

INTERNET IN TEACHERS' PROFESSIONAL PRACTICE OUTSIDE THE CLASSROOM: EXAMINING SUPPORTIVE AND MANAGEMENT USES IN PRIMARY AND SECONDARY SCHOOLS¹

In recent years there has been widespread interest in the implementation of information and communication technologies (ICT) in schools. While most studies primarily focus on the use of ICT in teaching and learning, little attention has been given to their incorporation as a professional tool outside the classroom. Using a digital inequality approach, the aim of this paper is to develop and test a model of the factors that affect teachers' professional use of ICT, particularly the internet, in primary and secondary schools. One thousand four hundred and five (1405) teachers from a representative sample of 536 primary and 273 secondary schools in Spain were surveyed. The dependent variables include attitudes towards the professional use of ICT and the use of the internet in professional practice. The explanatory variables are the socio-demographics, school-level information, frequency of internet access within and outside the school, educational ICT training, digital literacy, and organisational development. Controlling for socio-demographics and school-level information, multiple regression analyses are used to make inferential judgements and test the separate effects of the independent variables. Findings suggest that technological factors and organisational practices are important predictors of ICT appropriation for professional purpose.

1. INTRODUCTION

In recent decades, the progressive introduction of information and communication technologies (ICT) into different areas of society has been accompanied by a wide interest in its implementation in schools (Hepp, Hinostroza, Laval, & Rebhein, 2004; Law, Pelgrum, & Plomp, 2008; UNESCO, 2005). Much of the research undertaken has focused on the role of computers in the classroom, specifically in the process of teaching and learning. Among other things, these studies have highlighted how ICT reconfigure classroom practice, create new varieties of learning practices, change teachers' and students' roles, and improve students' engagement and outcomes (Crook, Harrison, Farrington-Flint, Tomás, & Underwood, 2010; OECD, 2005). According to this evidence, ICT are incorporated into teaching practices with the aim of building new opportunities as well as improving the teaching and learning processes. This is illustrated by the preparation and use of more complex teaching activities and materials, and the increase in teacher–student interaction and encouragement of student-centred cooperative learning (Gibson & Oberg, 2004; Russell, Bebell, O'Dwyer, & O'Connor, 2003; Windschitl & Sahl, 2002).

Considerable attention has also been given to the factors that influence teachers' use of ICT in schools (Mominó, Sigalés, & Meneses, 2008; Mumtaz, 2000; Somekh, 2008; Webb & Cox, 2004). In this literature, a classification that divides these factors

¹ A preliminary version of this study was presented at the British Educational Research Association Annual Conference (6th-8th September, 2011, London) and the European Conference on Educational Research (12th-16th September, 2011, Berlin).

between the teacher and school-level has been made (Balanskat, Blamire, & Kefala, 2006; Cartwright & Hammond, 2007; Jones, 2004; Tondeur, Valcke, & van Braak, 2008). On the one hand, factors that operate at the teacher level are related to the individual, and include demographic attributes such as age and gender (van Braak, Tondeur, & Valcke, 2004), experience with the use of computers (Drent & Meelissen, 2008), attitudes towards teaching with technology (ChanLin, Hong, Horng, Chang, & Chu, 2006), educational beliefs (Hermans, Tondeur, van Braak, & Valcke, 2008), and approach to teaching (Becker, 2000). On the other hand, factors on the school-level pertain to organisations rather than individuals. According to Tondeur et al. (2008), these factors have until now been less prominent. They include the availability of infrastructure and connectivity (Mumtaz, 2000), technical support from the school administration (Jones, 2004), ICT policy (Scrimshaw, 2004) and school culture (Tearle, 2003).

The abovementioned studies primarily focus on the use of ICT in teaching and learning practices. However, the factors influencing ICT use as a professional tool outside the classroom have received little attention. Adopting a digital inequality approach, this study addresses this gap in the literature by examining the factors that affect teachers' professional use of ICT, particularly the internet, in primary and secondary schools. Based on a review of the literature, this study focuses on two types of professional use of the internet: firstly, a supportive use linked to classroom preparation activities such as finding supplementary information for lessons (Orr, 2006) and preparing worksheets for pupils (van Braak et al., 2004); and secondly, a management use that relates to teachers' general duties in the functioning of schools as organisations (Meneses & Mominó, 2012). These duties include performing administrative and management tasks (McCannon & Crews, 2000), communicating with colleagues and experts (Law et al., 2008) and interacting with parents and students (Ward & Parr, 2010).

Of the factors that operate at the abovementioned teacher level, teachers' attitudes towards ICT have been considered to be either a significant facilitator or barrier to their successful introduction to primary and secondary schools (see Afshari, Bakar, SuLuan, Samah, & Say, 2009; Cox & Marshall, 2007; Jones, 2004; and OECD, 2001; for a wider discussion). Substantial efforts have been made to analyse the role that general perceptions of ICT and, particularly, the specific attitudes concerning their utility as an educational tool, play in the enhancement of teaching and learning processes (Bullock, 2004; Salleh, 2005; Sang, Valcke, van Braak, & Tondeur, 2010; Tondeur, 2007). Furthermore, studies conducted by Albirini (2006), van Braak et al. (2004), Sadik (2006), and Wozney, Venkatesh, and Abrami (2006) provided a better understanding of the different components that constitute these attitudes (i.e., computer anxiety, computer confidence, and computer liking) as well as the processes associated with their formation and change. However, if we highlight the importance of the specific purpose of ICT use, it is worth noting that teachers' attitudes towards the professional use of ICT outside the classroom have received little attention.

2. DIGITAL INEQUALITIES IN TEACHERS' USE OF ICT AS A PROFESSIONAL TOOL

This study uses a digital inequality approach to examine the unequal distribution of teachers' attitudes towards, and use of, the internet in professional practice outside the

classroom. Digital inequality (DiMaggio & Hargittai, 2001; DiMaggio, Hargittai, Celeste, & Shafer, 2004) has recently emerged as an alternative framework that reconfigures the dichotomous view of the digital divide into a complex, dynamic, and multi-dimensional phenomenon. In its inception, research on the digital divide focused on the analysis of the widening gap between those who “have” access to ICT –mainly the internet– and those who “do not have”, or those who use ICT and those who do not. This dichotomous view was central in the initial development of research on digital exclusion and fuelled most of the debates in academia and in the policy arena during the 90s and 2000 (Castells, 2001; Lentz, 2000). However, as the process of internet diffusion grew bigger, the analysis of the digital divide in terms of a socio-demographic characterisation of users and non-users became too limited (van Dijk & Hacker, 2003; Steyaert, 2002; Warschauer, 2003).

Typically, scholars who adopt the digital divide perspective assume the knowledge gap hypothesis (Tichenor, Donohue, & Olien, 1970), which associates greater social and economic advantages with better access to, or use of, information. Consequently, these scholars are mainly interested in examining the differences in ICT access or use based on socio-demographic factors (i.e., age, gender, wealth, ethnicity, geographic location). While this approach has contributed to demonstrating the existence of an unequal distribution of ICT among population subgroups, it has been criticised for not paying enough attention to the nature of such distribution. According to Lievrouw and Farb (2003), the digital divide approach can be understood as a vertical or hierarchical perspective. They, however, disagree with this perspective and stress that researchers should adopt a horizontal or heterarchical viewpoint. In their view, the individual and contextual factors that affect ICT adoption need to be considered. These factors, in turn, transcend the socio-demographic attributes and highlight the unequal interests, expertise, concerns, and actual contexts of ICT use.

Thus, using a digital inequality framework, our aim is to construct and empirically test an exploratory model for the unequal appropriation² of the internet for professional purposes outside the classroom. As we discussed elsewhere (Meneses & Mominó, 2010), when ICT access is not the only concern, digital inequality needs to be addressed in terms of differences in conditions of access, knowledge and skills, and attitudes towards, and types of, ICT use. In this regard, for the analysis of the differences in attitudes towards, and types of, internet professional use by primary and secondary teachers, we will be able to explore the contribution of some factors discussed above (i.e., frequency of Internet access, educational ICT training, and levels of mastery of the internet). After controlling for socio-demographic characteristics, we will also be able to take into account the effects of organisational development. As discussed in the literature (Jones, 2004; Scrimshaw, 2004; Underwood et al., 2010; Zhao & Frank, 2003), the degree of development of primary and secondary schools as social organisations can be associated with their implementation of ICT. Accordingly, this research explores this relationship and examines the contribution of schools as the organisational context in which teaching, and other professional practices, take place. This will provide a potential explanation of the

² Although the term “appropriation” is commonly used in situations in which a subject sets an object apart for his/her particular use in exclusion of others, in this paper we use “ICT appropriation” to mean the process of the meaningful incorporation of ICT into concrete contexts of actions of everyday life.

differences observed in attitudes towards, and professional use of, the internet outside the classroom.

3. METHOD

This research has been conducted as part of the project *Integration of the internet in Spanish school education: The current situation and prospects for the future* (Sigalés, Mominó, Meneses, & Badia, 2009), a larger exploratory study of the specific traits of introducing the internet to primary and secondary schools in Spain. Its main objective is to address the contribution of ICT –and particularly the internet– to a new educational culture adjusted to the requirements of the network society. The study's fieldwork was conducted in 2007 with the support of the Telefónica Foundation, collecting survey data from a representative sample of 809 primary and secondary schools.

3.1. COMPULSORY EDUCATION AND ICT IN SPAIN

Compulsory education in Spain begins at the age of 6 years, and continues for ten years including the six-year primary and four-year lower secondary education. During the academic year 2006–2007 (Ministerio de Educación Cultura y Deporte, 2009), 18,115 schools and high schools provided compulsory primary and secondary education, 77.25% of which were government funded. Among the 580,213 teachers who taught at these educational centres, 69.8% were women and approximately 41.0% were younger than 39 years of age³. Most of these centres (99.3%) were connected to the internet, and half of these (56.9%) had a broadband connection (i.e., more than 2 Mbits/s).

An international comparison promoted by the European Commission (2006) showed that the process of ICT integration in Spanish education is quite comparable to its European counterparts. Table 1 provides information on ICT school infrastructure and teachers' computer use in eight selected European countries⁴ in 2006. Regarding the level of ICT infrastructure, Spanish primary and secondary schools were slightly below the mean for the European Union's 25 member states. Specifically, the number of computers and internet computers per 100 pupils in Spain was close to that of France and higher than other Mediterranean countries such as Portugal, Italy, and Greece. However, in comparison to better-equipped countries in Europe such as Denmark, Finland, and the United Kingdom, the ICT infrastructure in Spanish primary and secondary schools was significantly lower. In terms of teachers' computer use, Spain was ahead of other countries with a similar infrastructure level such as France, but worse than Italy, which had a lower availability of computers in schools. As expected, better-equipped countries such as Denmark showed significantly higher rates of teachers' computer use in the classroom.

Table 1. ICT school infrastructure and teachers' computer use in 8 European countries in 2006.

³ These figures include the teaching staff working at any level of pre-university education due to the fact that the Spanish government does not provide disaggregated data for compulsory education.

⁴ In order to simplify the comparison, four Mediterranean countries, three leading countries in terms of ICT integration, and an average of the 25 EU members were selected.

	Number of computers per 100 pupils		Number of internet computers per 100 pupils		Percentage of teachers who have used computers in classroom in the last 12 months	
	Primary schools	Lower secondary schools	Primary schools	Lower secondary schools	Primary schools	Lower secondary schools
Denmark	18.6	18.4	17.9	17.9	95.7	94.4
Finland	12.2	12.3	11.3	11.9	88.0	77.1
France	8.1	11.4	4.8	10.0	65.7	56.1
Greece	4.8	6.6	4.2	6.1	32.8	38.0
Italy	5.7	6.9	4.2	5.1	71.6	71.9
Portugal	5.8	5.8	4.4	5.2	70.0	66.2
Spain	8.6	10.0	7.4	9.2	68.9	66.6
United Kingdom	15.9	25.0	14.6	23.4	97.4	90.4
EU25	9.4	10.8	7.7	9.7	75.2	70.9

Source: European Commission (2006).

3.2. DATA COLLECTION

A survey was conducted at the end of the 2006–2007 academic year (March–June of 2007) with a representative and stratified sample of 809 educational centres offering primary (536) and secondary (273) education. Primary and secondary schools participating in the study were randomly selected from a list of 17,797 educational centres providing compulsory education in Spain. This list was elaborated with the support of the 17 Spanish regional governments, and was used to determine sample size with a proportional allocation by region, size of the town or city where the school was located, and type of funding. 12 interviewers made 59,492 telephone calls to the principals of the selected schools and invited them to join the study. If they declined to participate, their school was removed from the sample and replaced with another randomly selected school.

A cover letter was sent to each participating school by post, presenting the purpose of the study and stating that participation was voluntary and anonymous. School principals were also contacted by phone one week after sending the letter, confirming a date and time for an arranged visit to their schools. Within each school, teaching staff teaching in the final grades (i.e., primary students at the age of 11–12 years and lower secondary students at the age of 15–16 years) were interviewed. A team of 81 interviewers conducted the fieldwork, making an average of 3.7 visits to complete the questionnaires with the selected participants.

3.3. PARTICIPANTS

The final sample of this study is composed of 1405 teachers at compulsory primary (759) and secondary (646) education levels, who completed an in school, in-depth, self-administered questionnaire assisted by the research staff. At a confidence level of 95%, this research enables us to obtain statistically significant information for the teaching staff belonging to the entire educational system of Spain with a maximum error margin⁵ of $\pm 2.4\%$ ($p = q = 0.50$ and $k = 2$). Table 2 provides information (i.e., means and standard deviations) about their specific characteristics as well as the other measures included in this study.

3.4. MEASURES

SOCIO-DEMOGRAPHICS AND SCHOOL-LEVEL INFORMATION

Participants were asked to provide basic demographic information concerning age, gender, and the educational level where they work (i.e., compulsory primary or secondary). Additionally, this research included information about their school's type of funding –public or private– and the total population of the town or city where it is located. Size information was recoded using a five-level ordinal measure that ranges from less than 10,000 inhabitants to 500,001 or more inhabitants.

⁵ Although the Ministry of Education of Spain provided us with the population data to calculate the maximum observed error, we were unable to disaggregate compulsory teaching staff from their records. Hence, the maximum observed error we present is an over-estimation, due to the fact that post-obligatory teaching staff from primary and secondary schools in Spain are also included in the population.

Table 2. Means, standard deviations and correlations between the observed variables ($n = 1,405$).

	M	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Positive attitudes to professional use of ICT (1)	3.72	0.63	-													
Negative attitudes to professional use of ICT (2)	2.14	0.74	-0.32 ^d	-												
Supportive use of the internet in professional practice (3)	2.03	1.52	0.33 ^d	-0.22 ^d	-											
Management use of the internet in professional practice (4)	0.68	0.91	0.26 ^d	-0.02	0.50 ^d	-										
Organisational development (5)	3.36	0.69	0.13 ^d	0.02	0.12 ^d	0.19 ^d	-									
Digital literacy (6)	2.16	0.84	0.26 ^d	-0.18 ^d	0.56 ^d	0.34 ^d	0.06 ^a	-								
Educational ICT training^e (7)	0.97	0.91	0.19 ^d	-0.17 ^d	0.36 ^d	0.29 ^d	0.11 ^d	0.36 ^d	-							
School internet access^f (8)	2.00	1.04	0.24 ^d	-0.17 ^d	0.38 ^d	0.33 ^d	0.05	0.36 ^d	0.26 ^d	-						
Outside school internet access^g (9)	2.15	1.08	0.22 ^d	-0.18 ^d	0.37 ^d	0.22 ^d	0.01	0.50 ^d	0.18 ^d	0.30 ^d	-					
Age (10)	41.37	9.49	-0.08 ^b	0.01	-0.15 ^d	-0.07 ^b	-0.08 ^b	-0.31 ^d	0.00	-0.11 ^d	-0.15 ^d	-				
Gender^h (11)	0.44	0.50	0.13 ^d	-0.01	-0.11 ^d	0.10 ^d	-0.05	0.21 ^d	0.07 ^b	0.14 ^d	0.13 ^d	0.07 ^b	-			
Stage of educationⁱ (12)	0.46	0.50	0.10	-0.01	0.05 ^a	0.02	-0.15 ^d	0.08 ^c	-0.03	0.02	0.01	-0.00	0.12 ^d	-		
School type of funding^j (13)	0.28	0.45	0.04	-0.01	-0.03	-0.05 ^a	0.02	-0.05 ^a	-0.07 ^b	-0.17 ^d	-0.04	-0.07 ^b	0.00	0.12 ^d	-	
Town population^k (14)	1.86	1.37	0.03	-0.02	-0.08 ^c	-0.04	-0.02	-0.07 ^b	-0.06 ^a	-0.15 ^d	0.01	0.08 ^c	-0.00	0.09 ^d	0.33 ^d	-

^a $p < 0.05$; ^b $p < 0.01$; ^c $p < 0.001$; ^d $p = 0.000$.

^e 0 = Not having received any, 1 = Yes, but hardly useful, 2 = Yes, and very useful; ^f 0 = Never or hardly never, 3 = Daily; ^g 0 = Never or hardly never, 3 = Daily; ^h 0 = Female, 1 = Male; ⁱ 0 = Compulsory primary, 1 = Compulsory secondary; ^j 0 = Public, 1 = Private; ^k 0 = Less than 5,000, 4 = 500,001 or more.

INTERNET ACCESS

Participants were asked to report their frequency of internet access within (i.e., in the staff room, school library, computer lab) and outside (i.e., at home, public library, internet café) the school premises at any time other than their regular classes, disregarding the specific location where this access occurred. Two four-level ordinal items ranging from “never or hardly ever” to “daily” were used.

EDUCATIONAL ICT TRAINING

Participants were asked to report their attendance at a specific course addressing the educational uses of ICT over the last three years. After rating the utility of the course for their actual teaching practices, a three-level ordinal measure that included both quantity and perceived quality of educational ICT courses was constructed ranging from “did not receive any” to “received a very useful one”.

DIGITAL LITERACY

In order to assess teachers' digital proficiency, an ad-hoc Likert scale reflecting their self-reported competence in six internet practices (i.e., using a browser, downloading a file, sending an email, using instant messaging applications, publishing on the internet, and building a web page) was presented. Responses served as proxy measures for observed skills, which are not only much less expensive and difficult to collect for large samples but have also proven to be better predictors compared to other traditional measures such as general self-perceived ability (Hargittai, 2005). The scale covers four levels of mastering: “I don't know what this is or means”; “I know what it is but I'm not able to do it”; “I can do it with help”; and “I can do it on my own”. Principal components analysis (PCA) showed an acceptable one-component structure (KMO = 0.843 and a significant Bartlett's test, $p = 0.000$), with component loadings ranging from 0.771 to 0.903, and a 72.33% of total variance explained. Reliability analysis showed a Cronbach's α of 0.921.

ORGANISATIONAL DEVELOPMENT

Participants were asked to report perceived school's organisational maturity from an ad-hoc Likert-type scale of five items ranging from “strongly disagree” to “strongly agree”. The compounded measure was constructed according to organisational development theories that focus on school and individual-level change and improvement through planned interventions (i.e., Bradford & Burke, 2005; Greiner & Cummings, 2005), taking into account both the internal context of the school as a social organisation as well as its relationship with the local community in which it is located (Anderson, 2010; Underwood & Dillon, 2004). Teachers reported their agreement with some general but important organisational practices such as the development of monitoring and evaluation systems used to analyse goals, strategies and plans; the establishment of specific goals to improve teaching and learning processes; the involvement of school administrators in decision-making concerning the ways in which teaching processes, student assessment and class-dynamics are planned; the degree to which important decisions are made collectively to maximise co-responsibility and consensus; and the involvement of students' families in their learning experience (i.e., participating in school decision-making processes to define

educational goals). PCA showed an acceptable one-component structure (KMO = 0.773 and a significant Bartlett's test, $p = 0.000$), with component loadings ranging from 0.530 to 0.811, explaining 50.31% of the total variance. Reliability analysis of the final component showed an acceptable Cronbach's α of 0.747.

ATTITUDES TOWARDS THE PROFESSIONAL USE OF ICT

An additional ad-hoc Likert-type scale was developed to collect information about the level of agreement with eight items presenting different feelings towards ICT use from an educational perspective. Among them, four items represented positive attitudes, involving teachers' empowerment to deal with the learning conditions of their students; to choose better educational resources or learning activities; to facilitate their professional activity; and to improve their collaboration with other professionals. Another four items represented negative attitudes towards the professional use of ICT, including the teacher's belief that ICT weaken or supplant their role in the educational process; limit or diminish the range of educational resources or learning activities from which to choose; become a new barrier to their professional activity; and isolate teachers or at least reduce their opportunities of connecting with other professionals. PCA showed an acceptable two-component structure (KMO = 0.786 and a significant Bartlett test, $p = 0.000$), that accounts for 60.27% of the total variance explained in positive (30.16%) and in negative attitudes (30.11%). Respectively, the rotated factor solution (Varimax with Kaiser normalisation) provided component loadings ranging from 0.736 to 0.796, and from 0.694 to 0.815. Both of the components showed a Cronbach's α of 0.769 and 0.780.

Table 3. Multiple regression models of teachers' attitudes and teachers' professional uses of ICT.

	Positive attitudes to professional use of ICT			Negative attitudes to professional use of ICT			Supportive use of the internet in professional practice			Management use of the internet in professional practice		
	<i>B</i> (S.E.)	Beta	<i>t</i>	<i>B</i> (S.E.)	Beta	<i>t</i>	<i>B</i> (S.E.)	Beta	<i>t</i>	<i>B</i> (S.E.)	Beta	<i>t</i>
Intercept	2.664 (0.158)	-	16.829 ^c	2.754 (0.194)	-	14.171 ^c	-1.475 (0.319)	-	-4.620 ^c	-1.367 (0.234)	-	-5.840 ^c
Stage of education												
Compulsory primary	-	-	-	-	-	-	-	-	-	-	-	-
Compulsory secondary	0.005 (0.033)	0.004	0.142	0.001 (0.040)	0.000	0.014	0.109 (0.067)	0.038	1.628	0.050 (0.049)	0.026	1.031
School type of funding												
Public	-	-	-	-	-	-	-	-	-	-	-	-
Private	0.090 (0.039)	0.065	2.317 ^a	-0.073 (0.047)	-0.045	-1.537	0.111 (0.079)	0.035	1.412	-0.042 (0.058)	-0.020	-0.728
Town population												
Less than 10,000	-	-	-	-	-	-	-	-	-	-	-	-
10,001 – 50,000	0.099 (0.047)	0.071	2.106 ^a	0.019 (0.058)	0.012	0.334	0.114 (0.096)	0.036	1.190	0.095 (0.070)	0.044	1.358
50,001– 100.000	0.117 (0.063)	0.055	1.869	0.033 (0.077)	0.013	0.432	-0.138 (0.127)	-0.028	-1.087	0.039 (0.093)	0.012	0.422
100,001 – 500.000	0.058 (0.048)	0.042	1.206	0.017 (0.059)	0.011	0.289	-0.031 (0.098)	-0.010	-0.313	0.153 (0.072)	0.073	2.122 ^a
500,001 or more	0.096 (0.060)	0.051	1.606	-0.051 (0.073)	-0.023	-0.693	-0.054 (0.123)	-0.012	-0.438	0.016 (0.090)	0.006	0.181
Age	0.000 (0.002)	-0.004	-0.155	-0.003 (0.002)	-0.039	-1.339	0.003 (0.004)	0.020	0.817	0.003 (0.003)	0.031	1.168
Gender												
Female	-	-	-	-	-	-	-	-	-	-	-	-
Male	0.089 (0.033)	0.071	2.657 ^b	0.068 (0.041)	0.046	1.655	-0.83 (0.068)	-0.029	-1.220	0.041 (0.050)	0.021	0.821
School internet access												
Never or hardly never	-	-	-	-	-	-	-	-	-	-	-	-
Monthly	-0.057 (0.064)	-0.032	-0.886	-0.110 (0.079)	-0.054	-1.403	0.246 (0.129)	0.061	1.913	0.083 (0.094)	0.030	0.876
Weekly	-0.013 (0.059)	-0.010	-0.219	-0.098 (0.072)	-0.063	-1.353	0.463 (0.118)	0.150	3.924 ^c	0.105 (0.087)	0.051	1.211
Daily	0.154 (0.059)	0.122	2.592 ^b	-0.204 (0.073)	-0.139	-2.803 ^b	0.809 (0.119)	0.280	6.824 ^c	0.454 (0.087)	0.235	5.224 ^c
Outside school internet access												
Never or hardly never	-	-	-	-	-	-	-	-	-	-	-	-
Monthly	0.023 (0.068)	0.011	0.343	0.013 (0.083)	0.005	0.161	0.030 (0.137)	0.006	0.221	-0.017 (0.101)	-0.005	-0.165
Weekly	0.107 (0.057)	0.072	1.879	-0.024 (0.070)	-0.014	-0.347	0.027 (0.115)	0.008	0.235	0.115 (0.085)	0.050	1.357
Daily	0.151 (0.054)	0.121	2.768 ^b	-0.127 (0.066)	-0.087	-1.912	0.426 (0.110)	0.149	3.871 ^c	0.140 (0.081)	0.073	1.734
Educational ICT training												
Not having received any	-	-	-	-	-	-	-	-	-	-	-	-
Yes, but hardly useful	-0.027 (0.046)	-0.017	-0.589	0.023 (0.056)	0.012	0.415	0.150 (0.093)	0.041	1.616	0.069 (0.068)	0.028	1.016
Yes, and very useful	0.150 (0.037)	0.120	4.008 ^c	-0.160 (0.046)	-0.109	-3.500 ^c	0.389 (0.076)	0.135	5.107 ^c	0.163 (0.056)	0.085	2.917 ^b

Meneses, J., Fàbregues, S., Rodríguez-Gómez, D., & Ion, G. (2012). Internet in teachers' professional practice outside the classroom: Examining supportive and management uses in primary and secondary schools. *Computers & Education*, 59(3), 915–924. <https://doi.org/10.1016/j.compedu.2012.04.011>

Digital literacy	0.176 (0.039)	0.147	4.497 ^c	-0.182 (0.048)	-0.129	-3.790 ^c	0.805 (0.079)	0.295	10.152 ^c	0.290 (0.058)	0.158	4.979 ^c
Organisational development	0.092 (0.024)	0.101	3.877 ^c	0.055 (0.029)	0.052	1.903	0.210 (0.048)	0.102	4.403 ^c	0.242 (0.035)	0.175	6.913 ^c
Model summary												
<i>R</i> ² (Adjusted <i>R</i> ²)	0.150 (0.138)			0.076 (0.063)			0.304 (0.295)			0.164 (0.153)		
<i>F</i> for the model	12.840 ^c			5.955 ^c			33.217 ^c			14.956 ^c		
Sample size	1,405			1,405			1,405			1,405		

^a $p < 0.05$; ^b $p < 0.01$; ^c $p = 0.000$.

USE OF THE INTERNET IN PROFESSIONAL PRACTICE

Participants were asked to report their use of the internet as a professional tool when they are not teaching their students in the context of classroom activity (i.e., any location within and outside the school premises). Teachers chose from six response alternatives: “never”; “less than once a month”; “once a month”; “2–3 times a month”; “once a week”; and “more than once a week”. Two types of use emerged from the exploratory factor analysis: supportive (i.e., to plan classes; to develop documents, presentations, exercises or other conventional pencil and paper materials used in classroom; to prepare applications or other multimedia resources; and to maintain a repository of educational resources for teaching) and management internet uses (i.e., to participate in the management of the school; to collaborate with other teaching staff belonging to their school; to keep in touch with students' families; and to communicate with other educational and social services professionals working with their students). PCA showed an acceptable two-component structure (KMO = 0.831 and a significant Bartlett test, $p = 0.000$), explaining 62.70% of the total variance in supportive (37.17%) and management uses (25.53%). The rotated factor solution (Varimax with Kaiser normalisation) provided component loadings ranging from 0.811 to 0.831, and from 0.624 to 0.766. Both components showed an acceptable reliability, with a Cronbach's α of 0.867 and 0.695 respectively.

3.5. ANALYSIS

To meet the objectives of this research, we start with descriptive and initial bivariate relationships of our measures. For the sake of interpretation, total scores were calculated and transformed (i.e., divided by the number of items composing the above scales) to keep the original meaning of the response categories. Appropriate measures of association and corresponding significance tests were calculated depending on the level of measurement: Pearson's r was used between pairs of continuous variables; Spearman's rho (r_s) was used between ordinal and pairs formed by quantitative and ordinal variables; point-biserial correlation (r_{pb}) was calculated between quantitative and dichotomous variables; and phi (r_ϕ) served to test correlations between dichotomous and pairs formed by ordinal and dichotomous variables. Coefficients of the tests of association range from -1 to 1, and are reported in Table 2.

Four parallel multivariate regressions were developed to determine the relationship between teachers' attitudes towards, and professional use of, the internet and every independent variable, testing for separate effects and controlling for the other measures considered in the models (see Table 3). Ordinal and dichotomous independent variables were dummy coded. Regression coefficients (B), standard errors (S.E.), t -tests of significance and their corresponding standardised versions (Beta) were also calculated; the latter serving as a measure of the relative importance of any significant independent variable in each model. F -tests and R^2 values were used to determine the significance and the overall fit of the four multiple regressions, and served as an indication of the explanation reflected in each model. No significant violation of the major assumptions of regression modelling was observed. Variance-inflation factors (VIF) did not show any evidence of multicollinearity among the variables included, and multivariate normality was checked by inspecting the residuals.

4. FINDINGS

4.1. DESCRIPTIVE AND BIVARIATE ANALYSES

Table 2 shows that the internet appropriation for professional practice appears not to be very present among Spanish teachers working at compulsory education. The sample means are 2.03 (with a standard deviation of 1.52) and 0.68 (with a standard deviation of 0.91) for supportive and management internet uses, indicating that their frequencies of use are approximately once a month and even less than once a month, respectively. Nevertheless, a slight positive attitude towards professional use also appears among primary and secondary school teachers, as shown by the means for positive (3.72, with a standard deviation of 0.63) and negative (2.14, with a standard deviation of 0.74) on a scale ranging from 1 to 5.

As expected, positive and negative attitudes towards the professional use of ICT are inversely related ($r = -0.32$, $p = 0.000$), whereas the use of the internet follows a direct and slightly stronger pattern of relationship ($r = 0.50$, $p = 0.000$). Interestingly, we are far from a strong or near perfect correlation among attitudes or among uses, indicating that these are complex beliefs and practices that may have different determining factors and explanations. Hence, positive attitudes are also related to both types of use ($r = 0.33$, $p = 0.000$, and $r = 0.26$, $p = 0.000$), while negative attitudes are inversely associated with supportive use ($r = -0.22$, $p = 0.000$) but not with management use of the internet ($r = -0.02$, $p > 0.050$).

Regarding the explanatory or independent variables, there is a weak pattern of relationship between the organisational development of the school and the dependent variables, with r ranging from 0.12 to 0.19 ($p = 0.000$). Negative attitudes, again, are not related to organisational development ($r = 0.02$, $p > 0.050$). However, as expected, digital literacy, educational ICT training, and frequency of internet access within and outside the school follow a stronger correlation pattern, showing moderate associations with positive and negative attitudes (correlations ranging from 0.19 to 0.26, $p = 0.000$, and from -0.17 to -0.18, $p = 0.000$, respectively). Meanwhile, the introduction of the internet to professional practice is slightly more correlated to these measures, where supportive use shows an even stronger relationship (correlations ranging from 0.36 to 0.56, $p = 0.000$) than management use (correlations ranging from 0.22 to 0.34, $p = 0.000$).

Socio-demographics and school-level information show weaker relationships that may be taken into account in the multivariate analysis. In this regard, the lower half of Table 2 reflects a consistent pattern in which males ($r_{pb} = 0.13$, $p = 0.000$) and younger teachers ($r = -0.08$, $p < 0.010$) have more positive attitudes towards the professional use of ICT than their counterparts, with no significant differences concerning negative attitudes ($r_{pb} = -0.01$ and $r = 0.01$, $p > 0.050$, respectively). Likewise, women appear to make more frequent supportive use ($r_{pb} = -0.11$, $p = 0.000$) but also less management use ($r_{pb} = 0.10$, $p = 0.000$) of the internet, whereas older teachers systematically make less frequent use of the internet in their professional practice ($r = -0.15$, $p = 0.000$, and $r = -0.07$, $p < 0.010$, respectively). Finally, school-level information (i.e., sampling variables such as stage of education, funding, and location of school) does not show any difference

in positive or negative attitudes, although some even weaker but statistically significant correlations may be observed regarding internet use in professional practice.

4.2. MULTIVARIATE ANALYSIS

In order to contrast the bivariate relationships and weight the relative contribution of the explanatory variables, Table 3 shows four parallel multiple regressions of both positive and negative attitudes towards the professional use of ICT, and supportive and management uses of the internet. With the appropriate controls, and holding for all the other effects, we can explain how changes in every independent variable are related to each dependent variable considered in the models. However, due to the limitation of space, we will not comment on each of the partial regression coefficients. Rather, our strategy is based on the analysis of attitudes and professional uses separately, looking at the particular contribution of each explanatory variable (i.e., socio-demographics, school-level information, frequency of internet access within and outside the school, educational ICT training, digital literacy, and organisational development) through their corresponding standardised coefficient. Interested readers may check specific details in Table 3.

Regarding the unequal attitudes of teachers towards the professional use of ICT, it is important to note that although the main direct effects appear to be coherent, the resulting multivariable models need to be addressed with caution. As has been pointed out, negative attitudes do not seem to be the exact opposite of positive ones, resulting in two statistically significant models ($F = 5.955$ and $F = 12.840$, $p = 0.000$) with quite different levels of global adjustment ($R^2 = 0.076$ and $R^2 = 0.150$, respectively) that suggest a focus primarily on the latter. Thus, positive attitudes are statistically higher among male teachers (Beta = 0.071, $p < 0.010$) belonging to private schools (Beta = 0.065, $p < 0.050$) mostly located in medium-sized municipalities (i.e., towns with 10,001–50,000 inhabitants, compared to the reference group). However, looking at the relative size of the standardised coefficients, it is important to observe that the major effects tested in the regression models concern technological factors and organisational development.

Being a daily user of the internet within (Beta = 0.122, $p < 0.010$) and outside (Beta = 0.121, $p < 0.010$) the school, and having attended useful educational ICT courses over the last three years (Beta = 0.120, $p = 0.000$) are the characteristics of teachers that are significantly associated with higher positive attitudes towards the professional use of ICT. Furthermore, controlling for the other independent variables, higher levels of reported digital literacy (Beta = 0.147, $p = 0.000$) and, especially, better organisational development (Beta = 0.101, $p = 0.000$) are two other significant predictors of these feelings. Negative attitudes behave in a coherent way, whereby these effects are more or less observed but in the opposite direction (see the negative sign of the regression coefficients) except for the non-significance of the perceived organisational development (Beta = 0.052, $p > 0.050$).

Focussing on the right half of Table 3, we are also able to examine the unequal distribution of teachers' professional uses of the internet. Taking into account the global adjustment of the two regression models, our findings indicate that both are statistically significant ($F = 33.217$ and $F = 14.956$, $p = 0.000$) and also provide a moderate but acceptable degree of explanation ($R^2 = 0.304$ and $R^2 = 0.164$, respectively). Exploring the

bivariate relationships in greater depth, sampling variables such as stage of education, funding and location of the school are not actually associated with professional use. In turn, holding for the other effects considered in multiple regressions, the slight correlations observed between professional uses and socio-demographics (i.e., age and gender) are not statistically significant either.

Removing these effects, other technological factors and organisational development appear to be related to teachers' professional use of the internet. More frequent access to the internet at school is associated with an expected consistent increase in supportive and management uses, especially for daily users (Beta = 0.280, $p = 0.000$, and 0.235, $p = 0.000$). Interestingly, daily access outside the school is also related to a more frequent supportive use (Beta = 0.149, $p = 0.000$). However, daily access becomes non-significant as an explanation of management use (Beta = 0.073, $p < 0.050$).

Likewise, useful-rated educational ICT training courses are associated with professional usage, with a slightly higher relative importance revealed for the supportive use of the internet (Beta = 0.135, $p = 0.000$, compared to 0.085, $p = 0.000$). Similarly, higher digital literacy levels also make a positive and significant contribution to effective appropriation of the internet in professional practice (Beta = 0.295 and 0.158, $p = 0.000$). Finally, regarding organisational development, an additional moderate effect is still observed after controlling for all the other explanatory variables. However, according to the corresponding standardised regression coefficients, increases in organisational development account for a slightly more frequent management use of the internet (Beta = 0.175, $p = 0.000$, compared to 0.102, $p = 0.000$).

5. DISCUSSION

5.1. OVERVIEW OF KEY FINDINGS

In this study we used a digital inequality approach to analyse teachers' unequal appropriation of ICT, particularly the internet, in professional practice outside the classroom. As we have discussed, this is a key area for understanding the process of ICT integration in schools. Furthermore, it complements the more traditional approach that focuses on teaching and learning practices. In a progressively more complex society, being a teacher does not only entail transmitting knowledge to children or guiding the development of their skills and competencies. Indeed, another concern should be how teachers use ICT as a professional tool to support the teaching and learning practices that usually occur in class.

Contrary to the digital divide approach, socio-demographics and school-level information do not provide an adequate explanation for the unequal appropriation of the internet in teachers' professional practice. Our findings indicate that there are other factors that need to be taken into account. For instance, bivariate analysis shows that male and young teachers have higher positive attitudes and more frequent professional internet use than their female and older counterparts. These differences become non-significant in the multivariate analyses when we include technological factors such as the frequency of internet access within and outside school, and digital literacy. In fact, male and young teachers are more frequent users of the internet within and outside the school, and have

acquired better skills than their counterparts. Accordingly, differences in the frequency of internet access and digital literacy account for age and gender differences in the appropriation of the internet in teachers' professional practice.

In a nutshell, this study suggests that technological factors as well as organisational development are associated not only with higher positive attitudes towards the professional use of ICT, but also with an increasing adoption of the internet in teachers' professional practice outside the classroom. Even after controlling the effect of socio-demographics and school-level information, schools' organisational development is related to more frequent professional uses among teaching staff. Whether in the supportive or management uses of the internet, the findings suggest a connection between daily organisational practices and the unequal appropriation of ICT outside the classroom.

The findings also suggest that the frequency of internet access within and outside school has a similar effect on positive attitudes towards the professional use of ICT. This is particularly true for daily users in both contexts whose attitudes are significantly higher. Interestingly, there is also a differential effect of the frequency of internet access on supportive and management uses of the internet. While within-school internet access is associated with both types of professional use, outside school access is not associated with the management use of the internet. These findings suggest that the location where the internet is accessed plays a significant role in the types of teachers' professional practices outside the classroom. In this respect, daily access at home or in other public locations is more related to supportive use, while daily school access becomes the most important predictor of management use.

Educational ICT training and digital literacy also have a positive effect on teachers' attitudes towards, and professional uses of, the internet outside the classroom. Teachers who have attended useful-rated ICT courses, and especially those who report a higher level of internet mastering, show more positive attitudes and more frequent supportive and management uses. Remarkably, these effects are significantly stronger for the supportive use than for the management use of the internet. These findings suggest that the development of teachers' digital skills is primarily focused on attaining supportive practices. Finally, organisational development shows a different pattern of relationship, given that its effect is greater on management use of the internet than on supportive use or attitudes towards the professional use of ICT. Accordingly, organisational development is the second most important predictor of management use after frequency of internet access within the school. Such findings are consistent with the expected results, and suggest that organisational practices influence the individual appropriation of the internet for teachers' professional purposes.

5.2. STRENGTHS AND LIMITATIONS

This study contributes to the research on factors influencing ICT integration in schools by adopting a digital inequality approach. This perspective is not limited to the mere access or frequency of internet use in classrooms and schools; it actually proposes a multi-dimensional view of ICT appropriation by highlighting the importance of focussing on other technological concerns, such as conditions of access, knowledge and skills, and attitudes towards, and types of, ICT use. An analysis of ICT appropriation in schools requires taking into account the purpose that guides the individual adoption of ICT.

Accordingly, in this study we limited the scope of general internet use to focus exclusively on teachers' use of the internet as a professional tool outside the classroom. In line with the literature on teachers' use of ICT, we have identified and characterised two types of professional use aimed at enhancing teaching, learning, and management practices. We also considered that attitudes towards ICT have a prominent role in the actual appropriation of ICT. In this regard, rather than being a question of teachers being interested in or liking computers, we conceptualised attitudes towards ICT in terms of a close relation to the professional purpose of ICT use.

This study has some limitations. Findings should be viewed as an initial exploration of the individual and school-related factors that affect teachers' use of ICT as a professional tool in compulsory education. We established a relationship between individual adoption of ICT and schools' organisational development. However, in order to explore the relationships and patterns that may explain the changes in teaching and in professional practices from an organisational perspective, more studies clearly are needed. Additionally, more specific measures that would take into account some other aspects of organisational development theory would be helpful to increase our understanding of teachers' use of ICT as a professional tool. Such examples can be found in the work of Tondeur, Devos, van Houtte, van Braak, and Valcke (2009). In this study a questionnaire was developed to explore the organisational factors affecting ICT introduction in the classroom, based on three dimensions of school culture: innovativeness, goal orientedness and supportive leadership.

Complementarily, a qualitative approach based on interviews and observations would extend our knowledge beyond statistical significance and generate in-depth understanding about the meanings and values of the actors involved. As suggested by Vitale, Armenakis, and Field (2008), qualitative data gives the opportunity to gather contextual information, which contrasts with the focused and selective nature of fixed-choice questionnaires. For instance, it would be worthwhile to explore in more detail why teachers include ICT in their professional practice, as well as the perspectives and beliefs accompanying the professional use of ICT outside the classroom. Taking into account the value of qualitative research to capture organisational realities (Currall & Towler, 2003), this approach would be useful to describe the structural features of the factors affecting ICT use in relation to school cultures, subcultures, and climate. Finally, from a triangulation point of view, qualitative data could also help to corroborate our survey findings as Webster and Hackley (1997) did in their study.

6. CONCLUSION

Research on the factors that affect ICT adoption and implementation in schools has mainly focused on the teaching and learning processes in the context of classroom use. While these studies have contributed to understanding the complexity of ICT implementation in schools, more research is also needed on the potential of ICT to support out-of-classroom professional practices. Accordingly, the study presented here examines the influence of individual and school-related factors on teachers' attitudes towards the professional use of ICT, as well as on supportive and management uses of the internet outside the classroom. Controlling for socio-demographics and school-level information,

findings suggest that technological factors and organisational practices are important predictors of ICT appropriation for professional purposes.

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