

COMPETENCES AND USE OF ICT BY FUTURE TEACHERS AND KINDERGARTEN EDUCATORS: USING AN ONLINE SURVEY TO PORTRAY THE CASE OF A PORTUGUESE SCHOOL OF EDUCATION

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Abstract

Nowadays, the preservice teachers' education is faced with the complex and challenging issue of developing programs that improve both future teachers' ICT competences as well as technological pedagogical content knowledge to incorporate them in their future practice.

The aim of this study is twofold: describe and analyse the extent of ICT use and self-reported competences by preservice elementary teachers and kindergarten educators in a higher education institution in Lisbon; establish their expectations regarding the future use of collaborative technology for learning purposes.

The study population is made up of 297 students enrolled at the Basic Education Bachelor degree during the 2016-2017 academic year. In this bachelor, although there are no ICT compulsory courses, students are presented to these tools and are expected to use and develop ICT knowledge and skills in different courses.

For data collection we have used an on-line survey with closed questions about access, frequency, context, purpose and confidence regarding ICT use and motivation towards future use of collaborative ICT. A total of 131 students, 124 females and 7 males, answered the online survey. After a descriptive analysis, non-parametric tests were used in order to explore the existence of significant relationship between different variables.

Almost all respondents reported to have internet access in their homes and to have computer as well mobile phone with camera. Of the respondents, 89% informed to use almost daily or even every day the computer at home, while only 22% reported using this device at school with the same frequency. More than 80% of the students stated the almost every day use of ICT tools to do school work and to navigate the internet.

Of the ICT tools considered in the questionnaire, internet browsing, research, preparation of presentations, text edition and live conversational tools were the technologies which the majority of students reported having used with great confidence. However, more than 50% of the students do not know or do not know how to use data bases, statistic software and tools that allow the construction of concept maps and collaborative pages. Moreover, there is no relation between the reported use of almost ICT tools addressed in the questionnaire and the bachelor year on which students were enrolled.

Results also indicate that students reported positive expectations regarding using ICT for collaborative work. The introduction of these tools is significantly regarded by the students as an opportunity to learn new things and to improve the final product of their works as well as an interesting experience. Statistical calculations revealed that there is no significant relationship between students' ICT motivations and bachelor year.

Although the evaluation regarding ICT use is generally positive there are some important educational tools which even students' in the third year of the bachelor don't know. Based on the results obtained, this study suggests a set of recommendations in order to improve students' knowledge and competences regarding ICT. These recommendations include the integration of compulsory science education curricular activities that require the use of data bases, statistic software and tools that allow the construction of concept maps and collaborative pages.

Keywords: Information and Communication Technologies, preservice teachers' education

1 INTRODUCTION

There is a growing consensus regarding the importance and benefits of integrating information and communication technology (ICT) in education. Indeed, ICT has the potential to help transform the teaching learning process - the nature of teacher-students, students-students and students-resources interactions - since it provides tools which can support learners to take more responsibility for their own learning. To fully accomplish this potential it is necessary, alongside with a technology transformation, also a pedagogical shift from teacher centered to student centered approach [1], [2].

According to the technological pedagogical content knowledge model (TPACK model), a model that attempts to identify the nature of knowledge required by teachers for technology integration in their teaching, good teaching requires an understanding of how technology relates to the pedagogy and subject content [3].

In order to foster substantial changes in ICT based learning, it is crucial to invest in teacher education and to prepared preservice teachers for the use of ICT [1]. In fact, "any sustainable development of ICT in the field of Education should be based upon teacher education" [4, p. 18]. However, a review of the literature made by OECD, which covered research studies from eleven OECD countries between 2002 and 2009, suggests that ICT is not used in teacher training in a regular and systematic way [5]. In the Portuguese scenery, [6] states that most of the elementary and high school teachers received ICT training, but their practices are still mostly centered on "Office" tools.

The low level of ICT use in teacher training can be analysed according to the Access-Competence-Motivation Model (ACM) [7]. This model assumes that the level of ICT use depends on the access to digital equipment, the competence in using software, as well in using it for teaching purposes, and motivation and perception of the benefits and potentials of ICT in learning and teaching.

So, it seems that student teacher education has still a long way to fully respond to the challenges brought by the introduction of ICT in education. In other words, the preservice teachers' education is still faced with the complex and challenging issue of developing programs that improve both future teachers' ICT competences as well as technological pedagogical content knowledge to incorporate them in their future practice.

The aim of this study is to describe and analyse: i) the access and frequency use of ICT by elementary teachers and kindergarten educators in a higher education institution in Lisbon; ii) their self-reported competences regarding ICT; iii) their expectations regarding the future use of collaborative technology for learning purposes.

2 METHODOLOGY

The present study was conducted at a Portuguese higher education institution. In Portugal, higher education institutions are free to decide not only if they include ICT in teachers initial training, but also how they do it. In the institution where we developed the study there are no separate technology compulsory courses; technology is integrated in subject-specific courses. So, students are presented to ICT tools and are expected to use and develop ICT knowledge and skills while studying other subjects. Moreover, the learning management system of the institution (Moodle) have been adopted by most bachelor courses as a support to the teaching and learning practice.

The population of the study is made up of 297 students enrolled at the Basic Education Bachelor degree, during the 2016-2017 academic year. For data collection we have used an on-line closed questionnaire inquiry on access, frequency, context, purpose and confidence regarding ICT use as well as motivation towards future use of collaborative ICT. A total of 131 students, 124 females and 7 males, answered the questionnaire. In the first year there was 46 (35,1%) students, in the second year 65 (49,6%) and in the third 20 students (15,3%).

Data was analysed by SPSS software. After a descriptive analysis, all numeric variables were test for normality. The significance values of the Kolmogorov-Smirnov test were below 0,05 which means that data significantly deviate from a normal distribution. Non-parametric tests were, therefore, used in order to explore the existence of significant relationship between different variables. In order to assess for significant differences between two independent groups (female and male students) the Mann-Whitney U test was used. The Kruskal-Wallis test was performed to examine the possible differences between more than two independent groups (bachelor year). The Spearman rank-order correlation coefficient

was used to measure the strength and direction of association that exists between two variables (frequency of school Wi-Fi use and internet access at school). In all tests the significant level was 0,05.

3 RESULTS

All respondents reported to have internet access in their homes. However, 5 students informed not having computer at home and 42 not having scanner. Moreover, some students also reported not having mobile phone with camera (2 students), mobile phone with internet access (2 students) and laptop (9 students). Of those students that reported not having computer, only one stated not having a laptop.

Almost all respondents stated they access internet almost daily or even every day at home (97,7%) and at school (83,2%). Moreover, the majority of the students (81,7%) reported using many times or even always the school Wi-Fi. There is an association between the frequency of the school Wi-Fi use and the frequency of internet access at school ($r_s=0,581$, $p<0,001$). On the other hand, 77,9% of the respondents stated that they never use or use sometimes the school computer lab.

Of the respondents, 89,3% informed to use almost daily or even every day the computer at home, while only 22% reported using this device at school with the same frequency (Table 1). The tablet is less used than the computer independently of the location.

Table 1. Self-assessed frequency and context of ICT use.

	Never	Rarely	A few times a week	Daily or almost
Use computer at home	0,0%	1,5%	9,2%	89,3%
Use computer at school	4,6%	35,1%	38,2%	22,1%
Use computer in other places	9,2%	49,6%	30,5%	10,7%
Use tablet at home	41,2%	17,6%	22,9%	18,3%
Use tablet at school	58,8%	19,1%	17,6%	4,6%
Use tablet in other places	50,4%	29,0%	14,5%	6,1%

The distributions of the frequency of computer use at school weren't significantly different among the three years of the bachelor ($H(2)=4,434$, $p=0,109$). However, there was a statistically significant difference between the frequency of the tablet use by students enrolled in different years of the bachelor ($H(2)=6,347$, $p=0,042$). In the last year, students tend to use the tablet with more frequency.

More than 80% of the students stated that they use ICT every day or almost daily with the following purposes: to do school work, to navigate the internet and to talk. Publishing in social networks, upload and download school documents and collaborate in group works are activities that 50,4%, 66,4% and 55,7% of the respondents reported use every day or almost, respectively. However, more than 25% of the students rarely share photos or videos and play games (Table 2).

Table 2. Self-assessed frequency and aim of ICT use.

	Never	Rarely	A few times a week	Daily or almost
To do school work	0,0%	1,5%	16,8%	81,7%
To navigate the internet	0,8%	1,5%	9,9%	87,8%
To talk	1,5%	7,6%	10,7%	80,2%
To publish in social networks	3,1%	19,1%	27,5%	50,4%
To share photos and videos	3,8%	28,2%	29,0%	38,9%
To play games	23,7%	38,2%	22,9%	15,3%
To upload and download school documents	0,0%	1,5%	32,1%	66,4%
To collaborate in group work	3,8%	7,6%	32,8%	55,7%
For other things	6,9%	21,4%	32,1%	39,7%

The distributions of the frequency of ICT use for school work were the only significantly difference among the three years of the bachelor ($H(2)=7,785$, $p=0,020$). Results from Spearman correlation indicated that there is a small but significant positive association between these two variables ($r_s=0,239$, $p=0,006$) (Figure 1).

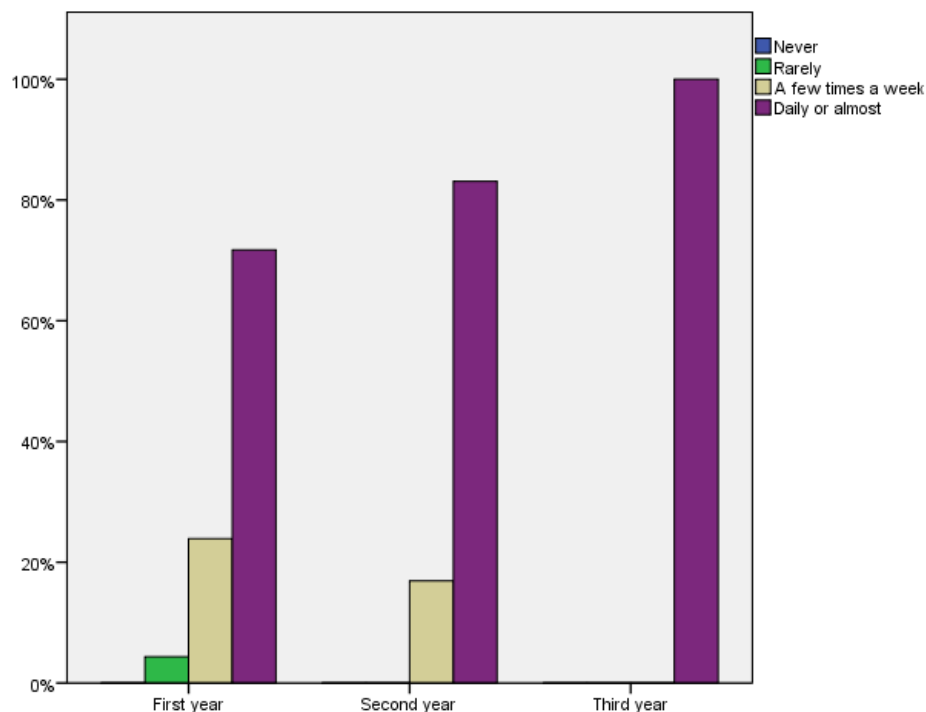


Figure 1. Students' reported frequency of ICT to do school work by course year.

The questionnaire also asked students to indicate their perceived ability to use diverse software by selecting one of the following options: (1) Unaware of the tool/software; (2) knows the tool/software but does not know how to use it; (3) uses the tool/software with difficulty; (4) uses the tool/software with some confidence; (5) uses the tool/software with great confidence.

The responses showed that most students were confident in the use of software for text edition (74,8%), presentation manager (71,0%), internet browsing (86,3%), search engines (87,8%), synchronous communication (80,9%) and social media (70,2%). However, more than 50% of the students stated that they didn't know or didn't know how to use databases, statistic software and tools that allow the construction of concept maps and collaborative pages.

Table 3. Students' reported confidence of ICT tools/software.

	Unaware of the tool	knows the tool/software			
		does not know how to use	uses with difficulty	uses with some confidence	uses with great confidence
Text editor	0,0%	0,0%	1,5%	23,7%	74,8%
Spreadsheet	0,8%	13,0%	52,7%	24,4%	9,2%
Statistical analysis software	32,1%	31,3%	28,2%	6,1%	2,3%
Drawing software	0,0%	3,1%	15,3%	45,8%	35,9%
Image edition software	4,6%	40,5%	26,7%	20,6%	7,6%
Multimedia presentation program	0,0%	0,0%	1,5%	27,5%	71,0%
Internet browser	0,0%	0,0%	0,8%	13,0%	86,3%
Search engines	0,0%	0,8%	1,5%	9,9%	87,8%
Synchronous communication	0,0%	0,8%	0,8%	17,6%	80,9%
Asynchronous communication	0,0%	3,8%	6,9%	25,2%	64,1%
Concept maps software	51,9%	12,2%	21,4%	12,2%	2,3%
Databases	38,9%	30,5%	25,2%	3,1%	2,3%
Learning management system	8,4%	4,6%	14,5%	26,0%	46,6%
Collaborative pages	21,4%	35,1%	17,6%	18,3%	7,6%
Video editing software	6,1%	17,6%	23,7%	35,9%	16,8%
Photos, audio and videos share	5,3%	16,0%	19,8%	23,7%	35,1%
Social media	0,8%	3,8%	3,8%	21,4%	70,2%

Moreover, the distributions of the reported use of all the ICT tools/software addressed in the questionnaire were not significantly different among the three years of the bachelor, as well as between female and male students.

In order to evaluate students' expectations regarding the use of ICT for collaborative work they were asked to indicate their level of agreement or disagreement with eight statements (1- totally disagree; 4- totally agree). Figure 2 displays students' mean scores for each item. Results indicate that students reported positive expectations regarding using ICT for collaborative work. The introduction of these tools is regarded by the students as an opportunity to learn new things and to improve the final product of their works, as well as an interesting experience. There is no significant relationship between students' ICT motivations and bachelor year.

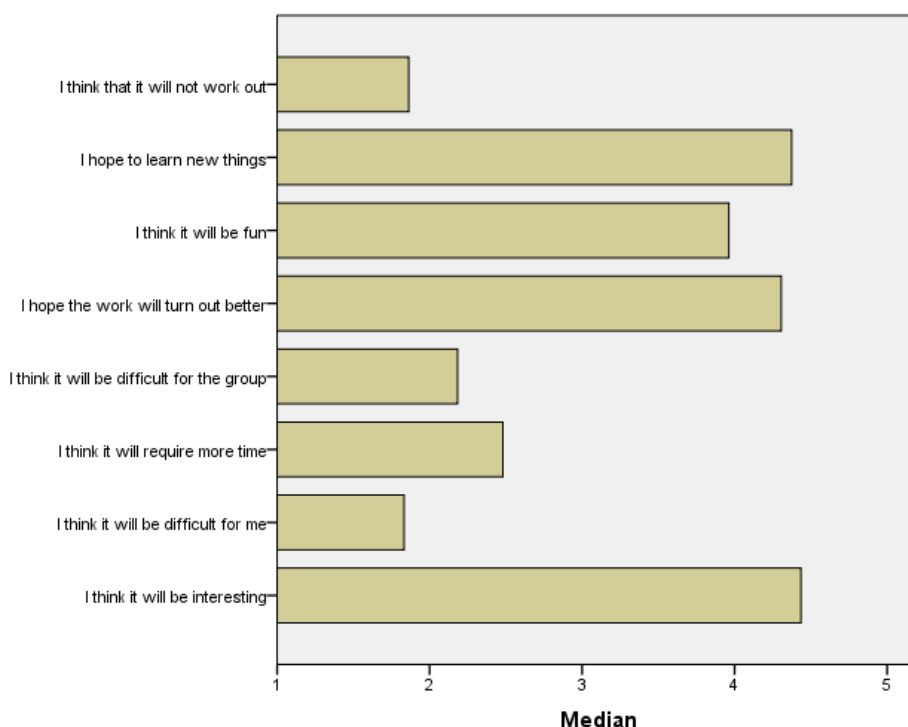


Figure 2. Students' mean scores about their expectations regarding the use of ICT for collaborative work in the course.

4 CONCLUSIONS

The goal of this study was to learn about the ICT experience, confidence and attitudes of the future kindergarten educators and primary teachers in a Portuguese School of Education.

The practice of ICT skills depends, to a large degree, on having access to a computer to work on and on having access to the internet. Of the students surveyed, 100% of them responded that they had access to internet at home. This level is much higher than the one estimated for Portugal by the Eurostat (77%) [8]. Moreover, 99,3% of students reported to have a computer or a laptop which may explain the low use level of the school computer lab. It seems, therefore, that in the institution surveyed preservice teachers have an adequate access to technology resources and internet.

In what regards to frequency of internet use, the levels reported are also very high. So, students have access to internet and use it with high frequency in different locations. However, the scenery changes when we asked about computer or tablet use: home is the main location where students use the

computer and in school most students don't use it. Even so, one of the main reasons why students use the computer is to do school work. These results may indicate that there is a lack of integration of ICT into activities with a compulsory nature during lessons, but probably there is some integration during the autonomous study or in the type of the courses' assignments requested.

The nature of the courses may also explain the correlation found between the use of ICT to do school work and the bachelor year: in the first years the courses have a more scientific orientation and the assessments have a more individual nature and many consist of an written test; in the last year the great majority of the courses are related with pedagogy and didactics, courses that value group work and development of lessons plans. However, it is important to highlight that regarding other aims of ICT use no difference among bachelor years was found.

Although the evaluation regarding ICT confidence is generally positive, there are some important ICT tools which even students' in the third year of the bachelor don't know, including some tools that facilitate collaborative work and the production of image and video resources, which can be very important in project development. Results also suggest that the year of bachelor enrolment doesn't influence students' reported confidence of different ICT tools/software. In order to improve students ICT competence the institution surveyed should plan the integration of compulsory curricular activities that require the use of databases, statistic software and tools that allow the construction of concept maps, the production of image and video resources and of collaborative pages. Teacher educators should also integrate these tools in their presentations, demonstrating its utility and use.

The present findings are quite important since will help the institution and each teacher educator to plan and adopt strategies in order to improve and enhance students' ICT skills. In addition, this study can be the base for future researches. For example, it will be important to survey the students enrolled in the first year of the bachelor at the end of their graduate experience. Longitudinal data analysis will enable us to study the influence of the bachelor in the ICT knowledge and competences while minimizing bias.

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