Interdisciplinary study on the attitude, knowledge and use of ICT in the first years of education.

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Abstract

Information Communication Technology (ICT) is an important element in the education scenario in order to prepare the citizens for the future. The quality of teaching is often related to the use of ICT in teaching and learning. The effective use of Information Technology and Communication (ICT) in education requires that both, students and teachers maintain a positive attitude towards these activities, at the same time they need to be able to develop in educational environments. This study also investigates obstacles faced by Primary Education (PE) students in using ICT. The application of ICTs requires therefore a positive attitude to the use of these tools in the teaching-learning process on the side of the members involved, which is analyzed in this research article, through a survey design and using the questionnaire as an instrument. In general and in view of the results obtained by descriptive analysis, it is concluded that the use of ICT in the classroom will depend largely on the student's inclination with ICT. That fact is contributed by the knowledge of the technologies themselves and their use by teachers and students. This can be observed in the sixth grade students of PE that does not have a negative attitude to ICT so that the implementation of ICT and their effective use would be advisable for the teaching-learning process.

Introduction

The XXI century is posing new challenges, challenges to be faced by teachers, students, families, etc. These challenges are faced with new perspectives. The change is contributed with the school's provision of technological resources, tools and applications that help to classrooms and schools modernization offering different ways of online communication. We must start with the most important task that is the change of culture and mindset. This process affects all educational systems, both national and international. We have experienced a historical development with the inclusion of ICT properly adjusted in the schools, as the European Commission indicated in 2010 that the internet connections in all the schools must be a high speed connection in order to facilitate the access to internet for teachers and students making available the multimedia resources that are in it. This process is always developed with the concern of the established competencies compliance as cored in these projects for the e-learning initiative and in the coming years for its inclusion in the society as the basis of digital literacy.

The inclusion of ICT in the teaching-learning process must be linked to the development of education in the new era of digitization and it will occur when the school learning and the society goes in the same direction. For make this possible, the students collaborating with the teachers must be convinced of the aspects and methodology leading to an improved knowledge generation and not merely the information

mechanization as a tool or a technology application. In Spain there are a number of practices that can be taken as a reference, such as those of Cebrián de la Serna and Paul Pons [1,2]. These refer to large communication systems such as: video, computers and telecommunications, not only to the computers (hardware) that enable communication but the development of their applications (software) [3].

The technologies must be compared with conceptual elements that are going to allow their operation, as said by Ortega "it consists of two things: first one is the business plan invention, it is a method or procedure and second one that is the plan implementation. Technology is the "technique that uses scientific knowledge", although, as it is pointed by Bunge, "The new technologies only share with science the method"[4,5]. Thus, when we talk about investment in new technologies for the schools, in any case it should be reduced to certain electronic equipment, more or less sophisticated, we must refer to methods of work that should also be included within this concept and are largely what make its existence possible [6].

In a relatively short period of time, the new technologies have been incorporated into all school subjects. At the beginning with the subject of computer science that provided the basis for computer use, later, as a cross curricular tool in all subjects, and finally an importance beyond of the school considering the knowledge and use of new technologies as a core competency of the Compulsory Education, specified in "The information

processing and digital competence" which establishes the curricular subjects in Primary Education in Spain. The education authorities are betting on the widespread incorporation of the new technologies in the schools, and each day is more common for students, teachers and families the use of these technologies to access the most relevant information. Despite such projects, the effects of various programmes and investment by schools in ICT resources, there has been disappointingly slow uptake in schools [7]. These findings indicate that there are factors that discourage student from using technology, the roles of the teacher in relation to ICT and the effect on pedagogy.

The developments produced by ICT in the educational system, has such importance that is trying to develop different ways of working. These ways of working affect the formation and the start-up phase of teachers in the school. Then to start to understand the impact the use of ICT tools and applications in the school is necessary to know the opinion that has the students about them. For this reason, our main objective was to assess the students' attitudes to ICT in the teaching-learning process. In particular it aims to inquire the student's opinion on ICT to encourage teachers and authorities on the optimal processes for include its use in the classroom.

Methodology

Experimental design

The study conducted is a survey design using the questionnaire as a tool for information gathering. The questionnaire has a closed question with two possible outcomes "Positive" and "Negative", and a series of open-ended questions that allow the respondent the freedom to provide more details and points of view regarding educational contexts and technologies applied on it.

The closed question was: "What do you think about the Information Technology and Communication?" This question is related with some guided open questions, in order to determine the perceptions of students in relation to the ICT with the following indicators of this study: Understanding of the tools and applications, usability as a work tool in the future, accessibility to students and teachers, interaction in the classroom, active communication, speed and ease of use and educational support.

The questionnaires were distributed in the academic year 2012/2013, creating a prospectus that gives Primary Education trends in the context of the Spanish public education. The population analyzed in this research is the 6th grade pupils of Primary Education (PE) of the Nursery and Primary Education Schools (NPES) of the Community of Madrid. The sample is composed by 1770 students belonging to 50 different schools. This sample was made randomly. We start from the 5 districts in which is divided the Community of Madrid: North, South, East, West and Central. The choice of schools per district is based on the official register of NPES of this Commonwealth. This research is developed in Madrid due to act as a reference for be the capital of Spain. Furthermore, the distribution in

districts allows us to assess different socio-economic and educational environments, and the differences resulting of the ICT implementation system in these different districts.

Statistical analysis

The statistical analysis of data was performed using the SPSS Stadistics 13 software for Windows environments. As a first step the normality and homogeneity of variances is assessed. We also carried out a descriptive analysis of the student's sample.

In each of the calculations made we considered the number of valid cases, excluding cases with missing values. In frequency tables is indicated the absolute frequency of valid cases for each measured variable (frequency), the percentage frequency (percentage), percentage frequency calculated on valid cases *i.e.* without considering missing values (valid percentage) and the cumulative percentage frequency (cumulative percentage).

As measure for the association of the variables evaluated in frequency tables, we used chi-square (Pearson Chi-Square). When this value is <0.05 it is indicating that the study variables are related. In some results of contingency tables can also see the likelihood ratio (Likelihood Ratio). For each of them is always indicated the statistical significance, which was predetermined as p<0.05. Having demonstrated the association between two nominal variables, we assessed the strength of that association with the contingency coefficient (Contingency Coefficient). When deemed necessary, the mean values were compared, for example, the age of students, for which T test was used for two independent samples. This test performed simultaneously provides the Levene test about variances equality. In all cases it was indicated as confidence level, 95% and the cases with missing values were excluded. We performed the Levene test (F), as well as the statistic (t), its degrees of freedom (gl), the bilateral critical level (bilateral significance), the difference between the mean values of each group (average difference), the standard error of this difference and the lower and upper limits of the confidence interval at 95%.

Results

The questionnaire results are shown distributed in the five districts studied, to clarify the differences due to the socio-economic and educational variables in which the schools are framed.

It is shown the data obtained from the questionnaire given to all the students of the 50 NPES distributed across the districts north, south, east, west and center of the community of Madrid. The general opinion of the students related to ICT is positive. Over 80% of students, *i.e.* 1527 of the 1770 that make up the sample, have answered that think that ICT are positive in relation to the closed question that was formulated to them. Students who think that ICTs are negative correspond to about 14%, only 243 of the 1770 students negatively valued ICT in the closed question.

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If we perform the comparative study between schools, it can be seen that the opinion about ICT of the students is associated to the school where they belong, with a probability (p=0.440) and an analysis of variance (F=38.02), there are significant differences between the responses of students from different schools studied (Figure 1).
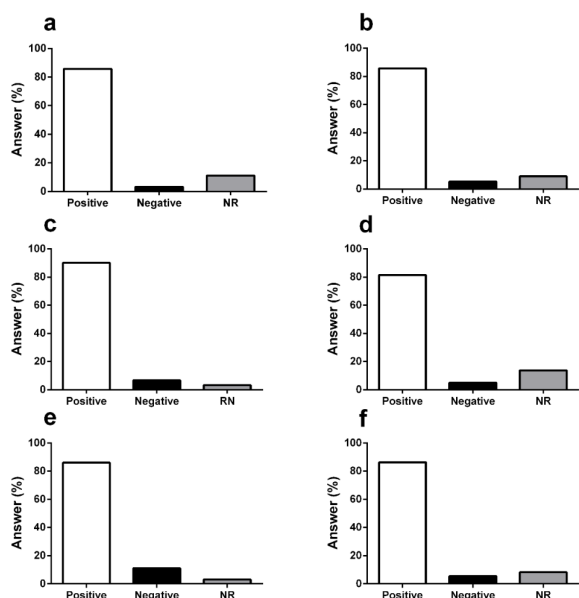
Figure 1. ICT differences between the responses of students from different schools studied.

However, it can be seen that unlike the rest of the districts, the ICT opinion of the south district students is not associated to the school where they belong with a probability (p=0.204) and a Chi-squared (Chi2=3,178) then in this case there is no significant difference between the responses of students from the different schools studied in this district. The response may be conditioned by the use made in the classroom by teachers.

The answers to the open questions are common in terms of "its effectiveness", "the wide variety of activities that can make

learning more and entertaining themselves at the same time" and "the ease to find information without limits", emphasizing that they see ICT as a "great source of knowledge" and "it helps them to communicate", "it improves them in work", "it helps them to study", "it facilitates teaching them ","it is helpful in the school" and "it is very funny". They think they are "better to work with ease", "fast", "they are very practical revealing new techniques" and "it helps them to understand everything better". However, in the west district between the responses of the students anyone mention that learning is improved with the use of ICT but it is clear the great acceptance that exists in this population as it is reflected in other districts.

Moreover, some students believe that are effective but "become a distraction in sometimes", also they say that being easier to find the information they become "lazy students". These distractions in many cases are not detected by the teachers and in many other cases are linked to their training. Some other students believe that "they preferred to search the information in the books" and that "they do not like too much", another general complain is that "it is not frequently used" and "they find its use difficult and its functions learning". These responses are very interesting due to they do not know about ICTs because in many schools is not used, or it is just used to projections, which makes these students completely unaware of the functionality of the tool. It really attracts our attention that "it can be a bad habit", in general, it refers to the use of the technology by the students at home, the students become accustomed to use consoles or computers without any established control beyond that the provided by families. The teacher can give some operating guidelines to use the tools or some programs that make possible for the students to know and learn how to operate and manage the interaction with the technological means, Internet browsers, social networks, kind of games. There is another part of the students, just 8.2% of the students, 146 over the 1770 of the sample of the Community of Madrid that has not answered this question, represented in the graph as No Answer (NA) (Table 1).

Reference in graphs	Center	North	South	East	West
1	Moncloa-Aravaca 1	The Molar	Speaks	torrejon de ardoz 1	Boadilla del Monte
2	Moncloa-Aravaca 2	Old Apiary 1	Leganes	torrejon de ardoz 2	Col of Villalva
3	The Latina1	Old Apiary 2	Mostoles	Loeches	Galapagar
4	The Latina2	Saint Sebastian of the kings 1	Aranjuez	Arganda of the King	Guadarrama
5	The Latina 3	Saint Sebastian of the kings 2	Valdemoro	Rivas vaciamadrid	Majadahonda
6	Retirement	Saint Sebastian of the kings 3	Ciempozuelos	Alcala de Henares 1	Pozuelo de Alarcón 1
7	linear city	Three songs	Getafe	Alcala de Henares 2	Pozuelo de Alarcón 2
8	Vallecas Bridge	Grove of the Real	Speaks 2	San Fernando de Henares	Las Rozas
9	Chamberí	Algete	Pinto	Coslada	Torrelodones
10	Hortaleza	Alcobendas	Fuenlabrada	Villalbilla	Villanueva del pardillo

Table 1. NPES distribution in the different districts of the community of Madrid.

Although it should be noted that some students have felt that in their school the tools they have are not enough for everyone.

It is important to highlight that all the public schools provision in the field of new technology is the same within the community of Madrid and this observation of the students is due to a subjective perception.

A point to analyze in the survey responses is the gender gap, in this sense we can analyze if there is an impact of some of the topics set by the society, as the boys like to use more the technology than the girls. Then, we made a distinction of responses by sex and we analyzed the differences linked to it. In the public schools in the Community of Madrid with a similar number of registrations of both sexes (Table 2).

	Frequency	Percentage
Male	921	52,0
Female	818	46,2
Total	1739	98,2
Lost data	31	1,8
Total	1770	100,0

Table 2. Gender distribution on the community of Madrid.

There were no significant differences in the general perception of ICTs (positive response to the question closed) (Table 3), but some differences were found in terms of the issues they had to give this positive or negative feedback. Regarding all the students that make up the total sample, the 52.0%, *i.e.,* 921 over 1739 of the students are boys, while 818, *i.e.,* 46.20% are girls.

	Value	DF	A symp. sig. (2-sided)
Pearson Chi-square	1,685[a]	2	0.431
Likelihood Ratio	1,701	2	0.427
Linear-by-Linear Association	1,676	1	0.195
N of Valid Cases	1739		

Table 3. Chi-Square tests. a=0 cells (0%) have expected count less than 5. The minimum expected count is 6, 92.

In the Table 4 presents the results among the students' attitudes towards ICT.

Items	DA%	N%	A%	CA%
I like using ICT as a tool in teaching and learning	23		5	72
The use of computer stresses me out	55	43	2	
I am very motivated with the use of ICT in teaching and learning	4		19	67
I like to participate in classes when using ICT	19		23	58
I like to present work with ICT in the classroom as they are very easy to use.	18	9	15	58
With ICT I can understand the concepts more efficiently	6		71	23
When I use ICT increases my attention in class	17	11	22	50

Table 4. Attitudes students towards ICT. DA: Disagree; N: Neutral; A: Agree; CA: Completely Agree.

In general, the findings demonstrate that students' attitudes towards ICT are positive. 72% of the students completely agree that they like using ICT as a tool in teaching and learning. Majority of the students surveyed disagree (55%) that the use of computer in class stresses them out.

A large number of students *i.e.* 96% stated that they are very motivated with the use of ICT in teaching and learning. 58% of them are completely agree to the statement that enjoy participating in class when they use ICT. 15% of the students agree and 58% of the students completely agree that they like to present work with ICT in the classroom as they are very easy to use. The

statement with ICT I can understand the concepts more efficiently is agreed by 71% of the students and completely agree by 23% students respectively. Only a handful of them disagree (17%) and neutral (11%) than when they use ICT increases their attention in class. The importance of these opinions, is in the great success that the students presents and in the training and equipment that the schools have to achieve this demand, not simply using ICT but being aware of how to use them to generate knowledge in the students and the interaction is not a merely projection of activities.

The Table 5 shows the results on knowledge level possessed by PE student in using ICT.

Statement	Excellent %	Good %	Fair %	No capability %
Word Processing (Ms Word)	17	22	61	
Forums		8	24	68
Chats		12		88
Webquest		8		92
Blogs		9	16	75
E-mailing	23	51	26	
Spread sheet (Excel)		13	47	40
Internet browsing	81	13	6	
Power point		25	72	3
Paint		11	2	87

Table 5. Knowledge level possessed by PE student in using ICT.

The students responses are rated from excellent, good, fair and no capability. The results demonstrated that 23% and 17% of students possess good or excellent knowledge on word processing, respectively, as it is one the most important and common applications used by students in the classroom. Approximately, only 10% of students rate themselves as good in using Forums, Chats, Webquest and Blogs. 23% of the respondents have acquired excellent knowledge on e-mailing and 51% of the respondents have good knowledge on the application of e-mailing. As for Spread sheet (Excel) 47% of student have fair knowledge on the application and only 13% of students rate themselves as good in using spread sheet (Excel) application. The majority of students have excellent knowledge on Internet browsing which comprises of 81% as they often have to do searches during their studies and in their homes. As for knowledge on PowerPoint application only 25% of the students have good knowledge on it. The majority of the students *i.e.* 87% regard themselves have no capability using Paint application. This reflects that majority of the students seldom use it.

Discussion

Education in the context of ICT must provide the necessary conditions to optimize the teaching-learning process and promote the transfer of knowledge and skills. The attitude is an important issue to be addressed in the design and development of learning environments [8]. Learning environments should reflect the possible uses of the knowledge expected for the students in order to prevent loss of knowledge [9]. The implementation system of the ICTs must be created in an educational context most appropriated, providing and preserving the links with the environment outside the classroom. In addition, the teachers should encourage students to participate with a positive attitude towards the use of ICTs and the active construction of knowledge. This requires an open learning environment instead of environments focused on a mere transmission of data for learning [7,9,10]. The cooperation and interaction in the classroom are important to encourage the acquisition of learning skills, problem solving skills, and social relationships [11-13]. Finally, since in the classroom we can find capabilities and different perceptions, regarding the use of ICTs, these differences must be considered to be one of the key criteria for the practice of the effective teaching-learning process in the classroom [14-16]. Therefore, the responsible authorities should adapt the learning environment to the needs and abilities of the students individually.

The ICTs can contribute to the creation of powerful learning environments in different ways. The ICTs offer opportunities to access a lot of information across multiple sources of

information and displaying information from multiple perspectives promoting authentic learning environments. The ICTs can also make complex processes more easily understood through simulations, which contributes to create an optimal learning environment [17]. Moreover, ICT can be a tool for curriculum differentiation, providing opportunities for adaptation of learning content and tasks to the needs and abilities of each student individually and provide tailored information [18,19].

However, some researches show that the approach in schools, in general, aims the use of ICTs based in the traditional knowledge [20-23]. Furthermore, in a recent study about the impact of ICT over the student performance, involving 60 schools, it was found that the proportion of lessons involving ICT was generally small. We found some positive relationships between the amount of ICT use and student performance, but the relationship found was not constant in all the areas at all key stages. Therefore, the authors assume that the way of use is important [24]. In the same way our observations are pointed, due to in NPESs with the same ICT implementation system, the students have different perceptions regarding infrastructure provision and use of this, noting that "the tools in our school are not sufficient and not used", compared to the students who receive resources and an appropriate use, stating that "it is important because they learn easily and have fun", "it allows to do many things", "it is easy learning", "it can be easily used ", "it allows a great number of activities" and "it serves to support the study".

Obviously, the attitude of the students towards the use of ICT has a significant impact on the learning environment and this attitude is defined by different factors. In this sense, the teacher skills regarding the use of ICT play an important role [25,26]. Another aspect that may influence, of course, is the access that the students have to the technology [27,28]. This refers not only to the number of computers per student but also for the location of this equipment, for example, in the classroom or in the computer room. Kennewell et al. considered that it is essential that equipment is placed in the classroom, in order to maximize the curricular opportunities. These authors say that the number of computers available has less relevance.

In addition, teacher's pedagogical perspectives and their views on how ICTs can contribute to the learning environment can play an important role in the actual use of ICTs in the school [29-32]. The change to a learning environment more centered in the student where the teachers must create an intellectual environment in which the knowledge is acquired. In particular, this applies to open-composition learning agreements [32,33].

Another fact to consider is the gender differentiation in the use of ICT. It is a proven fact that girls have a less positive attitude than boys in the use of ICT [34-37]. However, in the present study we do not found significant differences associated with gender, based on the closed question that is intended to denote whether students value positively or negatively the use of ICTs. This may be due to the fact that the differences are not as large in the young students [38,39]. The students in our study were generally positive about the use of ICT. Table 5 shows the lack of difference between the views of girls and boys.

Nevertheless, if we value the open questions in order to consider which statements lead them to give a positive or negative feedback, we can see that these are differentiated by gender. These differences in attitudes between boys and girls are more common in the aspects related to the proposed technology as a tool for the future against the educational as a support tool in the teaching-learning process. While the boys give a positive assessment based on the availability of the tools and applications to the teachers and students, the speed and ease of use of ICT, the confidence in working with them and the plans for getting a job in the future. The positive response of the girls is based on the ease of understanding and learning using ICTs, classroom interaction, active communication and educational support. These gender differences may come given by a lower knowledge and skills in the use of ICTs [40]. Similar results were reported by Kadijevich [41,42].

Conclusion

Now, it is shown the relevance of the data obtained in terms of the perceptions and impact of ICTs in the students. Thus we note that in the different primary schools analyzed, with the same ownership and with the same technological resources, it will exists different answers based on the gender and the belonging to a particular NPES based on the ICTs use made by this NPES. This is influenced by the students who have different perceptions within the educational-technological environment in which they are developing their learning processes.

Regardless of the use in the school, the student view of the ICT was positive independently of the gender, however in the open questions it was found that although there were no differences in the view of ICT related to the student gender, these differences exist related to the different reasons due to the students appreciate the use of ICT. The boys perceive that the ICTs are more positive for technological reasons against the girls who stand out the educational reasons. Taking into account all these considerations, both competent authority and teachers, when they carry out a implementation process of technology tools and applications in the schools, they have to make an individualized adaptation according to the specific needs of each technological-educational environment that is defined by the different individualized assessments.

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