

Learning to become a teacher in the 21st century: ICT integration in Initial Teacher Education in Chile

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(Submitted September 25, 2011; Revised April 23, 2012; Accepted April 12, 2014)

ABSTRACT

This paper presents the most relevant results from a national study about the availability and use of ICT in 46 Initial Teacher Education institutions in Chile, implemented during 2009 as part of the OECD (Organization for Economic Cooperation and Development) international project “*ICT in Initial Teacher Training*.” Main findings show an overall favorable context for the pedagogical use of ICT in such institutions, in terms of ICT infrastructure, support, policies and teachers’ self-reported ICT related skills. In addition, teachers report a quite frequent use of some ICT resources, giving a high importance to students’ learning of ICT. However, ICT integration is limited to a few specific resources (mainly computers and projectors), mostly applied to perform “traditional” pedagogical activities. Therefore, the expectations about the improvement of teaching and learning in Teacher Education in Chile through the integration of ICT, are not been fulfilled yet. This paper can constitute a significant contribution for developing more innovative and better quality pedagogical practices in this education level.

Keywords

Initial teacher training, Teacher education, ICT in education, Learning, ICT, Chile, ITT

Introduction

This paper presents the results of a study about the availability and use of ICT in the Initial Teacher Training (ITT) in Chile, conducted in the context of the international study “ICT and Initial Teacher Training” developed since late 2008 by the OECD. It stems from the concern shared by several OECD member countries about what they see as a deficit in their ITT systems in providing the required vision, experience and skills for enabling future teachers to integrate ICT into their professional practices in primary and secondary education levels.

Although several studies show that teachers are among the most skilled ICT users, it seems that they are still unable to apply these skills to the way they teach (Pedró, 2009). Some feasible explanations for this paradox highlight the experiences in ITT among the most important factors. However, a claim about the existence of a link between ITT and teaching skills with ICT needs to be supported by empirical evidence: this study aims at generate relevant information on this matter.

In this context, the international study investigates the current use of ICT in ITT in a number of countries from a comparative perspective, analyzing the future prospects and the possibility to formulate recommendations on applicable policies and strategies. Accordingly, the Government of Chile decided to participate in this project to get a deeper understanding about the use of ICT resources in its ITT institutions.

The obtained results provide an overall picture that could contribute to strengthen the processes related to the integration of ICT in this educational level.

National context about ICT in Initial teacher education in Chile

Initial Teacher Education in Chile is conducted by higher education institutions which are officially recognized by the State: Universities and, under certain conditions, Professional Institutes. In early 2009, approximately 65 of these institutions were offering more than 700 programs oriented to all levels of the national system: preschool, primary, special and secondary education.

Chile has a comparatively long history in the introduction and use of ICT in K-12 through the *Enlaces* project, its “official” nationwide initiative for ICT in education: it has been aiming to integrate ICT as a pedagogical resource for all students and teachers in Chilean public schools (Hinostrroza, Hepp & Cox, 2009). However, just recently the Ministry of Education (MoE) has started to pay attention to the use of ICT in ITT institutions: during the last years, the MoE has been developing some actions explicitly aimed at fostering the integration of ICT in ITT, such as the development and promotion of ICT related standards and the integration of ICT-based items in the teachers’ professional certificate implemented on a voluntary basis. Regarding this certificate, the “*Inicia*” program - conducted since 2008 by the MoE for encouraging the transformation of institutions, curricula and practices in ITT and ensuring the professional quality of graduated teachers at a national level (Meckes, 2010)- proposes a set of pedagogy and content related standards, including the evaluation of new teachers’ “*computational skills*.”

In addition, the MoE produced the report “*ICT Standards for Initial Teacher Training*” (Ministry of Education, 2006) and later, the “*Functional Map for ICT training and teaching skills*” (Ministry of Education, 2007): These documents present an articulated set of teaching competences organized in five functional dimensions, viz. pedagogical, technical, managerial, ethical and legal, as well as professional development.

The presented framework aimed at support the implementation of an ICT curriculum in ITT, opening a space for reflection and debate about the ways in which teacher education institutions are responding to the demands of current society, from a more complex and global perspective related to the appropriation of ICT.

Research background

The information and innovation-based society demands from the education systems continuous improvements to prepare new generations for taking full advantage of the new socio-cultural and economic conditions. Consequently, education systems are recognizing teachers' key impact on students’ performance (Barber & Mourshed, 2007) and they are increasingly focusing on ITT institutions, transforming them into the new “locus of attention.”

Considering the widespread availability of ICT in schools and society, and being aware of the “difficulties” to easily demonstrate a positive impact of ICT in students’ learning outcomes, researchers in this field are also shifting their attention to the use of ICT in ITT. Although it should not to be assumed that the use of ICT is *per se* a necessary and sufficient condition for a good pedagogical practice, in cases like Chile -with a major nationwide initiative on ICT in Education implemented for the last 15 years- the preparation of future teachers for using ICT resources in teaching constitutes a real need that cannot be neglected.

Consequently, the process of an effective use of ICT in schools should start in the ITT (Kay, 2006) since this training stage is a key factor for promoting ICT-based skills related to future teachers work at schools (Graham & Thornley, 2000). Nevertheless, the lack of explanation about why many students in ITT feel unprepared to integrate ICT in their future pedagogical practices (Twidle et al., 2006) reveals the complexity of this issue.

Drawing on the results of the review done by Enochsson & Rizza (2009) it seems that ICT aren’t being used in a regular or systematic way in ITT. The main factors that could explain this situation can be summarized as follows:

- *Policies on ICT integration*: Research in K-12 shows that the institutional vision about the role of ICT in teaching and learning is a key factor for its effective pedagogical integration (Anderson & Dexter, 2000; Law, Pelgrum & Plomp, 2008). However, institutional policies are among the least mentioned factors in research works on Teacher Education.
- *Curricular integration of ICT*: Technologies can be integrated as a specific subject or as contents included across most of the disciplines (Schmidt, 1998). It’s generally accepted that the inclusion of ICT just in one or a few subjects is an ineffective way for integrating it in ITT (Kirschner & Davis, 2003; Sardone & Devlin-Scherer, 2008), whereas a cross-curricular approach is more effective (BECTA, 2006).
- *ICT infrastructure and support*: Availability and access to ICT are required conditions to integrate it in teaching and learning (Anderson & Petch-Hogan, 2001; Judge & O’Bannon, 2008), but they aren’t enough to promote its pedagogical use (Selwyn, 2004). Current literature claims that ICT infrastructure is no longer a problem in Higher Education institutions (Enochsson & Rizza, 2009): although there is little information about computers

availability in ITT, a ratio of 14 students per computer in Sweden (Enochsson, 2010) and 16 in Norway (Tømte, Hovdhaugen & Solum, 2010) could be mentioned as references. Additionally, many authors (e.g., Tong & Trinidad, 2005) highlight the importance of an adequate support to teachers.

- *Actors' competences and visions about ICT use:* The lack of teachers' ICT-related pedagogical competences has been pointed among the main obstacles for technologies use in teaching (Vrasidas & McIsaac, 2001; Afshari et al., 2009). This demand for training is reflected in the international survey TALIS (OECD, 2009) where the acquisition of "ICT teaching skills" was the second most frequently prioritized item. This prospect about professional development is also backed-up by different studies related to the role of ICT in ITT (Georgina & Olson, 2008; Buckenmayer, 2008) and the "TPACK" (*Technological Pedagogical and Content Knowledge*) framework (Mishra & Koehler, 2006; Archambault & Crippen, 2009)—which claims for the existence of technological, pedagogical and disciplinary knowledge, not only as separate components, but also as interrelated contents. Furthermore, teachers' comfort in using ICT, and their attitudes toward the pedagogical use of technologies, are also mentioned as relevant factors (Judge & O'Bannon, 2008; Drent & Meelissen, 2008). Regarding students, they seem to feel comfortable with ICT but they rarely use it for instructional purposes (Twidle et al., 2006); accordingly, many future teachers believe they aren't being fully prepared for using ICT in teaching (Enochsson & Rizza, 2009), claiming that their training in this matter is patchy and inconsistent (Moeini, 2008).
- *ICT use in teaching and learning activities:* Different studies report a relatively low, basic and repetitive use of ICT in K-12, associated to simple and traditional pedagogical activities, rather than to more complex and/or innovative ones (Trucano, 2005; Law et al., 2008). Many authors consider ICT as an 'appendix' to other pedagogical resources (Whitworth & Berson, 2003) or as a support for existing teaching practices (Ottesen, 2006), while others posit an underuse of the ICT resources available at educational institutions (Cuban, 2001; Jimoyiannis & Komis, 2007). In this context, the students' lack of confidence to integrate ICT in their future teaching seems to be related to the scarcity of pedagogical activities with ICT during their ITT. Perhaps "students don't know how to use new technology in their classroom instruction when they go to (...) schools, because they lack previous practices of applying ICT into curriculum" (UNESCO, 2002, p. 69).

These studies highlight the importance of future teachers' understanding, not only about how to use ICT but also about the specific knowledge involved in the pedagogical use of ICT, and the full comprehension of the impact of technology on learning processes. Although more and more teachers and students are achieving increasing levels of ICT-related skills and the availability of technology is constantly growing in educational institutions, the underlying knowledge is still not been fully transferred to teaching practices (Player-Koro, 2007; Pedró & Ananiadou, 2009).

Thereby, the main purpose of this paper is to provide a general description of the current integration of ICT in ITT in Chile, with the aims of respond the following research questions:

- What are the institutional contexts regarding the use of ICT in ITT?
- To what extent and in what ways is ICT been used in teacher education institutions?
- How are students been prepared in ITT institutions to integrate ICT in their future teaching?
- What are the main pedagogical activities performed with ICT?
- What are the most relevant factors considered as barriers and enablers to ICT integration in ITT?
- What recommendations could be issued to policy-makers in this field?

This paper started by presenting the national context in this domain, and the research background. Then, the method is described and main results are shown. Finally, it presents the most relevant conclusions that might have implications for policy-design and further research.

Method

To address the research questions, this study used a methodological approach combining both quantitative and qualitative data collection techniques, such as a survey applied to different actors in Initial Teacher Education institutions in Chile using a self-administered paper questionnaires, and several case studies (mainly involving interviews and focus groups) carried out in ITT institutions selected according different criteria.

The questionnaires provided by the international study covered diverse issues (namely: policies, curricular integration, infrastructure and support, frequency of ICT use, teaching and learning activities, enablers and barriers to ICT integration, among others), aimed to get an overview of the use of ICT in ITT. These instruments were firstly translated into Spanish; then adapted to the local context and, finally, some complementary questions were added.

Questionnaires were applied in 46 teacher training institutions participating voluntarily in the study (about 75% of national total), targeting different actors whose corresponding samples were: (a) 46 deans (or equivalent authorities); (b) 495 teachers (considering different programs: primary education, and secondary education in mathematics, national language, social sciences and natural sciences); (c) 164 mentors (supervising students during their teaching practices); (d) 1,675 students (selected from different years); (e) 233 recent graduates; and (f) 50 technical and/or pedagogical responsible (in charge of pedagogical ICT related issues and/or technical aspects, such as maintenance). Fieldwork was conducted from June to September, 2009.

Results have a 95% significance level, allowing to perform inferential processes over the total population. The main quantitative statistical procedures used in this paper correspond to descriptive analysis (i.e., frequencies, and mean differences using t-test and one-way ANOVA), and they were performed with the software SPSS-Statistics v.17.00 .

Results

Results are structured in seven sub-sections, according to the dimensions addressed in the theoretical framework: (1) Institutional policies and practices for ICT integration; (2) Infrastructure, ICT resources and support; (3) Actors' confidence in the use of ICT; (4) Visions about the pedagogical use of ICT; (5) Use of ICT resources in teaching and learning activities; (6) Teaching and learning activities performed; (7) Main barriers and enablers for ICT integration.

Institutional policies and practices for ICT integration in ITT

Results show that 63% of deans mentioned the existence of an institutional policy to integrate ICT in teaching, and almost 70% of them reported to have a department specifically oriented to support pedagogical innovations in teaching, including the use of ICT.

They reported that ICT is mostly integrated into the curriculum only in some specific subjects (83% of ITT institutions) instead of across several subjects (cross-disciplinary). Moreover, 56% of the institutions included explicit objectives related to students' development of ICT-related pedagogical competences in half or less of their programs.

Aligned with this, only 39% of the deans answered that “innovating in teaching using ICT” or “implementing specific actions to integrate ICT” are among the highest institutional priorities regarding teachers' acquisition of competencies to perform instructional practices (see Figure 1).

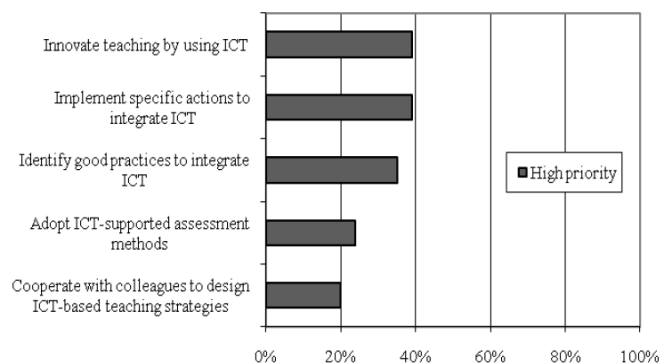


Figure 1. Percentages of deans assigning a high priority to teachers' acquisition of ICT related competences

Consistent with the previous figure, 65% and 68% of the institutions only provided optional courses related to the technical and pedagogical use of ICT, respectively; whereas only less than 20% of such courses were mandatory (Figure 2).

Summarizing, it can be argued that despite the intentions associated to incorporate ICT in teaching and learning, relatively few ITT institutions formally integrate technologies into their curriculum; and for most of them, this is not a high priority (notwithstanding the fact that many institutions do have a department supporting pedagogical innovations). This finding is also consistent with the predominantly optional character of the ICT related courses they offer.

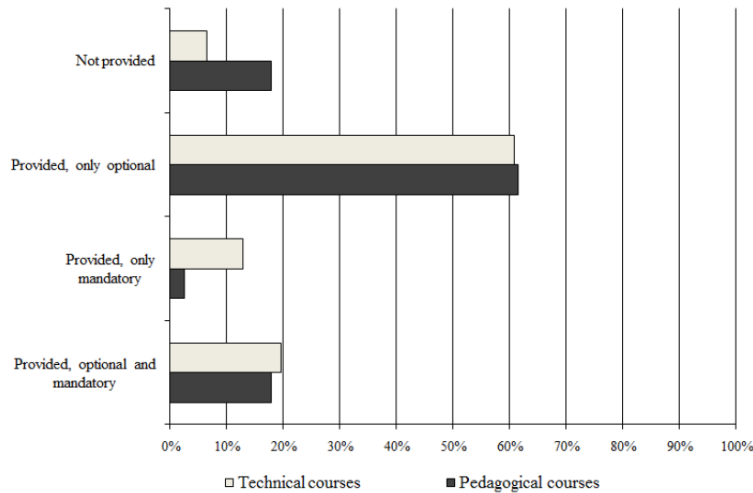


Figure 2. Percentages of deans reporting the provision of ICT related courses

Infrastructure, ICT resources and support

An adequate infrastructure and the availability of technical and pedagogical support are necessary conditions to integrate ICT into educational institutions (Chen & Chang, 2007). Results from this study show that the students per computer ratio in ITT institutions in Chile is 17, whereas all participating institutions provide Internet access (96% with broadband access). Additionally, 59% of the institutions reported to have LMS/VLS systems, supporting 53% of their courses and been used by 44% of teachers at least once a week. Furthermore, almost 75% of teachers and mentors reported to have access to a computer in their institutions.

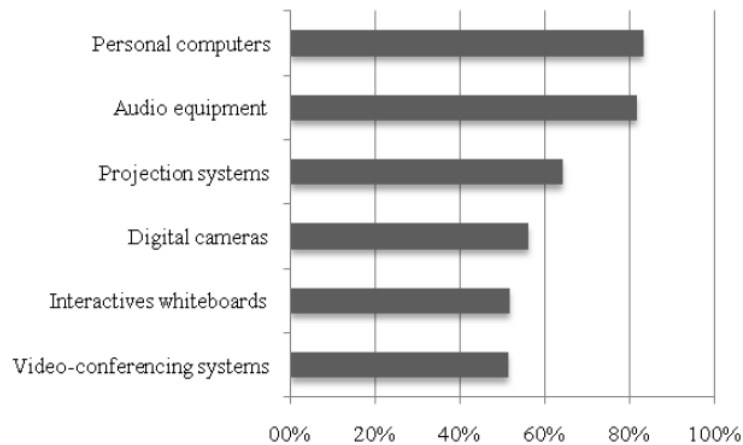


Figure 3. Percentages of teachers reporting the availability of ICT resources in the classrooms

About the availability of ICT resources in the classrooms, 83% and 82% of teachers reported the existence of computers and audio equipment –respectively– in “some” or “almost all” classrooms; with a lower availability of other resources such as projections systems (64%), interactive whiteboards (52%) and videoconference systems (51%), as Figure 3 shows.

About *students’ access to ICT resources*, 85% of the students reported to have free access to computers, 50% to projection systems, and only 35% to LMS/VLS systems. Moreover, less than 10% of them reported a free access to interactive whiteboards and digital cameras (Figure 4).

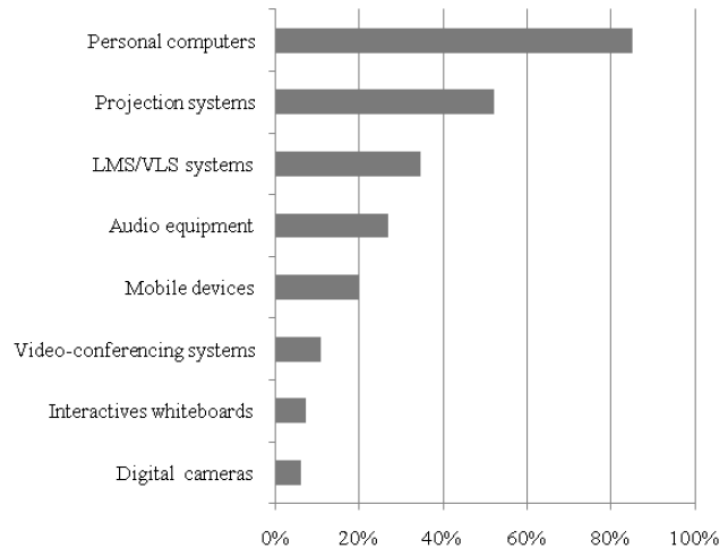


Figure 4. Percentages of students reporting to have free access to different ICT resources in their institutions

Regarding the availability of technical and pedagogical support, 96% and 70% of teachers reported—respectively—that these services are available in their institutions. In turn, only 63% and 57% of students mentioned the availability of such support (Table 1). In addition, results show that the overall quality was ranked between “medium” and “high” for both services.

Table 1. Percentages of teachers and students reporting the availability of technical and pedagogical support

Actor	Technical	Pedagogical
Teachers	96%	70%
Students	63%	57%

In summary, results show that the most available and accessible resources are computers and projection systems; conversely, interactive whiteboards, video-conferencing systems and digital cameras are the least available. Besides, teachers reported more access to ICT infrastructure than students, and a higher availability of technical and pedagogical support. In general, it could be argued that access to computers and projection systems for teachers and students in ITT is widespread; however, availability and access to other resources is relatively scarce (particularly interactive whiteboards).

Actors’ confidence in the use of ICT

Broadly speaking, teachers and students reported high levels of comfort in ICT use, either at home or in classes: 78% and 67% of teachers reported to feel “very comfortable” while using ICT at home and in classes, respectively. As seen in Figure 5, students show similar levels of comfort (66% and 62%, respectively) The fact that more teachers reported to feel comfortable with ICT when compared to students, is consistent with the previous results showing teachers’ higher access to ICT.

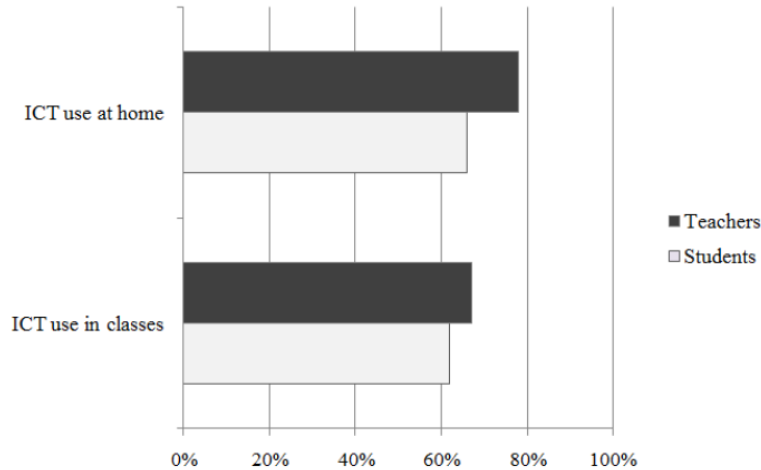


Figure 5. Percentages of teachers and students reporting to feel “very comfortable” when using ICT

Regarding teachers’ confidence in performing different activities with ICT, Figure 6 shows that the highest levels were related to: “attach a file and send it via email” ($M = 3.79$, $SD = 0.559$); “produce a letter with a word processor” ($M = 3.74$, $SD = 0.559$), and “file a digital document in a computer” ($M = 3.73$, $SD = 0.726$). Conversely, the activity with the lowest confidence level was “making purchases and payments on the Internet” ($M = 3.13$, $SD = 1.129$).

In turn, students reported an ICT use of 14 hours per week for academic purposes and another 15 hours for its use at home. Additionally, only 38% of students took workshops or courses about ICT during the two years preceding the study, and just 10% of them have been personally engaged in innovative projects developed by their teachers involving the use of ICT.

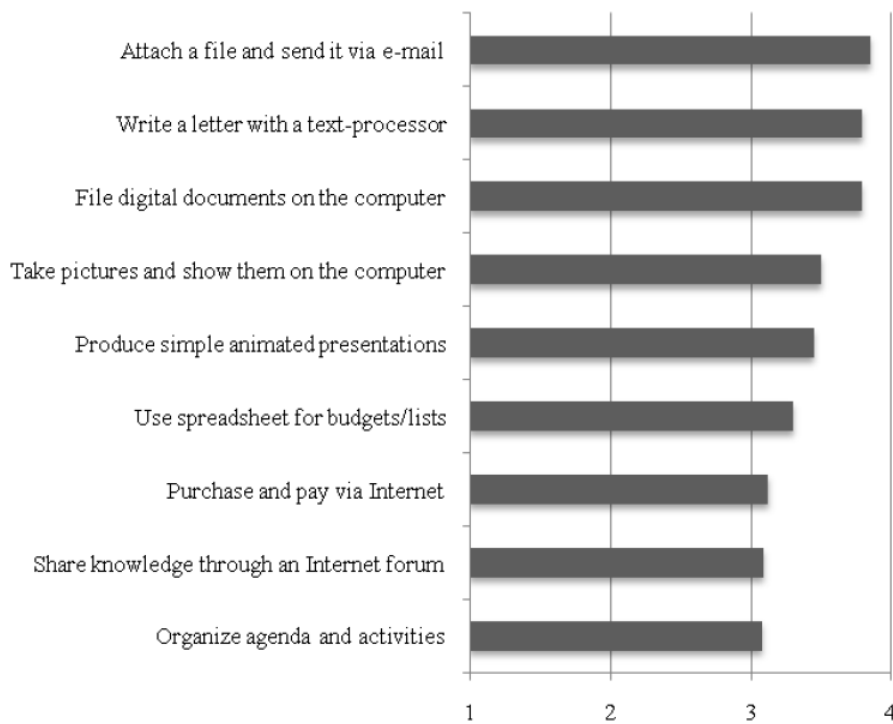


Figure 6. Means of confidence levels reported by teachers when performing different activities with ICT (Likert scale: 1 = not confident; 2 = somewhat confident; 3 = fairly confident; 4 = totally confident)

Finally, approximately 70% of students reported to feel confident to integrate ICT in their future teaching activities. However, results from the case studies showed that many interviewed students considered that the ICT-related pedagogical skills acquired during their ITT were incomplete and insufficient.

Summarizing, the majority of teachers and students declared to feel confident to take advantage of ICT and to integrate ICT in their teaching practices, however, based on the case studies, there is some evidence pointing at the need to more deeply analyze the type and quality of the ICT-related pedagogical skills that students are learning.

Visions about the pedagogical use of ICT

The questionnaire asked teachers and students about the importance of new teachers learning about using ICT for different activities. The corresponding responses were grouped in four indicators:

- *Communication and networking*: This indicator groups the items related to the use of ICT communication tools.
- *Own development and learning*: Item related to ICT use in professional development activities.
- *Organization of teaching work*: This indicator groups the items related to ICT use for administrative and planning activities.
- *Integration in teaching*: This indicator groups the items related to ICT use in teaching and learning activities.

Results show that both teachers and students considered as “quite” or “very” important that new teachers learn how to use ICT to perform those activities (Table 2). It’s noteworthy that differences between and within groups aren’t significant, revealing the high degree of consensus among teachers and students about the importance of learning ICT for teachers’ professional activities.

Table 2. Importance attached by teachers and students to students’ learning about the use of ICT for different purposes

Indicator	items	Teachers			Students		
		Cronbach’s alpha	M	SD	Cronbach’s alpha	M	SD
Communication and networking	4	.854	3.7	0.416	.877	3.3	0.629
Own development and learning	1	-	3.8	0.381	-	3.5	0.644
Organization of teachers’ work	4	.921	3.8	0.366	.888	3.6	0.529
Integration in teaching	11	.940	3.6	0.458	.949	3.4	0.572

Note. Means measured in a Likert scale: 1 = not important; 2 = rather important; 3 = quite important; 4 = very important.

Based on these results, it’s reasonable to argue that teachers and students are aware of the importance of new teachers’ learning about how to use ICT in their professional activities. However, it also emerges from case studies that students perceive they are not learning enough about the use of these tools for their future teaching.

Use of ICT resources in teaching and learning activities

Regarding the frequency of ICT use in teaching and learning activities, results show that 76% and 74% of teachers used projection systems and computers, respectively, in half or more of their lessons, whereas most of the remaining hardware resources show percentages below 10%. It’s noteworthy that while 44% of teachers reported the use of digital learning resources in half or more of their lessons, only 13% or less reported the same frequency regarding multimedia or educational software (see Figure 7).

In relation to the relatively low percentage of teachers using some specific ICT resources, it could be argued that it’s a consequence of their lower availability. Nevertheless, when comparing the availability of most of ICT resources (except for computers and projection systems) with their frequencies of use, it can be seen that availability is, in general, quite higher than use (Figure 8). For example, whereas about half of the teachers reported the availability of interactive whiteboards, digital cameras or video-conferencing systems in at least some classrooms, less than 10% of them reported to use them in half or more of their classes.

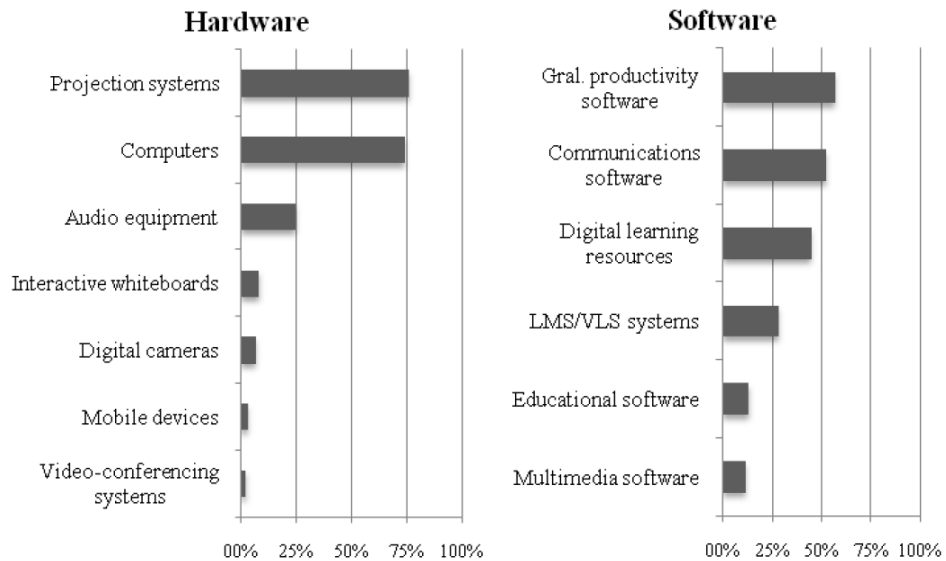


Figure 7. Percentages of teachers reporting the use of different ICT resources during half of their lessons or more

In addition, teachers were asked about how often they taught their students how to use ICT resources for teaching. Results show that whereas one third of teachers reported to teach their students how to use computers and projection systems for teaching in half or more of their classes, less than 10% reported to teach the use of the other ICT resources. This was somewhat confirmed by students' interviews, when they claim: *"They always require us to make PowerPoint presentations, but in fact this is the only resource we use, the only thing."* This result is interesting and opens questions about the need to fully provide students the conditions for developing the required level of technological-pedagogical-content knowledge (Mishra & Koehler, 2006) to fully take advantage of ICT resources in teaching.

Summarizing, results show that teachers tend to use quite frequently computers, projection systems and some software products during their lessons; however, they do not frequently use other ICT resources. Moreover, they show that relatively few teachers teach their students how to use the available variety of ICT resources for teaching, mainly focusing in teaching the use of computers and projectors, and mostly using presentation software, as students declared.

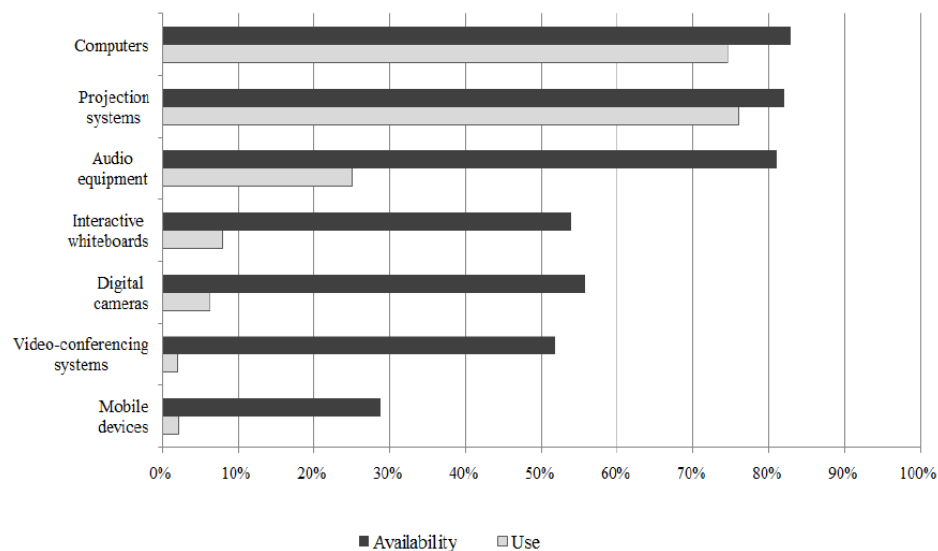


Figure 8. Percentages of teachers reporting the availability and use of different ICT resources in their classes (Percentages of availability correspond to "at least in some classrooms" and percentages of use correspond to "in half of the classes or more")

Teaching and learning activities

The study also asked teachers and students about how often they performed different activities, both overall – regardless the use of ICT– and specifically by using ICT. Particularly, three groups of activities were included: (a) teachers’ educational management related activities; (b) teaching activities; and (c) learning activities.

Regarding *teachers’ educational management related activities* Figure 9 shows the percentages of teachers reporting the performance of different activities, at least once a month. The majority of them reported to perform the following overall activities: preparation of general classes (92%); search useful learning resources (87%); communication with students (87%) and colleagues (86%); organization of teachers’ work (85%) and design own learning resources (83%). Conversely, relatively few teachers reported: participation in courses or workshops (24%); participation in collaborative projects (37%); and identification of pedagogical situations for the use of ICT (51%).

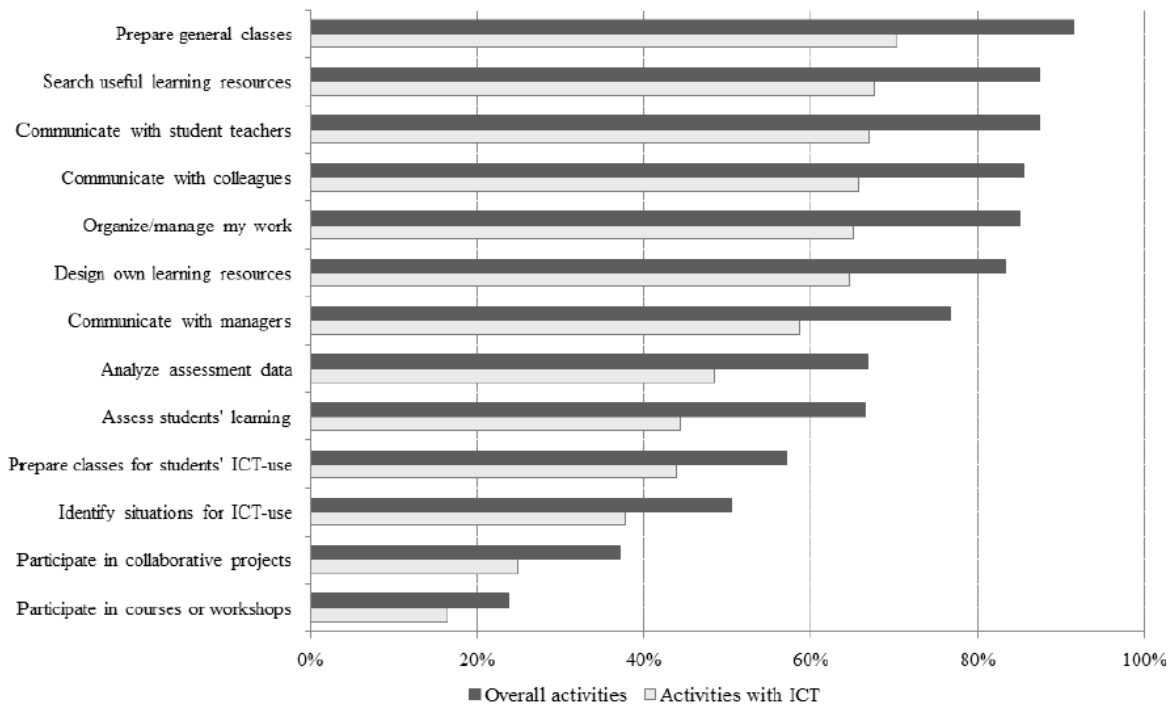


Figure 9. Percentages of teachers reporting to perform activities associated to their educational management related work, overall and with ICT (Percentages correspond to a frequency of, at least, once a month)

When considering the percentages of teachers reporting to perform these activities but by using ICT, it emerges that they follow a similar pattern: this finding is quite interesting, since indicates that ICT is not being used in any particular activity more than others, and that teachers’ use doesn’t seem to modify the patterns of implementation corresponding to their practices regardless the use of ICT.

Regarding *teaching activities*, Figure 10 shows the percentages of teachers reporting to implement different activities at least once a month with and without the use of ICT. In this case, the majority of teachers report they search for information (76%); develop products/reports (63%) and assess learning (66%); meanwhile, relatively few teachers report performing lab activities (18%); extra-institutional activities (19%) and communication with other experts/teachers (31%). Although the percentage of teachers reporting to perform these activities with the use of ICT tends to follow a similar pattern, it should be noted that some activities (e.g., research projects and activities accessed independently by students) show smaller differences, probably implying that, when they are performed, they are mostly done by using ICT.

Finally, Figure 11 presents the percentages of students reporting the implementation of different *learning activities*, at least once a month. Results show that the majority of students report to: make presentations (75%), work as a

group in class at same pace (70%) and develop learning materials (67%). Conversely, relatively few students report to communicate with external actors (34%) and contribute to the community through learning activities (36%). When comparing the percentage of students reporting the implementation of these activities, in general and with the use of ICT, results reveal the existence of some differences showing that ICT is relatively more frequently used by students in some activities, viz. communicate with external actors, develop learning materials, contribute to the community through learning activities and make presentations. Conversely, ICT is relatively less frequently used in activities such as participate in collaborative projects/activities, work individually in class at own pace, and self-evaluate or co-evaluate with peers. These findings open the discussion about the specific role played by ICT in performing these activities.

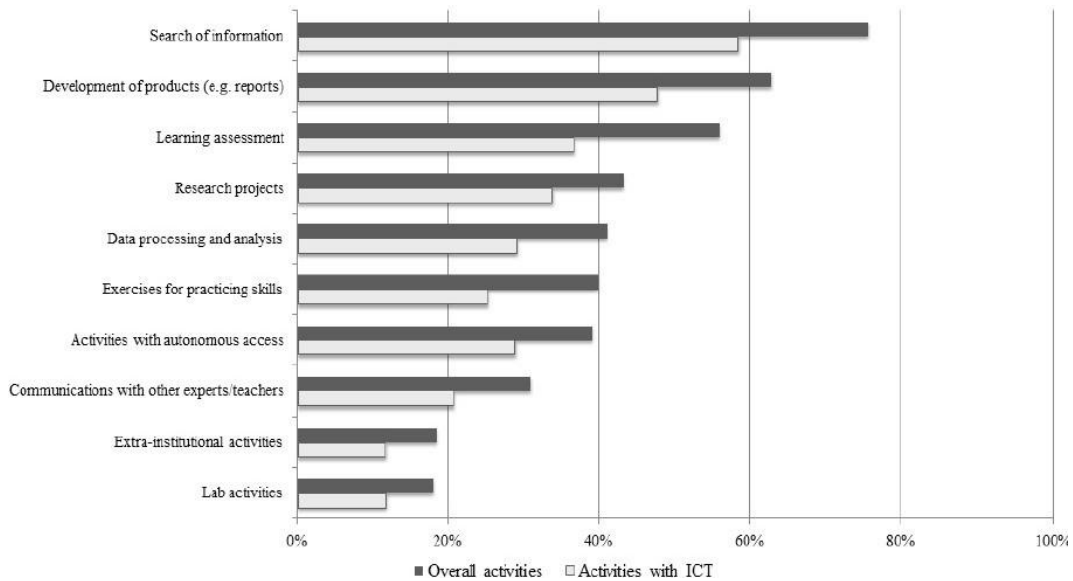


Figure 10. Percentages of teachers reporting to perform teaching activities, overall and with ICT (Percentages correspond to a frequency of, at least, once a month)

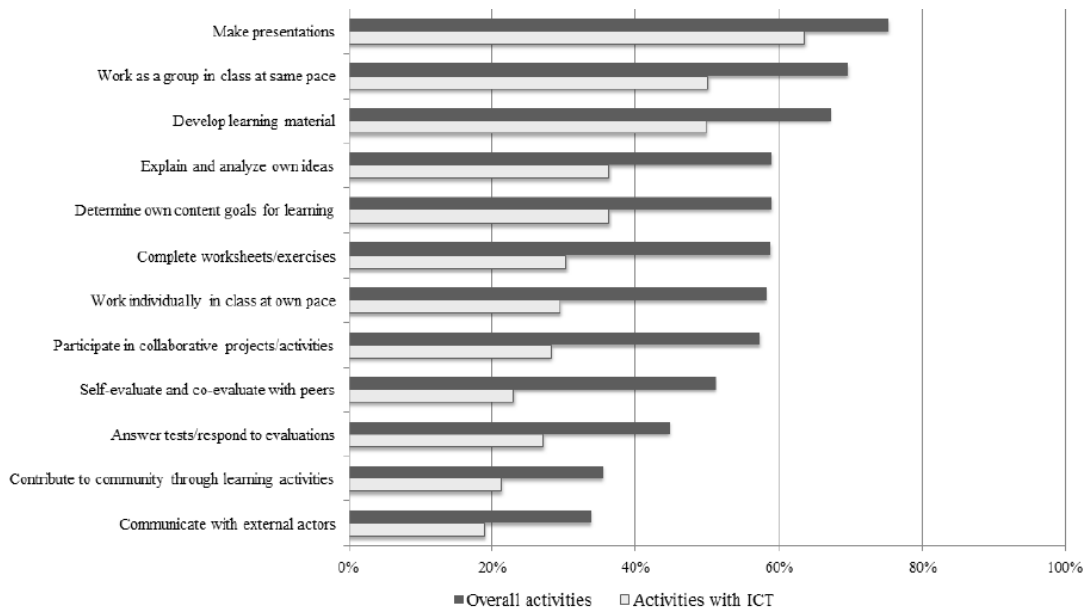


Figure 11. Percentages of students reporting to perform learning activities, overall and with ICT (Percentages correspond to a frequency of, at least, once a month)

The comparison of the frequencies of teachers and students activities performed with ICT shows that relatively less teachers report to use ICT for teaching activities than students do for learning activities (30% and 34.5%, respectively); however, the percentage of teachers reporting educational management activities with ICT reach the highest percentage (51.9%).

Summing up, results show that teachers tend to use ICT consistently across their educational management related activities and in most of their teaching practices, without showing any evidence of ICT contributing to the implementation of some specific activities over others. Nonetheless, the use of ICT by students shows some evidence of differentiated roles in certain particular learning activities.

Main barriers and enablers for ICT integration

Regarding the main barriers to integrate ICT in ITT, they can be grouped in two categories: (a) personal factors (related to the actors involved: e.g., lack of ICT competencies; visions about ICT; etc.); and (b) institutional factors (aspects clearly related to institutions: insufficient equipment and lack of institutional policies; among others).

As Figure 12 shows, the institutional obstacles most frequently mentioned by teachers were: lack of equipment or digital learning resources (41% and 46% respectively); lack of pedagogical or technical support (44% and 39% respectively); and lack of institutional interest or policies oriented to promote ICT integration (28% and 42%, respectively). Regarding personal barriers, the most frequently mentioned were: lack of time to explore ICT (52%); lack of general or pedagogical ICT-related competences (31% and 29%, respectively); lack of teachers' confidence or flexibility to try new approaches (24% and 18% respectively) and students' lack of ICT skills (24%).

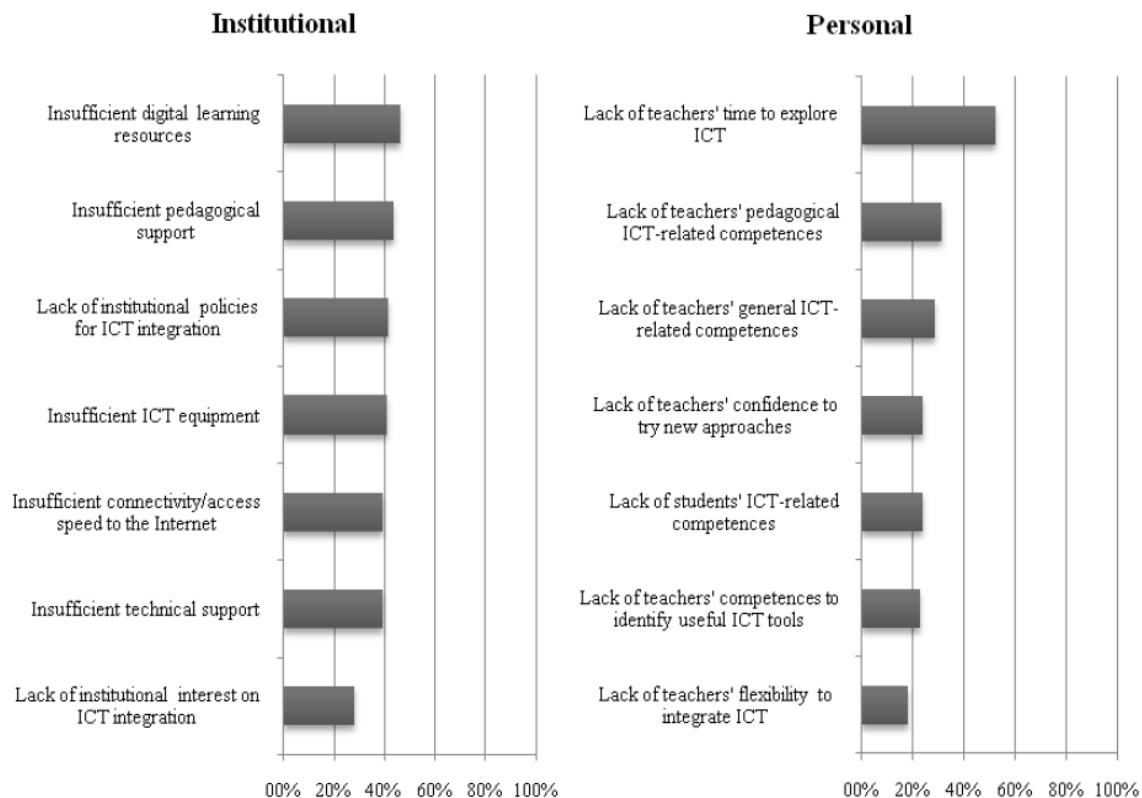


Figure 12. Percentages of teachers considering different factors as barriers to ICT integration

Results obtained allowed to develop composite indicators to summarize personal and institutional barriers, they show that -according to teachers- the general mean of institutional obstacles is significantly higher than personal barriers ($t = -7.825, p = .000$). Conversely, although students show a higher emphasis on personal barriers, the difference is not significant (Table 3).

Table 3. General means of personal and institutional barriers, according to teachers and students

Composite indicator	Items	Teachers			Students		
		Cronbach's alpha	M	SD	Cronbach's alpha	M	SD
Personal obstacles	7	0.893	2.06	0.683	0.862	2.53	0.687
Institutional obstacles	7	0.911	2.33	0.718	0.925	2.42	0.753

Note. Likert scale: 1 = Strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree (that each group of factors is a barrier to ICT integration).

Regarding the importance attached by teachers and students to different aspects as enablers for the integration of ICT in teaching and learning, the study asked about several factors that can be grouped in three categories: (1) infrastructure and support (ICT resources, technical and pedagogical support); (2) professional development (courses and workshops on ICT for general and pedagogical use); and (3) policies and management (cross-curricular ICT integration, incentives to use ICT, among others). Consistently with the above mentioned barriers, results show that all categories are considered as “quite” or “very” important enablers, by teachers and students (Table 4). Since differences between groups are not statistically significant, it could be said that all dimensions show similar levels of importance for both actors.

Table 4. Importance attached by teachers and students to several aspects related to the promotion of ICT integration

Importance attached to the following factors	Teachers		Students	
	M	SD	M	SD
Infrastructure and support	3.56	0.463	3.38	0.597
Professional development	3.57	0.593	3.49	0.648
Policies/Management	3.49	0.583	3.34	0.605

Note. In the scale used, 3 is equivalent to “quite important” and 4 to “very important.”

In summary, results show that, for teachers, institutional barriers to integrate ICT are more important, whereas institutional and personal barriers are similarly relevant for students. In addition, students and teachers assigned similar importance to all groups of enablers for the integration of ICT.

Discussion

Results presented in the previous section will be discussed separately as follows:

- Regarding *institutional policies and practices*, despite the institutional aims for integrating of ICT in teacher education, there are few institutions that formally put them into practice, revealing that this process is not among their highest priorities, which is consistent with the findings reported by Enochsson & Rizza (2009). Additionally, most of the institutions integrate ICT in the curriculum as specific subjects or courses, rather than as a cross-disciplinary topic to be included in most of the traditional subjects. This approach has shown to be less effective to promote a full and effective ICT integration (Kirschner & Davis, 2003; BECTA, 2006).
- About *infrastructure and support*, results show that -in general- institutions are well-equipped: For example, students per computer ratio in Chilean institutions is similar to those from European countries (Enochsson, 2010; Tømte et al., 2010). Particularly, there are adequate levels of availability and access to ICT resources, mostly computers and projection systems, as well as regarding technical and pedagogical support.
- Teachers and students show quite high *levels of confidence in ICT use*, whereas students report an intense use of ICT; consequently, the majority of them declared to be confident in their abilities to integrate ICT in their future teaching activities. However, it was also found that teachers only teach students the use computers and projectors, disregarding other ICT resources such as interactive whiteboards. This finding is important and opens the question about the real understanding of the potential of ICT in teaching and learning as a key factor on the lack of the required competencies to teach with technology. This is also supported by the findings of the TALIS study (OECD, 2009), which show that one of the professional development priorities most mentioned by teachers is

related to the integration of ICT into their teaching (which is also concordant with the study of Jimoyiannis & Komis, 2007).

- The actors' *visions about ICT* reveal a general awareness of the importance given to new teachers' learning about how to use ICT for pedagogical purposes (Littrell, Zagumny & Zagumny, 2005); however, as mentioned before, these visions has not been fully put in practice yet (Jamieson-Proctor, Burnett, Finger & Watson, 2006).
- Regarding *pedagogical activities*, results show that teachers tend to use ICT consistently across their educational management-related activities and in most of their teaching activities, without revealing any evidence of ICT contributing to perform some activities more than others. Nevertheless, ICT use in learning activities shows some evidence of differentiated roles in specific activities such as "communicate with external actors," "develop learning materials," "contribute to community through learning activities" and "make presentations." Most of these activities are more related to a "student-centered" pedagogy, coincidentally with the findings reported by Inan, Lowther, Ross & Strahl (2010) which claim that ICT use helps to promote this pedagogical approach.
- Moreover, results show that teachers and students are not frequently using ICT in activities associated to students' assessment (consistently with the results reported by Law et al., 2008). However, the highest frequencies of ICT use by teachers and students correspond to the most basic and conventional activities, such as "prepare general classes" and "organize teachers' work" (educational management-related activities); "search information" and "develop products" (teaching activities); "make presentations" and "work as a group at the same pace" (learning activities). This is also consistent with previous findings (Trucano, 2005; Law et al., 2008) and particularly with the claim that ICT is just another pedagogical resource to support preexistent teaching activities (Ottesen, 2006) rather than to revolutionize them (Karasavvidis, 2009).
- Concerning the *main barriers and enablers* to ICT integration in ITT, results are relatively homogenous and show little differences among the diverse actors and dimensions. However, according to teachers, most obstacles are institutional: this is consistent with the preliminary findings reported by Pedró & Ananiadou (2009).

Broadly speaking, it could be said that the foundations for a widespread integration of ICT in the ITT seem to be present in Chile, but this hasn't been enough to fully harness the potential of ICT for supporting teaching and learning activities, which is aligned to the findings reported by other authors (see for example Player-Koro, 2007). According to Fluck (as cited in Pearson, 2003), "pre-service teachers are expected to graduate (...) with the same competencies that working teachers have gained"; nevertheless, results show that new teachers are not learning yet how to exploit the potential of ICT in their future professional activities.

Conclusions

Based on the presented results, it can be said that institutional contexts are -generally speaking- auspicious to the integration of ICT in ITT: the existence of institutional policies on this matter; the overall infrastructure (e.g., the students per computer ratio); the availability and access to ICT resources, and the availability and quality of technical and pedagogical support have reached adequate levels, showing that these aspects shouldn't be a cause of particular concern in this ITT. In addition, teachers use ICT in teaching quite frequently and, to some extent, they also teach their students how to use ICT in teaching, although these latter practices are only restricted to some ICT resources. However, the use of technologies still seems to remain bounded to a set of basic teaching and learning activities, whereas the more advanced and complex pedagogical activities are significantly less frequent. Therefore is not unexpected that although teachers show high self-reported levels of comfort and confidence for using ICT, they ask for more professional development opportunities to integrate ICT into their teaching activities, recognizing implicitly their lack of competencies in this field and confirming the importance to teach future teachers how to integrate ICT in teaching and learning.

Consequently, it could be considered that the expectations about the pedagogical integration of ICT in Chilean institutions of ITT are not been fulfilled yet, since the majority of students are not being taught how to use in teaching the full range of available ICT resources, and nor are experiencing situations where ICT is used as an innovative pedagogical tool for acquiring the specific knowledge involved in some teaching practices (e.g., the ability to solve problems by using ICT) and the full comprehension of its impact on learning processes.

In this scenario, both professional development opportunities and pedagogical support for teachers focused on the pedagogical integration of ICT should be fostered in order to take more advantage of the current favorable context and to promote more innovative pedagogical practices which provided students relevant experiences involving the use of ICT in teaching. Additionally, more research in this area should be encouraged, to deepen the understanding of the contribution of ICT in specific pedagogical activities, thereby enlarging the knowledge base in this field. Results might also contribute to shed light on policy-related issues oriented to foster a more complete, updated, innovative and high-quality Initial Teacher Education in Chile.

Acknowledgements

Our gratitude to the Chilean Ministry of Education, through its Center for Education and Technology (CET) and to the Centre for Research on Educational Policy and Practice (Grant CIE01-CONICYT), for supporting this research. We are also grateful to the authorities and other actors from the institutions participating in this research, for their collaboration and readiness.

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