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Beliefs and Behaviours in Education and Culture: Cultural Determinants and Education

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Spanish Teachers' Perception of Their Ownand Their Students' Digital Competencies[1]

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Abstract

This paper examines Spanish teachers' perception of their own level of digital competency and that of their students. It works with a sample of 120 Spanish teachers of Primary and Secondary Education. Empirical data is collected through a Likert scale, valid and reliable. The results indicate that teachers perceive high their levels of digital skills. Also they value with medium that of their students. However statistically significant differences were found by relation with specific sociological variables of the sample. The results presented here show that the use of ICT in the classroom consolidates security and command of digital competencies in both teachers and students.

Keywords: *Digital competency, ICT, teachers, students, perception, Compulsory Education*

Introduction

This paper forms part of an R+D project funded by Spain's Ministry for Science and Innovation whose main objective is to assess the impact of ICT education policies in Spain's education system and specifically the *Escuela TIC 2.0* [ICT School 2.0] program.

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This scientific project falls within a line of research based on the monitoring of the implementation of ICT in Spain's different geopolitical regions over the last decade (Area 2010; De Pablos et al. 2010; González-Pérez2010, 2011). These studies have managed to identify certain indicators of interest that may help us to calibrate more precisely the level of impact of ICT educational policies in the Spanish education system. According to Colás, Conde and González (2015), *the level of digital competency* should be considered an indicator to take into account in the success of ICT policies, as it is currently one of the key competencies for education and training in international education systems.

However, the identification of digital competency levels is not an easy task. This is partly due to the lack of agreement over the conceptualization of what is understood as digital competency. This conceptualization is essential and fundamental for the drawing up of tailored systems. The following section presents a synthesis of the main conceptualizations in the specialized literature.

What is meant by digital competencies?

Van Deursen and Van Dick (2009) criticize most of the definitions of digital competency published on the internet for their superficiality and for being basically a list of internet skills. These authors have broken down the definitions of digital competency published in scientific studies into four different groups:

1) Digital competency understood as *technical skills for handling the internet.* In this conceptualization, digital competency is linked to basic skills in the use of information technology (Steyaert 2000, 2002; Bawden 2001; Søby 2003; Van Dijk 2005).
2) Digital competency as *formal internet skills.* This competency allows users to choose their own, non-linear paths. Thus, users who already possess technical expertise have more freedom to choose their own ways. This is made possible thanks to Hypermean (Kwan 2001).
3) Digital competencies as *information skills (digital literacy)*. Some studies (Bawden 2001; Correia and Teixeira 2003) understand that people are technologically competent when they are *information literate*; in other words, when they are aware they need to explore new contents and are capable of locating, assessing and using the necessary information efficiently.
4) Digital competencies as *strategic internet skills.* Proposed by Van Dijk (2005), this author understands that digital competency means having strategic skills; in other words, the ability to use computers and the Internet as a means for achieving specific objectives, and to improve one's position in society.

Other authors, such as Van Dick (2005), opt for an integrated conceptualization of these different fields, understanding digital competency as having the skills to search for, select, process and apply information from a variety of sources, as well as the capacity to

use that information strategically to improve one's position in society. We are therefore talking about instrumental, informational and strategic skills.

Other Spanish authors share this approach. For Colás and De Pablos (2005), a competency requires the activation of dimensions and knowledge combined in a coherent and efficient manner; an instrumental and/or cognitive dimension, a contextual (psychosocial) dimension and another personal dimension of action oriented or guided by goals or purposes.

This conceptual diversity represents a handicap or difficulty, both for the design of instruments for recording the acquired levels of digital competency, and for their assessment. According to Zhong (2011), there is, to date, no broadly accepted way of measuring (digital) technological competencies in an objective way.

How do you measure digital competency?

International bodies such as ISTE (2007), UNESCO (2008), INEE, (2011) are currently working on different measurement standards aimed at gathering information about student competency levels in education systems. Diagnostic tests for student digital competency have also been drawn up (Claro et al. 2012; González et al. 2012) for their application in schools.

However, despite these advances, the measurement of digital competencies encounters two obstacles at a methodological level. The first concerns the actual conceptualization of what digital competencies are, and the second, the selection of the procedure or technique used to gather information from the subjects. On this point, Van Deursen (2005) reminds us that most of the tests used to measure digital competency levels are based on a concept of technical skills, and to a lesser extent formal skills, with questionnaire techniques used most to gather data. Other authors believe that this type of study generates an excessively positive global view. Several studies into digital competencies have come to the conclusion that people's subjective perception has little to do with their real digital competencies (Hargittai and Shafer 2006; Van Deursen and Van Dijk2009). In terms of method, they criticize self-report questionnaires which paint an excessively favourable picture.

At a scientific level this subject has generated various lines of research. One of these focuses on the systematization of the conceptualization of digital competency. Another describes the problems related to individual skill which users experience when using Internet (Van Deursen and Van Dick 2009), and a third looks into the socio-cultural factors which influence these types of competencies and which are determining factors in the digital divide (Zhong 2011).

This paper falls within these lines of research. On the one hand, we work with a socio-cultural conceptualization of digital competency, but we also look into the socio-cultural variables which mark the differences in subjective perceptions of the domain of digital competency. Specifically, this study aims to gauge Spanish teachers' perception of

their own level of digital competency and that of their students. Apart from the empirical data obtained, this study also provides its own measurement scale, based on a socio-cultural concept of digital competency, drawing on a theoretical model proposed by Ala-Mutka (2011).

METHOD

Research Objectives and Hypotheses

This study's objectives are as follows:

1) *Gauge Spanish teachers' perception of their own level of digital competency and that of their students.*
2) *Identify the sociological variables which mark the differences in these perceptions.* This scientific objective has led to two research hypotheses:

   Hi = There are significant differences surrounding Spanish teachers' perception of the level of digital competency of themselves and their students depending on the gender of the teacher, the educational stage of their school and their participation in the *Escuela TIC 2.0* program, and in the continuity in their teaching of the *Escuela TIC 2.0* program.

   H_i = There are significant differences surrounding Spanish teachers' perception of the level of digital competency of themselves and their students depending on whether they have ever been an ICT Coordinator, attended ICT courses on a regular basis, or belong to an ICT innovation group.

The data was analyzed using version 22 of the scientific software SPSS. To meet the first objective we performed descriptive analyses: means, standard deviation and variance. For the second, we calculated means and applied Student's-*t* test for independent samples.

Population and sample

The population in this study consisted of schools in the province of Seville (Spain) participating in regional ICT programs, through the development of school curricular projects integrating ICT into the classroom. We performed a cluster sampling with this population in which the sampling units were the schools. The schools were selected intentionally from those which implement good educational practices with ICT as proposed by the Teachers Centers of Seville.

The sample consisted of 119 primary or secondary school teachers (44 men and 69 women) from 14 schools. Of these, 68 were from Seville capital and the rest from other parts of the province.

Their mean age was between 43 and 44 years, with some teachers having many years experience (maximum value of 44 years) while others were just beginning their teaching career (minimum values of 2 years).

In terms of ICT, while only 11.8% of the sample had at some point been ICT coordinators in their schools, 66.4% had participated in the *Escuela TIC 2.0* program. At the time of the interviews, only 19 of the 119 teachers said they were taking part in a work or innovation group using ICT.

Almost 80% of the sample said they had done courses on ICT related subjects, and 87.4% stated that they tried to keep up with ICT developments.

One last point of interest is that 65.5% of the teachers said they continued to apply the philosophy of the *Escuela TIC 2.0*program even though it had been stopped.

Preparation of the Data Collection Instrument

The scale used in this study is based on the model proposed by Ala-Mutka (2011). This model draws on and brings together other previous proposals or models, such as the model on levels of digital literacy by Martin and Grudzlecki (2006), digital literacy by Bawden (2008), and the proposal of Van Deursen (2010) and Van Deursen, Van Dijk and Peters (2011) on digital or Internet skills.

The scale we have used in this study consists of a total of 22 items rated from 1 to 5, with 1 = Never, 2 = Seldom, 3 = Sometimes, 4 = Often 5 = Always. Table 1 below shows the list of items.

			Teachers' perception of the level of digital competency					
			Of themselves			*Of their students*		
			Mean	Std.dev.	Variance	Mean	Std.dev.	Variance
Technical Level	Item 1	Know and use basic digital equipment	**4.20**	.946	.894	**3.44**	1.103	1.216
	Item 2	Know and handle different programs to do specific tasks	**4.14**	.871	.759	**3.15**	1.128	1.273
	Item 3	Access and use different digital platforms	**3.79**	1.034	1.070	**2.91**	1.245	1.550
	Item 4	Create and store digital contents	**3.88**	1.025	1.051	**2.81**	1.251	1.564
	Item 5	Locate, process and organize information using hyperlinks	**3.60**	1.173	1.376	**2.54**	1.266	1.602
	Item 6	Analyze and search for content on the Internet	**4.55**	.812	.659	**3.54**	1.161	1.348
Strategic Level	Item 7	Show concern about the source of the contents	**4.32**	.961	.923	**2.43**	1.190	1.416
	Item 8	Find important items for personal learning	**4.10**	.915	.837	**2.88**	1.148	1.318
	Item 9	Find important items for professional learning	**4.12**	.905	.819	**2.71**	1.231	1.515
	Item 10	Have accounts on digital platforms *(nuance with strategic intention)*	**3.87**	1.113	1.239	**2.94**	1.379	1.901
	Item 11	Take part in and/or collaborate in a network *(nuance with strategic intention)*	**3.21**	1.378	1.899	**2.61**	1.334	1.781
	Item 12	Exchange and download things one likes on the Internet	**3.98**	1.143	1.306	**3.37**	1.335	1.783
	Item 13	Communicate and express opinions using the mean	**3.63**	1.180	1.392	**3.19**	1.294	1.674

	Item 14	Recognize the value of the diversity offered by the Internet	**4.39**	.809	.654	**3.24**	1.167	1.362
Cultural Level	Item 15	Treat people the same way on the Internet as in real life	**4.14**	1.125	1.265	**2.81**	1.096	1.201
	Item 16	Have knowledge of legal and ethical issues concerning digital mean	**3.78**	1.182	1.397	**2.13**	1.076	1.157
	Item 17	Not interact with unknown people	**3.75**	1.427	2.037	**2.65**	1.168	1.364
	Item 18	Not share data or passwords with anyone	**4.00**	1.537	2.364	**2.75**	1.194	1.425
	Item 19	Know how to create new things with computers	**3.53**	1.130	1.276	**2.84**	1.046	1.095
	Item 20	Use the computer to learn by oneself	**4.14**	.990	.980	**3.09**	1.112	1.237
	Item 21	Use the computer to do things which could not be done with any other means	**4.18**	.927	.860	**3.35**	1.073	1.152
	Item 22	Recognize the value of both digital and traditional tools	**4.26**	.832	.692	**3.36**	1.032	1.065

Table 1. Scale and descriptive results (Mean, Standard deviation and Variance)

As you can see in Table 1, digital competences have been grouped in three states or levels: technical, strategic and cultural. The *technical level* includes skills related to a basic use of digital tools; in other words, the user accessing and administering on a basic level. The *strategic level* covers skills which involve users interacting to satisfy needs, communicate with others, and assessing the quality of the contents searched for and/or shared. The strategic or intentional nature of interactions is important on this level: subjects want to express themselves and they can do so on the Internet. Finally, the *cultural level* means that subjects reintegrate technologies in their daily lives, and they privilege them to perform actions and create things. In addition, we have included aspects related to digital privacy and security. On this last level, subjects are aware or have a certain awareness of immersion in digital culture.

Scale reliability and validity.

After applying the corresponding technical tests to obtain the validity and reliability of the scale we were left with high coefficients of reliability and validity: Cronbach's Alpha α=0,949, for the scale in which the teachers self-report their own level, and α=0,973 for the scale in which teachers rate their students' levels of digital competency.

We can therefore state that the results recorded in this study come from scales of a high technical quality.

RESULTS

a) Objective 1*. Gauge teachers' perception of their own level of digital competency and that of their students.*

As you can see in Table 1, the mean values with which teachers perceive the different skills and actions manifesting their level of competency are higher than those they attribute

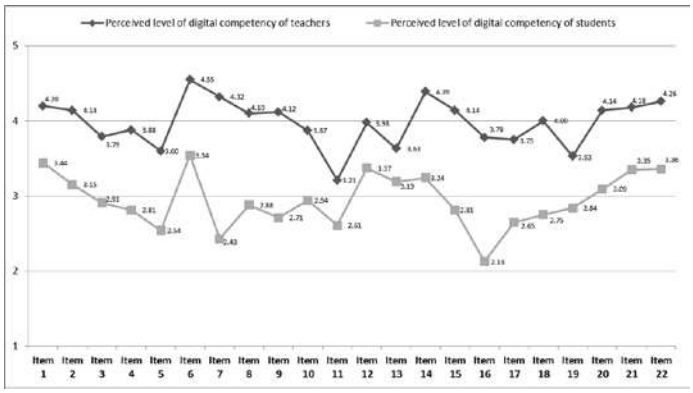
to their students. Table 1 also shows that the standard deviation and variance is greater in teachers' assessments of their students, pointing to a broader range of responses.

Graph 1 shows mean scores obtained for each item in our digital competency breakdown scale. You can see clearly that the values attributed by the teachers to their perception of their own level of digital competency were higher than those they gave to their students. Whilst the values among the teachers ranged between *sometimes* (3) and *always* (5), the scores for students ranged between *seldom* (2) and *often* (4).

The skills and/or actions valued most highly by the teachers at a technical level were: item 6 (mean = 4.55); at a strategic level: item 14 (mean = 4.39), and item 7 (mean = 4.32); and at a cultural level: item 22 (4.26). The worst valued at a technical level were: item 5 (mean 3.6); at a strategic level: item 11 (mean = 3.21) and item 13 (mean 3.63); and at a cultural level: item 19 (mean = 3.53).

As for the students, the highest values attributed by the teachers were: at a technical level: item 6 (mean=3.54); at a strategic level: item 12 (mean=3.37); and at a strategic level: item 21 (mean=3.35) and item 22 (mean=3.36). At the other end of the scale, at a technical level: item 5 (mean=2.54); at a strategic level: item 7 (mean=2.43) and item 11 (mean=2.61); and at a cultural level: item 16 (mean=2.13).

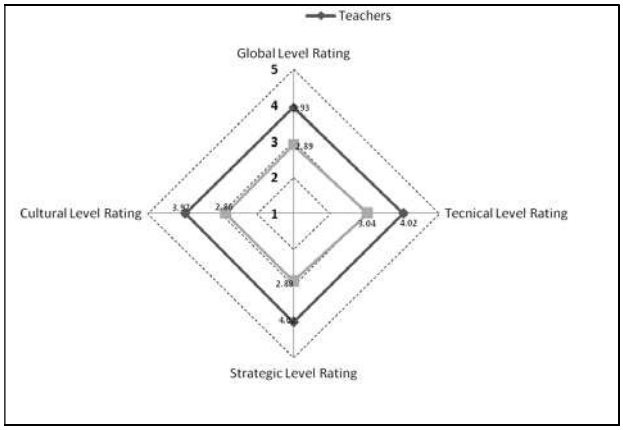
As a general observation of Graph 1, you can see the same trend line in the scores attributed by the teachers to themselves and their students, but with the aforementioned differences; in other words, while the trends of the mean rating lines are similar, they run parallel to each other because teachers rated their perceived level of digital competency above that of their students.



Graph 1. Mean scores per item.

Graph 2 confirms this clear tendency, showing the means by level of the breakdown of competency (technical, strategic and cultural) and the mean score for all actions in terms of overall digital competency. The teachers rated themselves on all levels and/or states with a high level of digital competency (mean score roughly 4 = Often), while they perceived an average level of digital competency for their students (mean

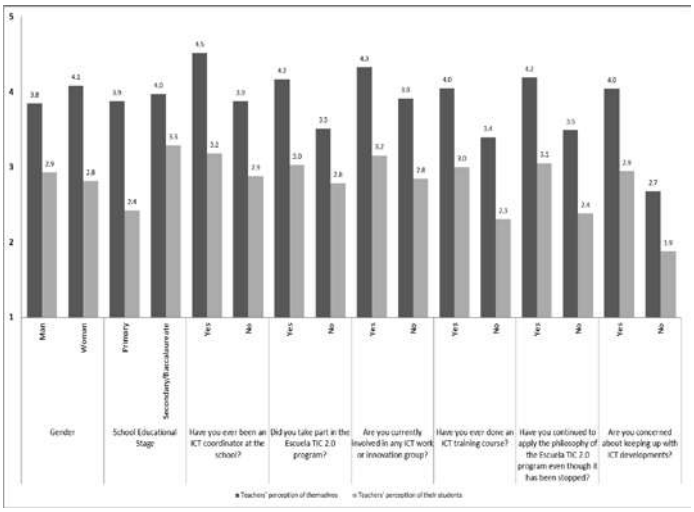
score roughly 3 = Sometimes).



Graph 2. Mean scores per level of digital competency.

b) Objective 2. *Identify the sociological variables which make these perceptions different.*

Graph 3 shows the mean scores disaggregated according to the different sociological variables on which we have contrasted the results to find out whether there are significant differences conditioned by such variables. It is clear that the mean scores of the ratings of the teachers' perception of their own level of digital competency are higher than their ratings of their students in all sociological variables used to disaggregate the information.



Graph 3. Mean response scores of digital competency according to the sociological variables of the study.

But the question still remains: are these differences significant at a statistical level? Before the application of Student's-*t* test for the equality of means, we applied the Levene Test to measure variance quality. In this case we obtained a value over 0.05 in all contrasts; thus, we have assumed equal variances.

As for the case of the perceptions of Spanish teachers about their level of digital competency, we did observe differences in terms of the perception teachers have about their level of digital competency, with the value of $\rho \leq 0.05$ in the following cases, depending on:

- Whether they have ever been an ICT coordinator: $\rho=0.016$
- Whether they took part in the *Escuela TIC 2.0* program: $\rho=0.000$
- Whether they are currently involved in an ICT work or innovation group: $\rho=0.048$
- Whether they have ever done an ICT training program: $\rho=0.005$
- Whether they have continued applying the philosophy of the *Escuela TIC 2.0* program even though it has been stopped: $\rho=0.000$
- Whether they are concerned about keeping up with ICT developments: $\rho=0.000$

Thus, in the previously mentioned sociological variables we can say that there are statistically significant differences in the perceptions of Spanish teachers in terms of their level of digital competency, thereby rejecting H_0.

In the rest of the variables analyzed, we obtained $\rho > 0.05$, which accepts H_0, and rejects the alternative hypothesis. There are no significant differences in the perceptions of teachers in terms of gender ($\rho=0.167$) or educational stage of the school ($\rho=0.574$).

As for teachers' perception of their students, according to the data obtained in the *t* tests, we saw that there are differences in terms of their perception of their students' level of digital competency, with the value $\rho \leq 0.05$ in the following cases:

- According to the educational stage of the school: $\rho=0.000$
- Depending on whether they have continued applying the philosophy of the *Escuela TIC 2.0* program even though it has been stopped: $\rho=0.038$

For these cases alone, we corroborated that there were differences in teachers' perceptions of their students' level of digital competency.

- In the rest of the variables we obtained $\rho > 0.05$ which therefore accepts H_0. We can interpret that there are no differences in perceptions: according to gender ($\rho=0.632$); whether they have been an ICT coordinator ($\rho=0.353$); whether they took part in the *Escuela TIC 2.0* program ($\rho=0372$); whether they currently take part in an ICT work or innovation group ($\rho=0.301$); whether they have ever done an ICT training course ($\rho=0 .071$); and whether they are concerned about keeping up with ICT developments ($\rho=0.063$).

CONCLUSIONS

The results show that Spanish schoolteachers' perception of their own digital competency is higher than that of their students. They perceive themselves as having a high level of competency, while they view their students as having an average level.

They also have a high rating of their own level of digital competency, on all breakdown levels (technical, strategic and cultural). The high values in these skills at a technical and strategic level would appear to indicate, according to the conceptual classification proposed by Van Deursen and Van Dick (2009), that teachers have high digital competencies, these being understood as *information skills* (digital literacy). At a cultural level, adopting the approach of other authors such as Bawden (2001) and Correia and Teixeira (2003) who understand digital competency as literacy in information, our results show that teachers are aware that they need knowledge and they are capable of locating, assessing and using the necessary information efficiently. However, they perceive these competencies in their students at very low levels.

The variables of gender and educational stage at which they teach do not condition the perceptions of Spanish teachers about their level of digital competency. In other words, they do not appear to be important differentiating factors in the perception of teachers' command of digital competencies. However, teachers' perception does seem to have been conditioned by having been ICT coordinators, having taken part in the *Escuela TIC 2.0* program, forming part of an ICT work or innovation group, doing ICT training courses, and continuing to apply the philosophy of the *Escuela TIC 2.0* program, even though it has been stopped. These variables show significant differences in terms of contrast. These results indicate that continuity in the educational use of ICT generates a more positive command and perception of their own digital competencies.

However, there are differences in teachers' perception of the level of digital competency of their students depending on the educational stage. They value secondary education students more positively than their primary counterparts (see Graph 3). These results appear to be coherent because students in secondary education have had longer to socialize with these technologies. Having continued to apply the philosophy of the *Escuela TIC 2.0* program, even though it is no longer being implemented, also marks differences in teachers' perception of their students. Teachers who continue to apply that philosophy attribute a higher level of competency to their students which is logical because it involves more practical teaching which leads to a progression in students' digital competencies.

This study distances itself from others which argue that teachers do not use ICT for fear of being caught out by their 'digital native' students, feeling themselves to be at a disadvantage and without a firm grip of the situation, which inhibits them from using ICT.

The results presented here show that the use of ICT in the classroom consolidates security and command of digital competencies in both teachers and students. This is an indicator of the success of ICT educational policies implemented in Spain's education system.

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