

Chapter #

# THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES BY PORTUGUESE TEACHERS

*The ICT*

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**Abstract:** We present a study made in Portugal, in 2001/2002, on the use of Information and Communication Technologies (ICT) by teachers of all teaching levels (except high education), in both public and private schools. It was an initiative of the Ministry of Education (“Nonio – 21<sup>st</sup> Century” program), which was carried out by the Competence Centre “Softsciences” and the Centre for Computational Physics of the University of Coimbra. Some of the conclusions of this study, that has collected data from 19337 teachers, are the following: the majority of Portuguese teachers own a PC and approximately half of them use it in several activities, though their use of computers with students is limited. Primary school teachers use often the PC in their schools, though, probably, in an incipient way. The self-training of teachers in ICT is quite common. The Internet is more used by 3rd cycle (last part of middle school) and high school teachers, being most of its users male and young. These and other conclusions should be taken into account in a strategy towards incrementing a better use of new technologies in schools. The whole study is available in: <http://nautilus.fid.uc.pt/cec/estudo>

**Keywords:** Use of computers in education.

## 1. INTRODUCTION

In the last few years, many steps have been undertaken in equipping Portuguese schools with hardware and software and in teacher training for the use of these equipments. However, there is still a long way to go till the Information and Communication Technologies (ICT) become integrated in a

transversal way in the curriculum, coming up in schools in a planned and systematic way and not spontaneously and sporadically [1].

We have assumed that the use of this kind of technologies in education represents an advantage for teachers. The challenges of educational change are clear but not easy to overcome [2]. To follow national and European policies [3] it is necessary to know quantitatively the teachers' practices on their use of computers for the benefit of themselves and their students. This is the main aim of a study promoted by the Ministry of Education ("Nonio – 21<sup>st</sup> Century" program) and carried out by the Competence Centre "Softsciences" and the Centre for Computational Physics of the University of Coimbra. We made an inquiry, in the academic year 2001/2002, to 26707 Portuguese teachers, from 2499 schools of all levels (except high education), public as well as private. The answers were collected between December 2001 and April 2002. The statistical data arose from the analysis of 19337 questionnaires, *i.e.*, 72.4% of the total inquired. In 2000/2001, a pre-study, done in a small sample, allowed to improve the methodology [4].

We present here a brief description of the study, as well as a summary of its objectives, results, analysis and conclusions. We made a selection of tables and graphics, which may be more interesting to the educational community.

It is never too much to stress the importance of measuring and evaluating in order to select tools and methods that may lead to educational progress [5]. This study, which is a sequence of other surveys done by the Portuguese Ministry of Education [6, 7], namely studies on equipment in schools, portrays the situation in April 2002. We hope it may originate further progress on the ground.

## **2. IMPORTANCE AND ADVANTAGES OF ICT**

Nowadays a school which does not have computers risks to become obsolete. As Adell [8] says: "The information and communication technologies are not any longer a didactic tool for teachers and students ... they are in the world where the youth we teach are growing."

Considering ICT it is possible to talk about two contexts:

- The personal context, *i.e.*, the way teachers and students use computers individually (not linked by a pedagogical relationship);
- The educational context, including not only the class environment, where subjects are being taught, but also pedagogical relationships out of class.

In the personal context, the advantages of computers include time saving in routine tasks (tests, worksheets, homework, etc.), facility in researching

specific topics, possibilities of distance training/learning, exchange of practices and experiences, etc. In the educational context we should refer to the differentiated interaction that a teacher can establish with his/her students using specific software, on-line search done by students and e-mail communication [9] to receive/send homework, etc.

Table 1 indicates some ICT uses in education, some of the activities that students can make with them and possible contexts.

In spite of the enthusiasm that usually accompanies the pedagogical use of ICT, we should say that they are not the elixir for all the troubles schools suffer!

Table #-1. Applications, activities and contexts of ICT use in teaching/learning

Applications	Activities	Contexts
Word Processor ( <i>Word</i> , <i>Publisher</i> , etc.)	Text and editing	Homework
Graphic/Drawing programmes	Graphic/Artistic activities	Project work
Spread sheet ( <i>Excel</i> , <i>SPSS</i> , etc.)	Organizing information	Reinforcement classes
Multimedia/ CD-ROM	Information search	Support to disabled students
E-mail	Communication and interchange	Clubs/ associations
Internet (Web)	Information search	Homework
Pedagogical <i>Software</i>	Simulations /Games	Pedagogical support
Data acquisition Software	Scientific data research and treatment	Laboratory classes

### 3. STUDY

#### A. DESCRIPTION

The base of this study is a questionnaire aimed to know the real uses of ICT in personal and educational contexts by Portuguese teachers in 2001/2002. An exhaustive observation of a sample [10] was performed, being the results generalized to the whole population.

#### B. AIMS

We tried to obtain as much data as possible. However, if there are too many aims it is difficult to display and discuss the results. Furthermore, the aims must be precise in order to avoid ambiguities.

We have then defined the following goals:

→To know qualitatively and quantitatively what is the computing equipment that teachers own.

→To know about teachers training in the use of ICT.

→To relate the previous objectives with gender, age, professional situation, initial training, and teaching levels.

→Quantify and qualify teachers who use ICT in their practice.

- Quantify and qualify ICT use in educational context.
- Infer the reasons for not using ICT in educational context.
- Recognise the ICT aspects in which teachers feel to need more training.
- Look for the possibilities of incrementing ICT use in educational context.
- Generalise the results to the whole universe.
- Define or redefine other aims for further studies.

### C. UNIVERSE

The universe to which we have generalised conclusions is the totality of Portuguese teachers in 2001/2002.

## 4. SOME RESULTS

### Some Features of Portuguese Teachers

Our teachers sample reflects the national reality, shown in Table 2.

Table #-2. Number of schools, teachers and students in Portugal, for all teaching levels except high education (data from the Ministry of Education, for 2000/2001)

Type of school	N° of schools	%	N° of teachers	%	N° of students	%
JI	5683	34.52	11920	7.02	192532	11.20
EB1	8343	50.68	31963	18.83	417790	24.30
EB1,2	7	0.04	259	0.15	2037	0.12
EB1/JI	32	0.19	440	0.26	6436	0.37
EB2	30	0.18	1310	0.77	9920	0.58
EB2,3	596	3.62	45108	26.57	383929	22.33
EB2,3/ES	82	0.50	6396	3.77	51486	2.99
EB3	4	0.02	160	0.09	1426	0.08
EBI	48	0.29	2506	1.48	20683	1.20
EBI/JI	20	0.12	1125	0.66	8950	0.52
EBM	365	2.22	800	0.47	5927	0.34
EP	203	1.23	6486	3.82	29435	1.71
ES	66	0.40	8171	4.81	70353	4.09
ES/EB3	324	1.97	38434	22.64	334904	19.48
ESA	3	0.02	412	0.24	2157	0.13
Others	357	3.99	14267	8.40	181362	10.55
<b>Total</b>	<b>16463</b>	<b>100</b>	<b>169757</b>	<b>100</b>	<b>1719327</b>	<b>100</b>

Note: In the first column we use the following notation: A – Artistic; E – School; B – Basic; JI – Kindergarden; S – Secondary (high school); I – Integrated; M – Mediatized; P – Professional; numbers 1, 2 e 3 refer to first, second and third cycles of basic school (EB) respectively.

The majority of the sample is made up by women (76%).

The most represented range of age is 36-45 (34%) while the least represented is that made up by people more than 56 years old (Fig. 1).

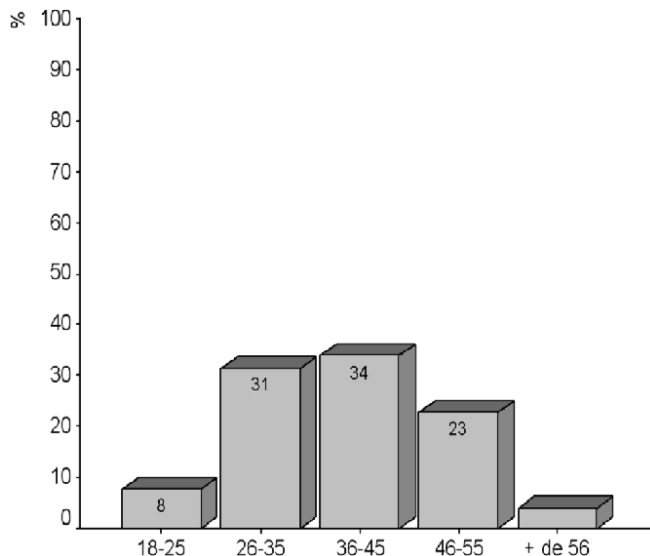


Figure #-1. Distribution of teachers of sample by age

The majority (about 90%) of teachers had initial teacher training. More than half of the teachers of our sample had done their initial teacher training at a university.

**Results for some questions**

The majority of teachers (88%) own a PC and simple peripherals (Fig. 2).

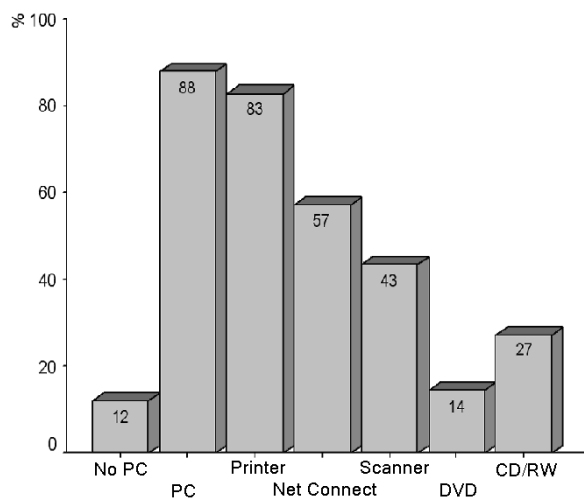


Figure #-2. Personal computing equipment of the teachers.

About half of the teachers had self-learning in ICT (Fig. 3).

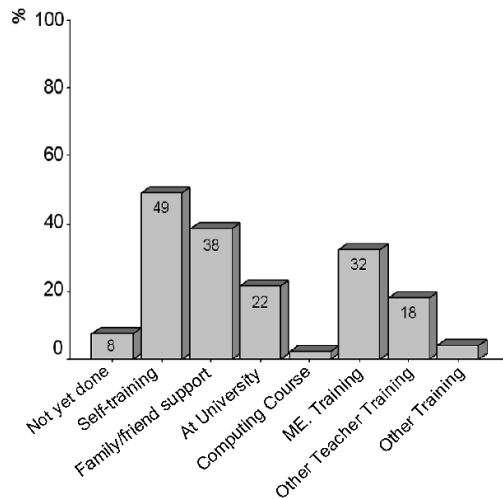


Figure #-3. Distribution according to teachers training in ICT.

Almost half of the teachers use quite often the PC but 31% only uses the *Word* application. About 65% of teachers use the Internet. Only 29% use the Internet at school but half of the teachers use it at home.

Less than half of the teachers use e-mail, mainly just to communicate with friends. It is insignificant the use of e-mail from teachers to students (Fig. 4).

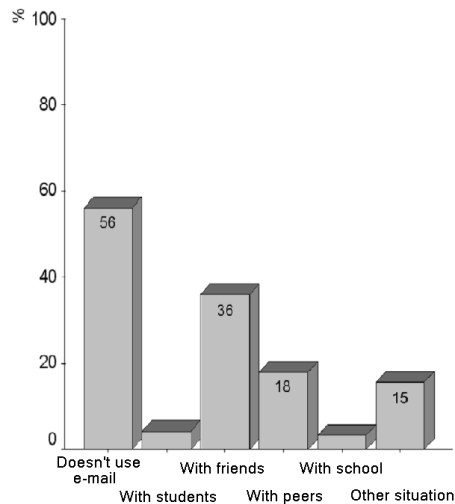


Figure #-4. How teachers of our sample communicate by e-mail.

Only a quarter of all teachers use the PC with students, in or outside classroom.

From the 26% of teachers who use the PC with students, 42% belong to the 1st cycle (primary) and 24% to the 3<sup>rd</sup> cycle of basic and secondary (Fig. 5).

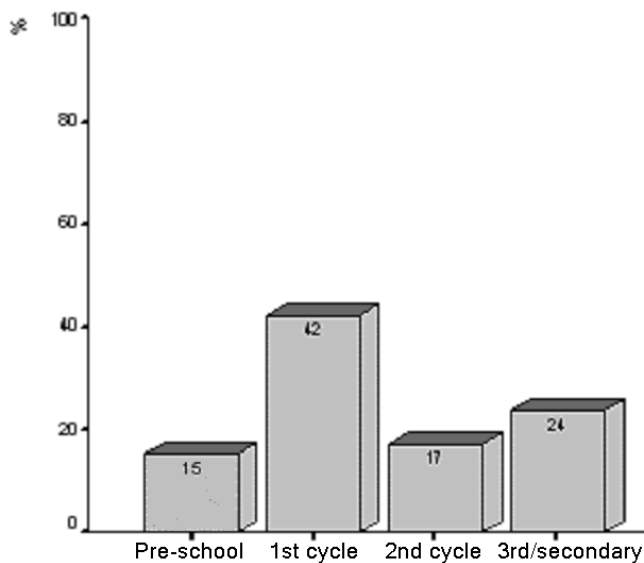


Figure #-5. Distribution of teachers who use computers in educational context by levels of teaching.

The ICT application most used by students, when teachers use a PC in class, is the word processor. Pedagogical software, for example, is used less frequently.

The larger obstacles to the use of ICT, from the point of view of teachers, are the lack of resources, mainly technical but also human resources. (Fig. 6)

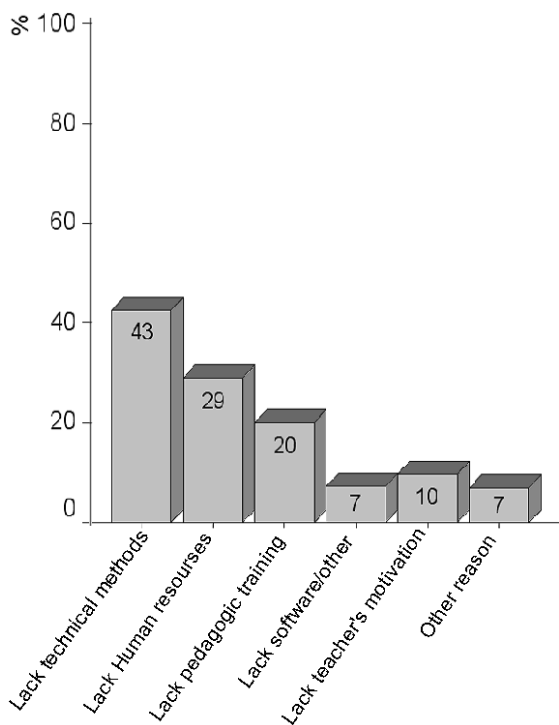


Figure #-6. Distribution of teachers by obstacles to the use of ICT.

## 5. ANALYSIS AND CROSSING OF SOME VARIABLES

We present in the following some relations between variables, explaining the main ideas that come out.

### Simple relation between parameters:

Teachers of the 3rd cycle and secondary use more their PCs to accomplish several private tasks (Fig. 7).

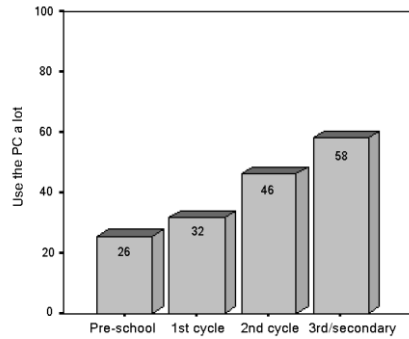


Figure #-7. Distribution of the way teachers use computers for private purposes by teaching levels.

The majority of teachers who use the PC for performing several tasks had initial training at a university (41.7%).

The Internet is more used by teachers, for private and pedagogical purposes, as the teaching level goes up (Fig. 8).

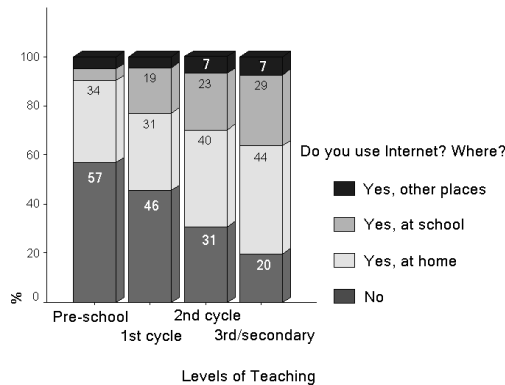


Figure #-8. Distribution of the way teachers use the Internet by teaching levels.



The word processor is the application students most use, mainly in the 1st and 2nd cycle of basic teaching (Fig. 9), when teachers use computers with their students.

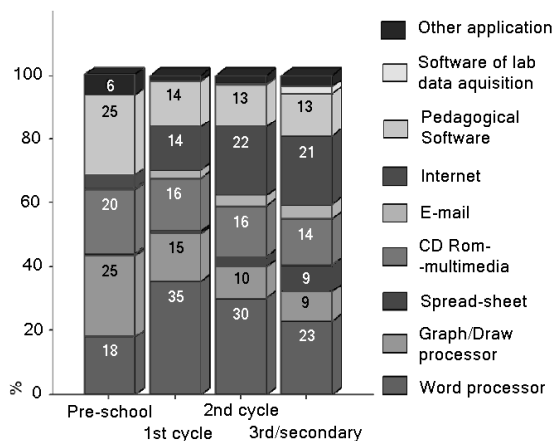


Figure #-9. Distribution of ICT applications used by students according to the school levels.

## 6. SOME TRENDS SHOWN BY MULTIVARIATED FACTORIAL ANALYSIS

We now present a multivariate factorial analysis of some questions, obtained through the use of the *SPSS* programme. This type of analysis produces qualitative graphics that allow to recognise relations between variables. Such relations are particularly interesting in this kind of studies. These graphics should be interpreted looking for the proximity of marks describing the different variables in study.

Fig. 10 shows an example of multivariate factorial analysis. It displays the correlations between the answers to the questions: “Do you use the computer in classroom activities?”, “How many hours a week do you work in computer?” and “Do you use quite often the computer?”, when associated to the teaching levels. The low number of working hours at a computer is intimately related to its non-use to perform several tasks. We can also read that the teachers of 3<sup>rd</sup> cycle and secondary are those who are nearer a longer use of the computer for private purposes.

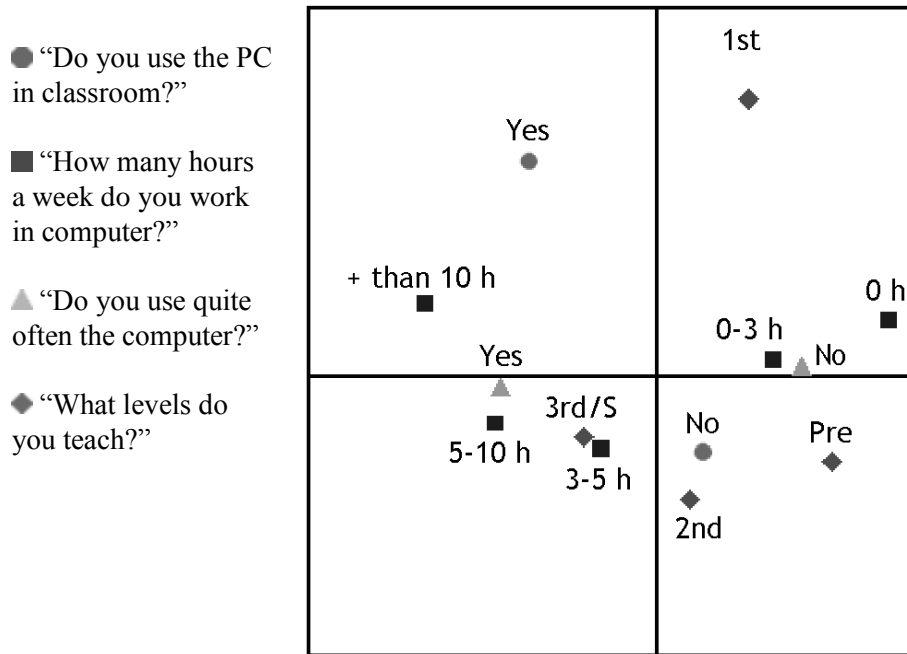


Figure #-10. Multivariate analysis of variables: ●■▲◆

## CONCLUSIONS

We summarize here the main conclusions of our study:

- Teachers are mainly women (they are almost exclusive in pre-school teaching), followed by the 1<sup>st</sup> cycle (primary school). More than half (65%) of the teachers are between 26 and 45 years old. Most teachers from the 1<sup>st</sup> cycle are between 36 and 45 years old and the range 18-35 years old is more represented in 3<sup>rd</sup> cycle and secondary schools.

- Initial training for more than half of the teachers took place at a university and more than 89% of the teachers had a teacher training period.

- The computing equipments of teachers are many and varied. 88% of the teachers own a PC against 39% of Portuguese who owned that equipment in 2001. 57% of the teachers are connected to the Internet against 30% of Portuguese in 2001 [11].

- Although for most teachers (91%) the computer is a personal tool, its general use depends on the gender, age, initial training and teaching levels. Thus, male younger teachers had their computer training at the university and use more often the PC for a general purpose in 3<sup>rd</sup> cycle and secondary schools.

- Portuguese teachers quite often use the Internet and particularly e-mail (65% and 44% respectively), this use being more associated to younger male teachers. Surfing the Internet is mainly done by teachers at home. The e-mail, in particular, is mostly used by teachers of 3<sup>rd</sup> cycle and secondary. We would like to highlight that electronic communication between teachers and students is quite rare.

- 81% of teachers use the computer to prepare classes (except in the pre-school teaching). 94% of these do it for worksheets and/or tests and 54% use the Internet to make searches on the subject they teach.

- Self-learning and the attendance of courses promoted by the Ministry of Education are the two main ways teachers had their computer training.

- 26% of the teachers use the computer at their school in direct interaction with students in and out of the classroom. 26% of these users are teachers of the 1<sup>st</sup> cycle (42%), followed by teachers of 3<sup>rd</sup> cycle and secondary (24%).

- The major ICT applications used in direct interaction with students are the word processor, Internet search and also specific software to perform ludic/pedagogical activities.

- Almost all teachers, without distinction of age and levels taught, need and wish to have training in ICT applications.

- Teachers have, in general, more positive than negative attitudes towards ICT. However, many female teachers show negative attitudes. The two main obstacles for integrating ICT in schools are the lack of technical means and human resources.

The whole study which formed the basis for this article is available at [http://www.dapp.min-edu.pt/nonio/pdf/utilizacao\\_tic\\_profs.pdf](http://www.dapp.min-edu.pt/nonio/pdf/utilizacao_tic_profs.pdf) (in Portuguese), where several links to other works on ICT in Portugal and in Europe can be found. Other data including detailed graphical analysis are available at <http://nautilus.fis.uc.pt/cec/estudo>.

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