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Abstract

Information and Communication Technologies (ICTs) are being used worldwide in every sector of society, however schools have not been permeated with them satisfactorily. In Portugal, as in the rest of the world, several projects have tried to introduce ICTs in schools in general and in classrooms in particular. Teacher training is therefore an important component. The research we have done focused on the Initial Teacher Training Institutions (Schools of Education – ESE) in Portugal that offer ICT in their curriculum as an integral part of teacher training. We give an overview of the aims, contents, methodologies and evaluation of the ICT subject in each School of Education.

ICT and teacher education – The Portuguese example

The growth and speed of the advances in technology in every sector of our society cannot let educational settings be indifferent. More and more the schools will be vulnerable and dependent on the outside world and to overcome this they must be ready to prepare the students for their future active working lives, (Gil, 1994). Also Friedler (1989, 58) refers that ‘(...) one major concern of education is to prepare students to live in a rapidly changing society.’ Cuban (1986) quoted by Scott (1992, 195-6) says ‘(...) the central and dominant aim of [computers] is to bring the world to the classroom, to make universally available the services for the finest teachers’. Sutton (1991, 476) referring to Nobel (1984) reinforces this idea ‘(...) the widespread belief that computer competence was essential for students, future workers, and in an educational citizenry and thus should be taught in schools’ So the idea that schools are ‘divorced’ from society must vanish and schools must prepare individuals well prepared in order to contradict Bitter (1987, 451) ‘(...) educators who ignore this phenomenon and refuse to change their techniques to accommodate the new technologies will soon find their methods lammed by functional obsolescence’.

Educational settings, in spite of having a positive attitude towards ICT, do not use or teach their use in a regular basis. Tinker (1987, 466) refers that after a decade of the use of computers '(...) education remains untouched by these technologies'.

Portugal is no exception and in order to change this we think that a correct use of ICT must begin with initial teacher training.

Several projects, the MINERVA project and FOCO training modules to name some, have tried to overcome that situation. However computers are not being fully used in educational settings so far. One reason can eventually be related with specific training oriented to the subject matter of the future teachers. The aim of our research is to verify which Higher Education Institutions (Schools of Education, from now on called ESE) train the future teachers to be in the use of ICT.

Data was collected from 'Plano de estudos – Ensino Superior Politécnico do Ministério da Educação – 1992', an official document and from the curricula each school of Education has sent us by mail with the exception of 'ESE de Viseu'.

Data collected had as main objectives to promote a reflection/discussion according to:

1. the number of ICT subjects in each institution;
2. when it appears in the curricula;
3. the character of the subject, i. e. computational or pedagogical oriented;
4. if the introduction of ICT is due to a global policy of the institution or if it is there to satisfy the objectives of a specific course;
5. analyse the curricula of ICT in order to determine its adequacy.

Table I shows the schools that have ICT, the number of subjects related to ICT, when they appear and the name given to the subject:

School of Education	ICT	Schooling Year	Term	Designation
Beja	Yes	3rd year	1st	Informatics
Bragança	Yes	2nd year	2nd	Computers and Numerical Calculation
Castelo Branco (*)	Yes	2nd year 2nd year	2nd 2nd	Algorithms and Computation Computers in Education
Faro	Yes	1st	1st	Computers in Education
Leiria	No	-	-	-
Lisbon	No	-	-	-
Portalegre	No	-	-	-
Oporto	Yes	1st & 3rd	1st & 1st	Educational Computers I & II
Setúbal	Yes	1st	1st	Introduction to Computers
Viana do Castelo	Yes	1st	2nd	Computers in Education
Viseu	Yes (optional)	1st	1st	Educational Software

Only 3 schools (27.3%) do not have a subject related to ICT. In Viseu for instance that subject is optional (9.1%). In eight schools (72.7%) ICT is clearly used. These figures, in our opinion, are very meaningful because they show clearly that there is awareness that future teachers should have knowledge in ICT in order to use it effectively in their future teaching.

In the great majority of the schools the subject appears in the first year which presupposes a more general approach to the subject. Only in one school ICT lasts more than one semester

Table II

Course	Beja	Bragança	C. Branco	Faro	Porto	Setúbal	Viana do Castelo	Viseu
Ed. Infância	-	-	Computers in Education	-	-	-	-	X
Ed. Musical	X	X	X	X	Computers I & II	X	-	X
Ed. Visual	Informatics	-	Computers in Education	X	Computers I & II	-	-	-
Ed. Física	Informatics	X	Computers in Education	Computers in Education	Computers I & II	-	-	-
Informatics	Several	X	X	X	X	X	X	X
Mat./C. Natrurezza	Informatics	Computers and Numerical Calculation	Algorithms and Computation	Computers in Education	Computers I & II	Introduction to Computers	Computers in Education	Educational Software
Port./Francês	Informatics	-	Computers in Education	Computers in Education	Computers I & II	-	-	-
Port./Inglês	Informatics	-	Computers in Education	Computers in Education	Computers I & II	-	-	-
T. Manuais	X	X	Computers in Education	X	Computers I & II	X	-	X
Prof. Primários	-	-	Computers in Education	Computers in Education	X	Introduction to Computers	X	-

Legend: (x) Course does not exist; (-) Does not include any subject about ICT.

The Schools of Education of Beja, Castelo Branco, Faro and Oporto introduce ICT in every course, which is very positive. In Bragança, Setúbal, Viana do Castelo and Viseu ICT is only related to the course of Mathematics/Sciences. It is clear the two-fold perspective taken by the different schools:

- (1). A 'classical' perspective that gives priority to maths/sciences teachers;
- (2). A 'modern' perspective that englobes ICT in every course.

Castelo Branco seems to have joined the two characteristics together: the introduction of ICT in every course and a specific subject related to ICT to maths/science teachers.

We are now going to analyse the aims, contents, methodology and assessment of every subject. It is worth referring that 'ESE de Viseu' is not going to be included in the analysis because it did not reply to our request and so data was not available and that 'ESE de Bragança' only sent us the contents of the subjects,

Table III – Aims of the several subjects

1. Aims	Beja	Bragança	C. Branco	Faro	Oporto	Setúbal	Viana do Castelo
1.1. Computers and their social implications	+	?	-	-	-	-	-
1.2. Computers and their educational implications	+	?	+	+	-	-	-
1.3. Promotion of skills to use computers	+	?	+	+	+	+	+
1.4. Promote the use of computers in educational context	+	?	+	+	+	+	+
1.5. Guidance for the use of computers in educational context	+	?	+	+	+	+	+
1.6. Critical software evaluation	+	?	-	+	-	-	-
1.7. Critical educational software evaluation	+	?	-	-	-	-	-
1.8. Historical computers' evolution	-	?	+	-	-	-	-
1.9. Programming	-	?	+	-	-	-	-
1.10. Knowledge of the main functions of a data analysis system	-	?	+	-	-	-	-
1.11. Promote opportunities to develop extra-curricular activities -	?	-	-	-	+	-	-
1.12. Promote opportunities to use software	+	?	-	-	+	+	+

We could verify 12 different objectives in the different schools.

Objectives 1.3, 1.4, and 1.5 seem to appear in every curricula – they all deal with the use of computers in Education.

Table IV – Contents of the several curricula of ICT

2. Contents	Beja	Bragança	C. Branco	Faro	Oporto	Setúbal	Viana do Castelo
2.1. Historical evolution of computers	+	-	+	-	-	-	-
2.2. ICT and Education	+	-	-	+	-	+	-
2.3. Computers' hardware	+	-	+	+	+	+	+
2.4. Computers way of working	-	-	+	-	+	-	+
2.5. Operating systems	+	-	+	-	-	+	+
2.6. Programming: Languages	-	-	+	-	-	-	-
2.7. LOGO	+	-	-	+	-	-	-
2.8. Word processor	+	-	-	+	+	+	+
2.9. Worksheet	+	-	-	+	+	+	+
2.10. Painting	+	-	-	+	+	-	-
2.11. Databases	+	-	+	+	-	-	+
2.12. Music assisted by computer	+	-	-	-	-	-	-
2.13. Analysis and evaluation of educational software	+	-	-	-	+	-	-
2.14. Use of educational software	+	-	-	-	+	-	-
2.15. Numerical analysis	-	+	-	-	-	-	-
2.16. Errors	-	+	-	-	-	-	-
2.17. Algorithms	-	+	+	-	-	-	-
2.18. Linear equations	-	+	-	-	-	-	-
2.19. Multimedia			+				
2.20. Communication			+				
2.21. Internet			+				

After having analysed the contents of the ICT subjects we found 21 different topics.

Topics differ from school to school however topics 2.3, 2.5, 2.8, 2.9 and 2.11 seem to be coincident in every curricula.

Topics 2.3 and 2.5 are related with hardware and operating systems, i. e. computer basics and topics 2.8, 2.9 and 2.11 are related with software.

Table V – Methodologies used in the teaching/learning of ICT

3. Methodology	Beja	Bragança	C. Branco	Faro	Oporto	Setúbal	Viana do Castelo
3.1. Group work (2-3 students)	+	?		+		+	?
3.2. Theoretical and practical activities	+	?		+			?
3.3. Practical activities		?			+	+	?
3.4. Reflection and evaluation about the use of educational software; literature review	+	?					?
3.5. Problem solving		?	+				?
3.6. Project work		?		+			?

As far as the methodologies used the majority referred 'group work'. One possible explanation for this is the scarcity of computers and the large number of students per class however it can also be explained by the character essentially practical of the subject. Students seem to have an active role in every methodology proposed.

Table VI – Evaluation used in ICT

4. Evaluation	Beja	Bragança	C. Branco	Faro	Oporto	Setúbal	Viana do Castelo
4.1. Continuous evaluation	+	?		+	?	+	
4.2. Group work	+	?		+	?		
4.3. Individual work	+	?			?		
4.4. Practical work		?	+		?		+
4.5. Theoretical-practical individual assessment		?		+	?		
4.6. Project work		?			?	+	
4.7. Pluri-disciplinary use		?			?	+	

Evaluation reflects the methodology used. The most referred (4 ESEs – Schools of Education) referred continuous assessment.

ESE de Setúbal referred a way of assessment that seems an attempt to promote the educational use of ICT, i. e. evaluating the work done in other subjects with ICT.

It seems important that the introduction of ICT in the curricula of initial teacher training should be of major importance, not only in relation to maths/science teachers but with teachers of other subjects and levels. Only so we can train teachers to use ICT effectively with their students in order to reduce the gap between school and society.

We do not want to finish without reflecting on the global policy of the Ministry of Education that do not compulsory integrate ICT in the curricula of the different subjects of the students of basic and secondary education. These curricula only refer ICT in a light way:

... using eventually audio-visual media and simple forms of ICT

... using with opportunity and efficiency audio-visual and computational media

It is urgent that policy makers and educational deciders change their practices in order to prepare teachers and students to become fully integrated in the 21st century.

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