

ICT Projects and Planning

From Equipments to Activities

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Abstract—Our study is based on a comparative analysis of two institutional documents, produced in public primary and secondary Portuguese schools, meant to enhance the use of ICT resources: an application to the *Iniciativa Escolas, Professores e Computadores Portáteis* ('Schools, Teachers and Laptops Initiative'), which aimed at equipping schools with ICT equipment, and the ICT Plan, a biannual plan of action for the integration of ICT in educational activities involving all the members of the educative community.

The analysis focused on the typologies of activities planned for each school in both documents. As these documents were produced in consecutive school years, it was possible to recognize a continuity and evolution relationship towards the activation of ICT resources when conceiving, planning and developing learning activities.

Index Terms—School and Computers; ICT in learning process

I. INTRODUCTION

In the beginning of the 21st century, the vertiginous development of ICT rises several challenges that may result into a heavy burden for schools' traditional organisation. The importance of a conscious and pedagogically intentional integration of ICT in educational contexts is enhanced by the transition from a mechanistic metaphor of education, in which learning processes are centered on the teacher, to a constructivist perspective, which values a network and collaborative representation as well as being centered on the student.

Such challenges must be considered by basic and secondary education schools, for they are such an important path for the students' development; on the other hand, educational challenges may not be dissociated from the nation's economical, political or sociocultural challenges [1], as that would imply a narrow vision of school, not contextualized in its surrounding global environment, as was in the past.

We may discuss several key aspects for significant ICT integration in the school context: the importance of building up a vision of the school's mission that is shared by all the concerned actors [2]; learning and assessment issues; the management organisation and the teachers' training and development dimensions; the communication and collaboration with the surrounding social environment dimension.

The idea of the learning schools [3] and of the communities of practice [4] have guidance potential in (re)defining the roles of the educative community main

actors, students and teachers, as well as the functions technologies may hold.

On the other hand, ICT real integration in teaching and learning processes involves assuming that they do considerably change these processes, as sustained by several authors. Jonassen [5], for instance, presents the powerful idea of exploring computers as a mindtool, promoting more collaboration, interactivity and active learning [6].

Although the existence of equipments is inevitable for using ICT at schools, it is not the critical factor of its real integration in the educative context. A study from the European Commission [7] concluded that new learning environments do not depend on the use of ICT as much as they depend on the teachers' capacity for reorganising learning situations, mobilising ICT in innovative activities that are not mere duplications of the traditional ones.

Several countries have been adopting policies and initiatives, both at national and regional level, to stimulate the approach of schools to the new reality the Knowledge Society encompasses. In Portugal, the first reference program was *Projecto Minerva (Meios Informáticos no Ensino: Racionalização Valorização Actualização)* ('Minerva Project: ICT in teaching: Rationalisation, Valorisation, Actualisation') launched in 1985, that had three main action dimensions: the development of educational software, ICT curricular integration and teachers' training on this field [8]. The *Nónio séc. XXI* ('Nónio 21st century') project followed, and, although with a different structure and organisation, aimed at the same goals of *Projecto Minerva*.

In 2007 a new plan of action was introduced in Portugal: the *Plano Tecnológico da Educação* ('Technological Plan for Education'), which aims at facing the challenge of the technological modernisation of the Portuguese schools [9].

It is, therefore, important to make an evaluation of the way schools are integrating ICT, and in what way they are benefiting from their technological and pedagogical potential.

II. THE STUDY FRAMEWORK

A. *The Iniciativa Escolas, Professores e Computadores Portáteis* ('Schools, Teachers and Laptops Initiative') – equipping schools

The *Iniciativa Escolas, Professores e Computadores Portáteis* ('Schools, Teachers and Laptops Initiative') was proposed by *CRIE – Equipa de Missão Computadores, Redes e Internet na Escola* ('Computers, Network and Internet at Schools Team'), within the context of the

PRODEP Measure 9 – Information and Communication Technologies.

Following an electronic applying process, in March 2006, the projects were evaluated in April, and the results were made public in May. The equipments were, thus, distributed to the schools from the first trimester of the 2006/2007 school year, as the implementation of the project activities should begin along that same school year.

The main goal of this initiative was equipping basic and secondary education public schools with technological equipments to support learning activities (laptops, wireless equipments and multimedia projectors), aiming at (i) promoting the professional use of ICT by teachers, (ii) contributing to the social appropriation of these technologies by teachers, and (iii) promoting its effective use on teaching and learning activities [10]. These aims would be accomplished through the mobilisation of ICT resources at schools, when developing diverse activities within the following categories:

- a) Innovation and curricular development;
- b) Pedagogical materials production;
- c) Classroom learning experiences;
- d) Educational projects;
- e) Team work among teachers and disciplinary groups;
- f) School management.

The equipments were made available for individual and professional use by teachers and students both in classroom context and curricular and extra-curricular support activities.

The project selection criteria indicate a concern with the future effective, productive and widespread to the whole school community use of the technological equipments, both in curricular and extra-curricular activities, focusing on the following items:

- a) The enhancement of the preparation and of the production of materials, and of the teaching process, using computers, networks and the Internet;
- b) The relevance of the planned practical activities, in which students use computers, networks and the Internet;
- c) The demonstration of the contribution of the planned activities for the teachers professional development;
- d) The use of the computer as a tool to manage school classes.

The schools were not required to apply, but in a universe of 1270 schools, equipments were given out to 1160 establishments.

B. ICT coordinators, teams and plans

The job of ICT Coordinator and the ICT team he leads was created by a ministerial dispatch [11] which justifies the need for this position with the increase of technological equipment, the networks management, the constant need for maintenance and technical assistance, the issues of security and the growing and desirable use of these resources, both by students and teachers; these factors have required schools to provide organisational solutions which allow for the best performance of computer hardware and networks as a prerequisite to assure security, confidence and reliability, thus providing its effective use in the teaching and learning processes.

Moreover, in addition to the maintenance of equipment, the ministerial dispatch stresses the need for continuing to invest in training and supporting teachers as far as new technologies are concerned, allowing for their use in teaching and non-teaching school activities, and tasks of school administration and management.

Accordingly, these two entities of intermediate school management – ICT Coordinator and Team – emerge as structures for coordinating ICT, whose educational action should focus on accomplishing the following aims:

- a) To develop the school ICT plan as an annual plan of action for ICT;
- b) To identify teachers training needs in ICT;
- c) To attend training courses that can answer the identified needs of training;
- d) To assess the results achieved with the implementation of the ICT plan and evaluate it.

The ICT team is created by the schools executive boards, following the suggestion of the ICT coordinators, in order to support the technical and pedagogical implementation of the ICT plan, and it may be composed by:

- a) Teachers of several curriculum areas, with pedagogical and technical skills;
- b) Administration and auxiliary staff with technical skills or that are trained in ICT;
- c) Trainees of ICT professional or technological courses;
- d) Students with ICT skills.

The ICT Coordinator acts on the intermediate school management, and so this job should be held by someone who promotes links among the school executive board and the different agents of the educational community.

According to the same dispatch, the ICT plan is a document that defines an annual plan of action for ICT, in order to promote the integration of ICT in teaching and non-teaching school activities, increasing the available technological resources benefits and its use by all the elements of the educational community.

The ICT plan should be designed as part of the school educational project and of the annual plan of activities, and its production and implementation should involve the administration and management boards and should have the support of the local teachers training center and of other relevant partners.

III. CONTEXT, METHODOLOGY AND RESULTS

A. The institutional documents

This analysis focused on two documents produced by 52 public schools/groups of schools located in the district of Viseu, Portugal, representing about 82% of the schools universe:

- The application for the *Iniciativa Escolas, Professores e Computadores Portáteis* ('Schools, Teachers and Laptops Initiative') (IEPCP Project), submitted in March 2006, to be implemented along 2006/2007 school year;
- The ICT plan, exceptionally designed for the biennium 2007/2009 and submitted to *CRIE – Equipa de Missão Computadores, Redes e Internet*

na Escola ('Computers, Network and Internet at Schools Team'), which integrates the Ministry of Education Directorate-General of Innovation and Curricular Development, in January 2008.

They are both documents of intention, presenting a set of goals and the activities through which they are expected to be achieved.

The study began with collecting the explicit references to educational and school management /administration activities from both documents. Categories and typologies of activities were then defined so as to allow the comparison of the reference numbers existing in each document and the calculus of the difference of the two frequencies percentages. This made it possible to quantify the variation occurring from the first to the last document in each typology of the selected and planned activities meant to develop ICT integration in the educational context.

B. The schools

The 52 public schools/groups of schools in which the documents were collected include very heterogeneous populations, with students coming from very diverse socioeconomic and cultural environments due to the variety of their families' professional activities, income levels and sociocultural backgrounds.

As it was impossible to describe the students' from the 52 schools social profiles, we decided to characterise the institutions from the prevailing socioeconomic standards of the population they serve, and their geographic location, thus defining the 3 categories of the following table: urban, rural-urban and rural.

TABLE I.
DISTRIBUTION OF SCHOOLS BY SOCIO-ECONOMIC AND CULTURAL CONTEXT

	Urban		Urban-rural		Rural	
	N	%	N	%	N	%
Number of schools	7	13,5	18	34,6	27	51,9

Regarding the distribution of schools by socioeconomic and cultural context, Table 1, more than half of the schools whose documents have been examined is located in a rural environment; added to these, more than one third of the schools are located in environments which combine both urban and rural characteristics. This shows the prevalence of a students' population for whom school will most probably be the main place where ICT skills are acquired and technological literacy developed.

As for the educational level, all schools provide basic education, and one third of them also have secondary courses, Table 2.

TABLE II.
DISTRIBUTION OF SCHOOLS BY EDUCATIONAL LEVEL

Educational level	Basic Education		Basic and Secondary Education	
	N	%	N	%
Number of schools	36	69,2	16	30,8

IV. COMPARATIVE ANALYSIS – FROM SCHOOLS' EQUIPPING TO INNOVATION IN LEARNING PROCESSES

The comparative analysis we carried out was based on 5 metacategories of activities, which stemmed from the explicit references found in the documents we studied: equipments and infrastructures; applications; learning practices and resources; training; evaluation.

Each of these metacategories includes a set of activities that comprise the explicit references found in each document; for each prototypical activity, we present the frequency of occurrence and the respective percentage; in the last column of each table, we present the difference between the percentages of the explicit references to each prototypical activity frequency of occurrence in the IEPCP projects and in the ICT plans.

In what concerns equipments and infrastructures related activities, Table 3, we must enhance the increasing concerns with the implementation of free software (+71,2). Also meaningful is the number of activities that aim at the implementation or optimization of wireless lan (+26,9), and, at a more modest level, at promoting and managing the usage of ICT rooms and equipments (+9,6).

The notorious decrease, in ICT plans, of references to equipment acquisition, upgrading, maintenance and access (-38,5) may be explained by the fact that the schools' main purpose for elaborating IEPCP projects was to obtain ICT equipment to support teaching and learning activities; consequently, the discrimination of this kind of activities was compulsory in these projects. In ICT plans, that purpose was no longer essential, since the Ministry of Education had been more regularly providing ICT equipment, through initiatives such as *Atribuição de Equipamentos Tecnológicos para o Enriquecimento do Ensino e da Aprendizagem* ('Attribution of technological equipments for teaching and learning improvement') [12].

TABLE III.
REFERENCES TO EQUIPMENTS AND INFRASTRUCTURES RELATED ACTIVITIES

	IEPCP Projects		ICT Plans		Δ
	N	%	N	%	
Equipments and infrastructures					
Free software	1	1,9	38	73,1	+71,2
Wireless (implementation/optimization)	3	5,8	17	32,7	+26,9
ICT room / equipment (promoting/managing usage)	10	19,2	15	28,8	+9,6
Equipment (acquisition/upgrade/maintenance/access)	52	100,0	32	61,5	-38,5

Regarding applications related activities, Table 4, besides the great increase of activities oriented to promote the usage of blended learning management systems (LMS) (+42,3) and the growing importance of schools websites, we may point out the reduction of actions towards computer mediated communication (CMC) in pedagogical contexts (teacher-teacher, teacher-student, student-student) (-9,7), which may indicate that computer mediated communication in pedagogical contexts is already considerable practiced in many schools; the references to computer mediated communication in the

context of school management and administration, that is to say, between the several school services, with the students families and with other members of school communities, were slightly less (-3,8); this could also be seen as a sign that some success had already been accomplished in the establishment of such activities.

TABLE IV.
REFERENCES TO APPLICATIONS RELATED ACTIVITIES

Applications	IEPCP Projects		ICT Plans		Δ
	N	%	N	%	
Learning Management System Moodle (dynamization)	16	30,8	38	73,1	+42,3
Website	33	63,5	38	73,1	+9,6
Radio	1	1,9	1	1,9	0,0
CMC in school management/administration (synchronous/asynchronous; implementation/optimization)	18	34,6	16	30,8	-3,8
Blog/online journal	18	34,6	16	30,8	-3,8
CMC in pedagogical contexts (synchronous/asynchronous; implementation/optimization)	24	46,2	19	36,5	-9,7
School management/administration	30	57,7	15	28,8	-28,8

As for activities more directly related to learning practices and pedagogical resources, Table 5, we may notice a great increase of the valorization of ICT applications and equipments in primary schools and kindergartens (+34,6), and of the cooperation with school libraries and resources centers (+17,3).

We may also perceive a slight growth of the number of references to the creation and use of e-portfolios (+9,6), still insufficient, however, to make it possible to achieve the goals established by the program *Ligar Portugal* ('Connecting Portugal') [13], a part of the governmental Technological Plan, that aims at a generalisation, until 2010, of an individual digital portfolio for each student that finishes basic education, which will contain all his/her relevant works, attest the relevant practices acquired in different domains (artistic, scientific, technologic, sportive and others), and display the effective use of ICT in the several school subjects.

There was, also, an expressive decrease of references to activities related to projects and clubs (-15,4), to producing and/or providing access to pedagogical materials and resources (-19,2) and to the mobilization of ICT in the learning experiences provided for the students (-30,8); in our opinion, two different, but not mutually excluding, explanations may account for this: on one hand, as schools have been being equipped with ICT equipment, due to the *Iniciativa Escolas, Professores e Computadores Portáteis* ('Schools, Teachers and Laptops Initiative'), since the beginning of the 2006/2007 school year, we may assume that ICT resources have already become more present in pedagogical practices, avoiding the need to keep thoroughly referring to their implementation; on the other hand, the previous experience ICT teams have had in producing IEPCP

projects, as well as the difficulties they faced in their application, may have originated more pragmatic and realistic attitudes and options towards designing the intentions of ICT activation in schools when they were producing ICT plans.

TABLE V.
REFERENCES TO LEARNING PRACTICES AND RESOURCES RELATED ACTIVITIES

Learning practices and resources	IEPCP Projects		ICT Plans		Δ
	N	%	N	%	
Support in ICT resources for primary schools and kindergartens	1	1,9	19	36,5	+34,6
Cooperation with school libraries and resources centers	7	13,5	16	30,8	+17,3
e-Portfolios	5	9,6	10	19,2	+9,6
Learning experiences for students with special needs	6	11,5	5	9,6	-1,9
Projects / clubs	31	59,6	23	44,2	-15,4
Learning materials and resources (production/providing access)	48	92,3	38	73,1	-19,2
Learning experiences (implementation/diversification/valorization)	48	92,3	32	61,5	-30,8

On the topic of ICT training activities, Table 6, we may highlight the considerable decrease of references to teachers training (-30,8), which seems to indicate that most teachers have already acquired basic technological competences. Consequently, we notice an increase of the references to training activities oriented to specific applications and equipment, of more recent implementation, such as Learning Management Systems (Moodle) and Multimedia Interactive Boards (MIB) (+34,6 and +25,0, respectively).

We may also point out the growing concern with the acquisition of ICT competences by the administration and auxiliary staff (AAS) (+25,0), as their action, complementary to teaching practices and school management, requires more and more use of technological resources.

TABLE VI.
REFERENCES TO TRAINING RELATED ACTIVITIES

Training	IEPCP Projects		ICT Plans		Δ
	N	%	N	%	
MIB training	1	1,9	25	48,1	+46,2
Moodle training in pedagogical context	3	5,8	21	40,4	+34,6
ICT training for (AAS)	0	0,0	13	25,0	+25,0
Moodle training in school management/administration	0	0,0	4	7,7	+7,7
Articulation with Schools Associations Training Centers (Teachers/ AAS)	28	53,8	15	28,8	-25,0
ICT training for teachers	48	92,3	32	61,5	-30,8

In regard to activities oriented to the evaluation of the projects and plans, Table 7, it is notorious that there was an increasing concern in employing instruments that are able to generate more quantifiable data, such as observation grids (+40,4), dismissing those with lower objectivity, such as questionnaires/inquiries and reports (-11,5 and -26,9, respectively).

Concerning evaluation indicators, we may notice an increase in all of them, except the less objective and more hardly measurable "Engagement in the activities" (-9,6); this fact may reveal a higher concern with the evaluation of the development of ICT plans.

TABLE VII.
REFERENCES TO PROJECTS AND PLANS EVALUATION RELATED
ACTIVITIES

Evaluation		IEPCP Projects		ICT Plans		Δ
		N	%	N	%	
Instruments	Observation / data gathering grids	5	9,6	26	50,0	+40,4
	Questionnaires/inquiries	33	63,5	27	51,9	-11,5
	Reports	34	65,4	20	38,5	-26,9
Indicators	ICT competences acquisition	1	1,9	17	32,7	+30,8
	Satisfaction level	5	9,6	20	38,5	+28,8
	Rate of use of the equipment	7	13,5	21	40,4	+26,9
	Produced materials	14	26,9	21	40,4	+13,5
	Improvement of teaching/learning process; change of practices	10	19,2	16	30,8	+11,6
	Improvement of school management/administration	0	0,0	2	3,8	+3,8
	Engagement in the activities	6	11,5	1	1,9	-9,6

V. CONCLUDING REMARKS

The comparative analysis we carried out of the two documents of intentions seems to reveal an important evolution of the intentions of the schools ICT Teams and teachers regarding ICT resources in planning and developing learning opportunities.

The results of this analysis reflect a decrease of the concerns related to equipments, either in what regards acquisition and distribution to schools, and with their availability; likewise, there is a less significant expression of the needs in training teachers basic ICT competences, which has been replaced by an investment in training directed to applications and equipment directly oriented to the enhancement of the emancipation of students from the teacher in the organisation and development of learning experiences, such as blended learning systems or multimedia interactive boards.

In a parallel tendency, we may also point out, regarding ICT plans, inferior levels of references to the activation of ICT in learning activities and to creating and/or supplying pedagogical materials and resources; we think this may be due to the greater presence of ICT resources in learning

practices since the school year 2006/2007, as result of equipping the schools.

This study shows an enhancement of the way ICT resources have been increasingly activated in the process of opening the school to the community, as we may infer from the greater importance given to the schools websites, and the almost unaltered number of references to computer mediated communication with students' parents and other members of the community.

We, thus, believe it is possible to notice a change of focus in two axes: from the teacher to the student; from the optimization of ICT resources and competences to their actual mobilisation aiming at enhancing the students autonomy in learning processes and in adopting collaborative work methods.

Even though our analysis is based on the evolution of the formulation of plans of intentions, which should be complemented with an evaluation of the impacts that stem from the execution of the ICT plans, we may still emphasize that schools seem to have evolved so as to present more realistic and objective plans.

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