

# **CienTIC Project: The Use of Portuguese Primary Schools Websites as a Way to Improve the Teaching and Learning Process in Science**

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The CienTIC Project aims to enhance the work and activities as a consequence of the Internet National Programme for Primary Schools that were created by the Portuguese Ministry of Education on the schooling year of 2002/03 till June 2004. Within this programme the main aim was the creation of a website in each Portuguese primary school besides the improvement and use of Internet by pupils and teachers. The focus of the CienTIC project is to promote an effective use of the school's website and the use of Internet as a resource that promotes different ways to teach and learning science. The involvement of student teachers is considered important in order to ensure that future use of the Internet resources has more probability to be used in educational context mainly in a country with a lack of systematic use of digital resources.

## **Portuguese Internet National Programme for Primary Schools**

### **The context of Castelo Branco District**

The Portuguese Internet National Programme for Primary Schools was created by the Ministry of Science and Technology (Resolution of Council of Ministries n.º 110/2000, 22<sup>nd</sup> August) but its formal implementation was in 2002 which means the school year of 2002/2003. In 2002 the School of Education of Castelo Branco established a protocol with the Portuguese Ministry of Science and Technology in order to implement and support all the actions that will be needed for the educational use of Internet by pupils and teachers of the Primary Schools. Each primary school of the district of Castelo Branco received a computer connected to the Internet and it was created a Virtual Resources Centre and a Coordination Team to support the pupils and teachers. The Coordination Team was composed by two sub-teams: a technical team (technicians) and a pedagogical team (expert teachers on ICT and a primary teacher which main aim was to promote a close relationship between ICT and primary schools context: contents; methodology; didactics). To promote the local support was done a selection and further training for monitors who should go to every schools 4 times during the schooling year. A 120 hours training course was implemented in six different modules: Module 1 (12 hours): The working and functions of operating systems - Windows (hardware and software installation; computer configuration; network; FTP; trouble shooting); Module 2 (16 hours): Internet (diachronic analysis and development; services; ethics; search engines; gathering and printing information/data; pedagogical suggestions including the use of Internet); Module 3 (6 hours): Electronic mail (creation of an e-mail account; receive, send, reply, Cc, BCC; attachments; pedagogical including the use of e-mail); Module 4 (36 hours): FrontPage (design and implementation of a webpage; layout; frames; content development); Module 5 (36 hours): Design of a pedagogical prototype (application of the technical and skills; planning for further implementation within educational context; computer mediated communication; collaborative projects); Module 6

(14 hours): Theory and practice of the Primary curriculum (goals, contents and methodologies; analysis and critical reflection; planning of strategies and intervention in the classroom; practical use of Internet in the teaching and learning process). Those modules were organised in three main areas: hardware and software (modules 1, 2, 3, and 4); pedagogical use of ICT (module 5); focus on the use of ICT in the Primary schools (module 6). During the school year of 2003-2204 the number of members involved is: (1) Total number of primary schools of the district of Castelo Branco: 218; (2) Total number of primary teachers involved: 569; (3) Total number of classrooms: 487; (4) Total number of pupils: 7282.

### **The first outcomes at the primary schools of Castelo Branco**

All the primary schools have a website and just only few of them were not operational. It must be stressed that the major goal of the Internet Programme was well succeeded i.e. to put on-line every primary schools (website). The next challenge is to find a way to promote the use of the website in an educational context. A prior analysis of the organization and contents of the different websites besides some differences (template; ergonomic; sitemap) it is possible to find several similarities. Almost every websites show at the homepage a picture of the school or the school and the teacher and the pupils with music and with animation (e.g. toons). The subsections usually are related to: (1) "Our school" (Picture of the school; description of the school (number of teachers, pupils, classrooms...)); (2) "Who are we?" (Picture of the teacher and pictures of the class and sometimes picture of each pupil); (3) "Our place" (Pictures and descriptions about the place – village – where they live, number of inhabitants, local festivals, gastronomy, historical events, legends and sometimes with a map and a link to the website of the Local Administrative Authority); (4) "Our activities/work done" (activities done; compositions; illustrations; special days (Autumn; Spring...); visits...); (5) "Educational Project" (presentation of the project of the school: aims; contents; products); (6) "Learning with ICT" (a collection of websites most of them for entertainment and other of institutions); (7) "Questionnaire" (Website evaluation); (8) "Address" (phone; e-mail). Besides the contents already described there is a real lack in order to promote the use both of the Internet and the school website for teaching and learning activities. It may be affirmed that the website is like a placard in static perspective. It also seemed that interactivity is not a concern but just like an «exhibition» of activities and work done (some texts, draws and pictures. Even the links were not proposed in a coherent way because it was found a mixture with institutional sites, entertainment sites, and online games without a defined pedagogical purpose.

## **CienTIC: Science and ICT in Primary Schools**

### **Main reasons for the CienTIC Project**

Despite the goals and the success that were achieved with the Internet Programme what is possible to observe is just a random publication of work done with no relationship with the syllabus. Another weak aspect is related to the lack of connections and/or common projects among the schools as well as the use of Internet to enhance and/or complete information/data. Nevertheless those reflections must be seen as just a stage of the project which weakness will be solved according to the planning previously presented. According to the previous reflections was created the CienTIC Project. This project arises as a will of two senior lecturer of the School of Education of Castelo Branco that wants to combine their both expertise and academic qualification: ICT and Science. This project aims to produce teaching materials for Science by using the Internet as a resource as well as evolving other schools of Castelo Branco. This evolution should promote the creation of a virtual community on Science subjects. It is supposed to be an example that may be taken in account for the development of projects and actions on the other subjects.

### **Development of the CienTIC Project: Main Steps**

The first step aimed to collect data related to the ICT skills/literacy of the primary teachers of each school involved (n=218). A questionnaire was delivered that was divided in three sections: 1) General characterization of the sample: years of teaching; gender; access to ICT (personal computer; access to Internet from home; type of training); 2) Advantages and disadvantages of the use of Internet as a resource for the process of teaching and learning; 3) Difficulties and constraints of the use of Internet as a way to promote teaching and learning activities. There was a return of 88 questionnaires (40%) which data is going to be presented. Most of the primary teachers are female

(86%) which result is according to the national rate. Two positive results show that 95% of the teachers have their personal computer and almost 77% has a connection at home to the Internet. Those results are very satisfactory because they will mean that computers (ICT) are not a novelty and basic literacy is already acquired and Internet may be used as resource. Another data related to the training in ICT show that 68% attended at an ICT course. Besides the previous «enthusiastic» result the kind of training seemed to be heterogeneous and without an internal coherence. The training seemed to be a result of the «offer of a moment» and not an organized training course. Maybe a lack of a course oriented to the use of ICT in general and Internet in particular for the process of teaching and learning may be an obstacle. When the primary teachers were asked about the main advantages of the Internet the data gathered may be observed at the Figure 1:

Advantages of the Internet	Answers
Diversity of information	36
As a mean of communication	36
Access of information	24
Facilitates teaching and learning	20
Fastness	20
Availability of information	16
Facilities (comodidade)	16
Searching of information	12
Quality/Update	12
Social/work skills	4
Motivation	4
No answers	16

**Figure 1:** Main advantages of the use of Internet

Internet is seen as an opportunity to deal with a large amount of information both in diversity and access as well as an «ideal» mean for communication. Really, there is a consensus linking information and Internet but considering Internet as a mean of communication must be contextualized and understood among the teachers involved. The majority of the primary teachers teach in very small villages with bad access by road and isolation is the consequence of those contexts. The use of Internet may invert that situation by promoting communication with «outside». It also seemed that teachers assume that Internet may be used for teaching and learning because of the availability of information and the facility to gather update information as well. Nevertheless 18% did not answer that means that they were not sure about the real advantages of Internet maybe because of the lack of training on ICT and Internet.

Figure 2 shows the answers of the teachers about the main disadvantages of the use of Internet:

Disadvantages of the Internet	Answers
Quality of the information	60
Slowness	20
Large amount of publicity	12
Costs	8
Dependence of the Internet	8
Decrease of social relationship	4
No answers	16

**Figure 2:** Main disadvantages of the Internet

The main disadvantage presented is a contradiction of the advantages previously commented. The teachers may assume that Internet must be used carefully, i.e. teachers must check the source of the information and verify indicators of quality. Today is very easy to create a personal website therefore the information put there only depends on the owner of that website that can be a pupil or just a «curious» with scientific credentials. Teachers must be a referee and this disadvantage may be transformed as an advantage because it seems that teachers pay attention and are critical about the availability of information and its further use for teaching and learning. A negative aspect that must be discussed is about the slowness of the system because schools use a regular phone line a wide band or ASDL. The slowness of the download of the pages is very unsatisfactory because several studies

showed that the speed of downloading may be a crucial criterion for abandoning a website that may be very interesting. About 18% did not answer that could reflect the same group of teachers with a lack of ICT literacy. When teachers were asked about their difficulties about the use of the websites of the other primary schools the data gathered is presented in Figure 3:

Difficulties on the use of the primary schools' websites	Answers
Difficulties to access the information they want	20
Lack of training	20
Lack of computers	12
Lack of feedback	12
Lack of rigor	8
Difficulties on the connection to the Internet	4
Slowness	4
Lack of security	4
No answer	24

**Figure 3:** Main difficulties on the use of the primary schools' website

One curiosity may be related to decrease of answers this question had. One possible reason may due to the lack or minimal use of the websites for teaching and learning. Therefore the teachers were not able to present their opinions. Despite the general consensus about the availability and large amount of information the teachers referred that they felt difficulties to find the information they really wanted. This problem is related to the lack of information according to the specific needs of the primary education because most of information is presented without a close relationship with the contents. The other problems were related with the lack of training and the lack of computers because the majority of primary schools only have one computer (!). Another major problem is the lack of feedback because all the schools have e-mail but it seemed that it is not used which is a contradiction because a sense of isolation the teachers feel. A previous conclusion may reflect some kind of another contradiction: teachers already have their personal computer, the majority accesses the Internet at home but they seemed not to be comfortable using ICT with their pupils. This is the problem and the challenge for CienTIC Project in order to propose and search ways to promote and enhance the use of websites for teaching and learning science by involving student teachers and their supervisors by planning classes where Internet will be used as an educational resource.

### **Websites' Assessment**

The next step of the CienTIC project consisted on the assessment of the websites of the primary schools. The assessment aimed to investigate the way the websites were created especially if there what some kind of concerns related to the process of teaching and learning of science. A literature review was done related to allow a deep understanding about the criteria of quality: Beck (1997), Harris (1997), Jacobson & Cohen (1998), Anderson (2001) and Barker (2002). Besides the different proposals of grids that were collected and discussed it was necessary to contextualise the criteria for the assessment. The criteria were: quality of text; quality of audio; quality of images; level of interactivity; links; internal coherence/navigation; scientific proposals; teaching and learning activities (science). Unfortunately science was not mentioned as a concern for the primary teachers at the websites of their schools. The major concern was related the inclusion of images and photos about each schools, pupils and teachers. Another main concern was the characterisation of the village and its region: history, legends, gastronomy, monuments, and handcraft. Science was practically absent at the websites just only the report of a punctual event (O Dia da Árvore - «Tree's Day») with a small text and an illustration (draw and/or picture). The exception was related to the mother language (Portuguese) and Mathematics because at the primary level the curriculum gives a special concern. The lack of scientific issues and the consequent absence of science pedagogical approaches stressed the need of a special attention by involving student teachers to plan scientific activities with their pupils. Teaching and learning science can be more effective if websites may contain science contents by promoting the search of scientific knowledge, planning practical work, discussing results and share experiences.

### **Student Teachers' Training Course**

A training course to student teachers were implemented in order to assure and discuss with them the main goals of the CienTIC Project and to clarify the conceptions about the use of Internet and its relationship with the process of

teaching and learning of science. The training course had five topics: 1. Brief history about Internet; 2. Main services of Internet; 3. Internet in education (advantages; disadvantages; constraints); 4. Websites (analysis; grid of assessment); Science (searching scientific contents; lists of scientific websites; educational use(s) of Internet scientific data; discussion and proposal(s) for the inclusion of a scientific section at the websites. The training aimed to promote a close relationship between Internet and science i.e. the technological approach and the pedagogical approach. According to the syllabus of science for primary education and after several discussions that were done with the student teachers' supervisors several contents were selected for each year of schooling (4 years of schooling for primary education) according to two main topics: «Discovering the environment» and «Discovering materials and objects». By taken in account the logistic and the availability an access on Internet it was decided to involve only the pupils of the 4<sup>th</sup> year of schooling. In consequence the contents that were selected will be:

a) «Discovering the environment»: Physical elements of the environment (solidification, condensation, and evaporation; practical activities related to the previous phenomena); Astronomy (Earth, Moon, and Solar System).

b) «Discovering materials and objects»: Practical activities about the effects of temperature and water; Practical activities about the air (presence of oxygen; combustion; air pressure); Practical activities with electricity (batteries, lamps, wires, electric circuits).

Several sites were already selected as a consequence of work sessions with the student teachers and their supervisors. Some of the sites that will be used are:

<http://eastnet.educ.ecu.edu>

<http://ibercajalav.net/laboratorii.php>

<http://project.bio.iastate.edu/Courses/BIOL202/Assignments/Globalwarming.htm>

<http://www-VRL.umich.edu>

### **CienTIC Project and the Expected Main Outcomes (Note: Still work-in-progress)**

At the present moment the next step will be the use of Internet with the pupils. The CienTIC Project will collect the data of the last step. However there are several expectations about the results. There is certainly sure that the motivation will be high but because of the novelty we will face the motivation in a «quite way». Another expectation will be related to the openness of the activities because the natural curiosity of the pupils will demand different answers from the student teachers. There will be made new connections among the contents involved and pupils will be the centre of the process of teaching and learning. Another expectation will be related to the practical way of learning science i.e. the use of scientific knowledge in everyday life. The connection with theory and practice will be achieved and scientific contents will have real sense for the pupils. Another and maybe the most positive aspect may be the possibility to show that the use of Internet may create different approaches of teaching and learning that may be used in every subject and field of knowledge.

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