of young Spaniards. In addition, 78.2% of Mexican students' teachers use educational platforms and 37.6% use social networks as support for their courses. Meanwhile, in the case of Spanish students only 45.6% of their professors use an educational platform and 50% use social networks for teaching-learning process.

4.3. Inferential analysis of competencies of students according to year of study

The results of the inferential analysis performed on the relationship between skill acquisition and year of study (first and final) revealed a weak correlation only in three competencies: one from the

area of information and two from the area of communication. The data shown in Table 2 show that students who are concluding their degree programme have better skills to manage information, that is, they increase the implementation of various strategies to retrieve content that has been previously organised and stored in folders on a hard disk or in the cloud, and to share it with other students. Also, during their formation they increased participation in online services, as well as their collaboration with other people who use digital tools. This is corroborated by the fact that the percentage of students with above-basic levels in information management reaches 62% among first year students and 75% among final-year students. Another significant but weak difference is seen in participation in communities, with 54.7% among final-year students and 34.6% among final-year students.

Table 2. Significant relations between study year and competencies in five areas

	Competence	Pearson's correlation coefficient	Sig. (2-tailed)
Relationship between study-year and information	Information storage and feedback	0.136	0.026
Relationship between study-year and communication	Participation in online communities	0.134	0.028
	Collaboration through various digital media	0.120	0.049

Source: Authors' own creation

According to Hernandez, Fernández and Baptista (2010), correlations can be significant, but if they are under 0.30 they are not so useful. As a result, with regards to our research question on whether there is an evolution in the competences between new-year and final-year students, the study showed that there is none, that students are not acquiring a higher degree of digital culture during their university life.

As we can see in Table 3, the analysis considered data concerning relations between country and competencies of the five areas. As shown in the descriptive analysis, there is still a weak correlation between these variables, specifically in 13 competences: one from the area of information, four from the area of communications, two from content creation and one from problem solving.

The analysis has revealed that there is a mid correlation (values greater than 0.30) between the 21 competencies measures, so that the level values observed maintain a homogeneous behaviour. Likewise, the analysis indicates that participation in online communities, software configuration, assessment of technical needs and use and identification of digital media to solve problems are related to the participation in innovative or research experience at the university.

Table 3: Significant relationships between country and competencies in the five areas

	Competence	Pearson's correlation coefficient	Sig. (2-tailed)
Relationship between country and information	Information atorage and feedback	0.124	0.042
Relationship between country and communication	Sharing of information and content	0.131	0.032
	Participation in online communities	0.152	0.013
	Netiquette	0.135	0.027
	Digital identity management	0.206	0.001
Relationship between country and content creation	Copyright and licenses	0.240	0.000
	Programming	0.281	0.000
Relationship between country and safety	Protection of device	0.181	0.003
	Protection of personal data	0.210	0.001
	Protection of environment	0.226	0.000
Relationship between country and problem solving	Solution of technical problems	0.173	0.004
	Identify technology needs to solve problems	0.226	0.000
	Innovate creatively using technology	0.203	0.001

Source: Authors' own creation

5. Discussion and conclusions

The authorities of the EU and Latin America have put in place various programmes related to the promotion of the development of appropriate digital competencies to improve the adaptation to the new requirements of the *Internet Economy*. However, these regulatory efforts and the promotion of the *e-Economy*, and specifically of digital skills, as reflected in the manifesto of the European Commission and the recent Bratislava Declaration, are having an uneven result.

Our research has identified the degree of digital culture of university students to respond to the need for adaptation and change required in the 21st century society. The weakness of the analysed students is manifested in their digital deficiencies to share and discuss in collaboration with others through social media, online communities and collaboration platforms, the application of regulations when working digitally and the management of digital identities, which is one of the competences with the highest incidence to be relegated. The study also highlights students' lack of knowledge on how to use digital media and technologies to solve conceptual problems and contribute to the creation of

knowledge by participating with others in creative and innovative actions. This deficiency can lead students to a less skilled job, since employers want guarantees that young people seeking employment have skills to expand their knowledge, to solve problems, take initiative and communicate with team members, not only to follow prescribed routines (UNESCO, 2012; Armendáriz, 2015; Monge and Etxebarria, 2017). Also worrying are the shortcomings and lack of skills in relevant aspects such as the safety of personal data and the management of devices. The analysis showed that, during their academic training, students did not acquire all the fundamental skills needed to improve employability in a digital economy (*Expert Group on New Skills for New Jobs*, 2010), in which "a better qualification by graduates in areas close to the Digital economy would help to shorten times of labour insertion" (MIET, 2015:89). The competencies that are acquired or improved at the university are related with information management.

This research provides empirical evidence that young people do not make the most of the possibilities offered to them by new technologies, which reinforces similar conclusions reached by other studies (Ferrés, Aguaded and García, 2012), which detected the limited use and shortcomings among digital natives in relation to technologies. As Öngün and Denirag (2015:184) point out, "data indicate that young people have a passive profile focused on interaction, communication, and downloading information", i.e., they consume information passively instead of creating content actively. This research reinforces Jenkins's study (2009), which indicates that many young people have important shortcomings given that they have acquired their digital knowledge in an experimentally way, based essentially on a trial and error basis and have even developed bad habits: passive and uncritical information consumption habits. This attitude, unfortunately, as shown in our results, has not changed significantly. The deficit in digital literacy persists and this may limit students' employment opportunities. As Pirzada and Khan (2013) have showed, digital skills and qualifications have a strong influence on employment and wages. Therefore, this is one of the areas to reinforce in university degrees.

ICT skills can be used to raise a person's employability, particularly when combined with other skills and attributes. Thus, students should use digital tools which are crucial for their learning and their growth in the digital age. However, "the potential of ICT can improve the employability of a person depending on the needs of employers and the extent in which ICT skills will be used at the workplace" (Green *et al.*, 2013:37).

Many young people face difficulties to find a job due to the mismatch between education and the requirements of the market (Bremer, 2013). In this sense, this research highlights that in the digital competencies of university students of traditional qualifications, measured with respect to work, there is a clear educational deficiency in certain skills at the beginning of their studies, as well as at the end of their academic training. It was showed that competing the final-year of the degree does not guarantee a degree of digital culture higher than the basic level, i.e. they are not acquired during the university undergraduate degree.

This research study also offers a vision of the digital behaviour of students from two universities, which reflects the shortcomings in significant skills among the participating countries. However, young Mexicans are currently more dynamic at taking advantage of the possibilities offered by the digital society, and have developed more skills related to the areas of communication, safety and problem solving, all of which can improve their employability, even in an international context that insists on opportunities of the *Internet Economy* for job creation and economic growth.

This research is part of a larger project that considers university degree programmes in other areas of knowledge and other countries. In future research, it is important to verify, through *ad hoc* studies, whether teachers' training strategies and skills can adversely affect the digital training of students.

*Funded research. This article has been produced by the "Digital Literacy at the University" Network (RED-LDU), certified by Mexico's National Council for Science and Technology (CONACYT) since May 2016 (project number 271853). The Network is composed of researchers, academics and students of the University of Veracruz, University of Sonora, the State University of Sonora, the Autonomous University of Ciudad Juárez and the Centre for Written Language and Mathematics Research (CILEM). The project has been supported by the programme "Dissemination actions of the European Commission's initiatives in relation to youth employment initiatives" of the Complutense University of Madrid, which has been funded by the European Commission.

6. References

K Ala-Mutka (2011): *Mapping Digital Competence: Towards a Conceptual Understanding. Technical Note: JRC 67075* – Joint Research Centre – Institute for Prospective Technological Studies. Seville: JRC-IPTS (https://goo.gl/aBl4zv).

M Arias, T Torres & JC Yáñez (2014): "El desarrollo de competencias digitales en la educación superior". *Historia y Comunicación Social*, 19(Esp.) pp. 355-366.
doi: http://dx.doi.org/10.5209/rev_HICS.2014.v19.44963

E Armendáriz (2015): "El Nuevo perfil del profesional de la Comunicación y las Relaciones Públicas. Una visión desde la perspectiva del Mercado". *Revista Internacional de Relaciones Públicas*, 9(V), pp. 153-178.
doi: http://dx.doi.org/10.5783/RIRP-9-2015-09-153-178

S Bennett, K Maton & L Kervin (2008): "The 'digital natives' debate: A critical review of the evidence". *British Journal of Educational Technology*, 5(39), pp. 775-786. doi: http://dx.doi.org/10.1111/j.1467-8535.2007.00793.

J Boisvert (2004): *La formación del pensamiento crítico: teoría y práctica*. México: Fondo de Cultura Económica.

L Bremer (2013): *Enhancing youth employability: What? Why? and How? Guide to core work skills*. International Labour Office, Skills and Employability Department. (https://goo.gl/NHE1j7).

C Byrge & S Hansen (2013): "Course in New Thinking in higher education: Enhancing creativity through the means of training, theory and workshop". *Problems of Education in the 21st Century*, 51(51), pp. 18-32.

M Camacho & T Lara (2011): *M-Learning en España, Portugal y América Latina. Monográfico SCOPEO n.3,* Salamanca: Servicios de publicaciones de la Universidad de Salamanca. (https://goo.gl/CEzkup).

F Campos & N Alonso (2015): "Las herramientas digitales sociales en línea para la autopromoción laboral. Hacia un estado de la cuestión". *Revista Latina de Comunicación Social*, 70, pp. 288-299. (https://goo.gl/Py7vxP).
DOI: 10.4185/RLCS-2015-1047

R Cejas, A Navío & JM Barroso (2016): "Las competencias del profesorado universitario desde el modelo TPACK (Conocimiento Tecnológico y Pedagógico del Contenido)". *Pixel-Bit. Revista de Medios y Educación*, 49, pp. 105-119.
doi: http://dx.doi.org/10.12795/pixelbit.2016.i49.07

C Cobo & JW Moravec (2011): *Aprendizaje invisible. Hacia una nueva ecología de la educación*. Col·lecció Transmedia XXI. Laboratori de Mitjans Interactius / Publicacions i Edicions de la Universitat de Barcelona. Barcelona (Spain). (https://goo.gl/oYgyU).

EA Elliot & C Nakata (2013): "Cross-Cultural Creativity: Conceptualization and Propositions for Global New Product Development". *The Journal of Product Innovation Management*, 30(S1), pp. 110-125.
DOI:10.1111/jpim.12066

A Escofet, I García & B Gros (2011): "Las nuevas culturas de aprendizaje y su incidencia en la educación superior". *Revista Mexicana de Investigación Educativa*, 51(16), pp. 1177-1195. (https://goo.gl/9vDPm0).

F Esteve & M Gisbert (2011): "El nuevo paradigma de aprendizaje y las nuevas tecnologías". *Revista de Docencia Universitaria (REDU)*, 9, pp. 55-73. (https://goo.gl/GmYj6Q).

European Parliament and the Council. (2008). "Decision of the European Parliament and of the Council of 16 December 2008 concerning the European Year of Creativity and Innovation (2009". *Official Journal of the European Union*, L348/115. (https://goo.gl/FAOcM0).

European Schoolnet and DIGITALEUROPE (2015): *The e-skills Manifesto 2015*. European Schoolnet: Bruselas. (https://goo.gl/q8dwX9).

Expert Group on New Skills for New Jobs (2010): *New Skills for New Jobs: Action Now*. A report by the Expert Group on New Skills for New Jobs prepared for the European Commission. (https://goo.gl/Rkz6nn).

A Ferrari (2012): *Digital Competence in practice: An analysis of frameworks*. Seville: JRC-IPTS.

A Ferrari (2013): *DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe*. Joint Research Centre of the European Commission. (https://goo.gl/MyjRyZ).

J Ferrés, I Aguaded & A García (2012): "La competencia mediática de la Ciudadanía Española. Dificultades y retos". *Icono 14*, 3(10), pp. 23-42.
doi: http://dx.doi.org/10.7195/ri14.v10i3.201

J Fraillon, J Ainley, W Schulz, T Friedman & E Gebhardt (2014): *Preparing for Life in a Digital Age. The IEA International Computer and Information Literacy Study*. Australia: Springer Open.

J Freire & K Shuch (2010): "Políticas y prácticas para la construcción de una Universidad Digital". *La Cuestión Universitaria*, 6, 85-94. (https://goo.gl/Tj4xUr).

Fundación Telefónica (2012): *Universidad 2020: El papel de las TIC en el nuevo entorno socioeconómico*. (https://goo.gl/6rDA8S).

A García-Valcárcel & M Martín (2016): "Análisis de las competencias digitales de los graduados en titulaciones de maestro". *Revista Latinoamericana de Tecnología Educativa*, 15(2), pp. 155-168.
doi: http://dx.doi.org/10.17398/1695-288X.15.2.155

M Gómez, S Roses & P Farias (2012): "El uso académico de las redes sociales en universitarios". *Comunicar*, 38(XIX), pp. 131-138.
doi: http://dx.doi.org/10.3916/C38-2012-03-04

AE Green, M de Hoyos, SA Barnes, D Owen, B Baldauf & H Behle (2013): *Literature Review on Employability, Inclusion and ICT, Report 2: ICT and Employability.* Centeno C, Stewart J (Eds.). JRC Technical Report Series, JRC EUR 25792 EN. Institute for Prospective Technological Studies, Joint Research Centre, European Commission. (https://goo.gl/aeFOui).

F Green, A Felstead, D Gillie & Y Zhou (2007): "Computers and pay". *National Institute Economic Review*, 201(1), pp. 63–75.

E Hargittai (2010): "Digital Na(t)ives? Variation in Internet Skills and Uses among Members of the Net Generation". *Sociological Inquiry*, 1(80), pp. 92–113.
doi: http://dx.doi.org/10.1111/j.1475-682X.2009.00317.x

R Hernández, C Fernández, MP Baptista (2010): *Metodología de la Investigación. Quinta edición*. México: Mc Graw Hill.

J Janssen & S Stoyanov (2012): *Online Consultation on Experts' Views on Digital Competence*. Seville: JRC-IPTS. (https://goo.gl/JwDpmr).

H Jenkins (2009): *Confronting the Challenges of Participatory Culture*. Media Education for the 21st Century. Cambridge, Massachusetts. The MIT Press. (https://goo.gl/n661EV).

A Martín-del-Peso, B Rabadán & J Hernández-March (2013): "Desajustes entre formación y empleo en el ámbito de las enseñanzas técnicas universitarias: la visión de los empleadores de la Comunidad de Madrid". *Revista de Educación*, 360, pp. 244-267.
DOI: 10.4438/1988-592X-RE-2011-360-110

Ministerio de Industria, Energía y Turismo (MIET) (2015): *Libro Blanco para el Diseño de las Titulaciones Universitarias en el Marco de la Economía Digital*. Agenda Digital para España.

S Moeller, A Joseph, J Lau & T Carbo (2011): *Towards Media and Information Literacy Indicators*. Paris: UNESCO. (https://goo.gl/04syAg).

S Monge & J Etxebarria (2017): "Competencias más valoradas por los profesionales de la publicidad de la Comunidad Autónoma Vasca. Comparación 2008-2016". *Communication & Society*, 30(2), pp. 97-111. (https://goo.gl/qoFVSf).

OECD (2005): *The definition and selection of key competencies*. Executive summary. 27 May 2005. (https://goo.gl/cTb3yf).

Oficina Regional de Educación para América Latina y el Caribe (OREALC/UNESCO Santiago) (2013): *Situación Educativa de América Latina y el Caribe: Hacia la educación de calidad para todos al 2015*. UNESCO. (https://goo.gl/Zl2Ysx) (2016-01-30).

E Öngün & A Denirag (2015): "El uso de Multimedias en las tareas académicas por los estudiantes". *Comunicar*, 44(XXII), pp. 121-129
doi: http://dx.doi.org/10.3916/C44-2015-13

S Ortega & JC Gacitúa (2008): "Espacios interactivos de comunicación y aprendizaje. La construcción de identidades". *Revista de Universidad y Sociedad del Conocimiento (RUSC)*, 2(5), pp. 17-25. (https://goo.gl/F2kfru).

PAFET VII (2011): Perfiles profesionales más demandados en el ámbito de los contenidos digitales en España 2012-2017. Madrid: Fundación tecnologías de la información- Ministerio de Empleo y Seguridad Social.

MA Pérez-Rodríguez & A Delgado (2012): "De la competencia digital y audiovisual a la competencia mediática: dimensiones e indicadores". *Comunicar*, 39(XX), pp. 25-34.
doi: http://dx.doi.org/10.3916/C39-2012-02-02

JM Pérez-Tornero & T Varis (2010): *Media literacy and new humanism*. UNESCO Institute for Information Technologies in Education. (https://goo.gl/SsWFMl).

M Perlado & J Rubio-Romero (2015): "Competencias, habilidades y formación del creativo publicitario en la era digital". *Creatividad y Sociedad*, 23, pp. 6-34. (https://goo.gl/utXHXV).

K Pirzada & FN Khan (2013): "Measuring Relationship between Digital Skills and Employability". *European Journal of Business and Management*. 5(24), pp. 124-133 (https://goo.gl/d58tCg).

M Prensky (2011): *Enseñar a nativos digitales*. Spain: Madrid Ediciones MS. (https://goo.gl/0x2awj).

Y Punie & M Cabrera (2006): *The Future of ICT and Learning in the Knowledge Society*. Institute for Prospective Technological studies. European Commission. (https://goo.gl/K5YDBI).

JF Reinoso (2012): "Aplicación de un ambiente virtual de aprendizaje orientado a la formación empresarial". *Estudios gerenciales*, 122(28), pp. 105-119.
doi: http://dx.doi.org/10.1016/S0123-5923(12)70196-1

S Rychen & L Salganik (2008): *Definir y seleccionar las competencias fundamentales para la vida*. México: Fondo de Cultura Económica.

RM Torres, A Santa & B Pueo (2013): "Innovando en la educación para la empleabilidad y el desarrollo de carrera profesional en Publicidad y Relaciones Públcas. SocialOVTT un caso de estudio. *EDUTEC. Revista Electrónica de Tecnología Educativa*, 44, pp. 1-16. (http://hdl.handle.net/10045/34382).

T Torres-Coronas & MA Vidal-Blasco (2015): "Percepción de estudiantes y empleadores sobre el desarrollo de competencias digitales en la Educación Superior", *Revista de Educación*, 367, pp. 63-90.
DOI: 10.4438/1988-592X-RE-2015-367-283

UNESCO and Institute for Information Technologies in Education (2011): *Digital Literacy in education. Policy Brief*. (https://goo.gl/YAEaLJ).

UNESCO Education for All Global Monitoring Report (2012): *EFA GMR 2012 Youth and skills: Putting education to work.* (https://goo.gl/dTfFp).

How to cite this article in bibliographies / References

EP Álvarez-Flores, P Núñez-Gómez, C Rodríguez Crespo (2017): "E-skills acquisition and deficiencies at the university in the context of the digital economy". *Revista Latina de Comunicación Social*, 72, pp. 540 to 559.
http://www.revistalatinacs.org/072paper/1178/28en.html
DOI: 10.4185/RLCS-2017-1178

Article received on 2 on March 2017. Accepted on 18 May.
Published on 24 May 2017.