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The Web@classroom project: portables computers and wireless technology in the classroom

Ramos, Jose Luis & Carvalho, Jose Luis
Universidade de Évora, Évora, Portugal
jlramos@uevora.pt
jlc@uevora.pt

Blasquez, F., Luengo, R. e Casas, G.L
Instituto de Ciencias de la Educacion, Badajoz, España
blasento@unex.es
rluengo@unex.es
mjimeneza06@enfermundi.com

Younie, S. & Bryn, H.
Mirandanet, Institute of Education, London University
syounie@dmu.ac.uk
Bryn.Holmes@inishnet.ie

Savage, T. Brendan, T. & Arnedillo, I.S.
Trinity College, Dublin University – Ireland
Tim.Savage@cs.tcd.ie
Brendan.Tangney@cs.tcd.ie
Macu.Arnedillo@cs.tcd.ie

Abstract

The study was carried out in four European schools (pupils age 9 to13 years old) within four countries (Portugal, Spain, UK and Ireland). The adopted methodology was based in action-research procedures and it included multiple methods and techniques: systematic classroom observation of teachers and pupil work and learning activities; documentary evidence (teachers working sheets, schemes of work) interviews (with selected pupils); questionnaires to all pupils and staff at intervals. This methodology implied the construction and testing of data collection instruments. Data was submitted to a qualitative and quantitative analysis. A summary of the findings is presented in this text.

Keywords
Webclassroom, pedagogical innovation, Internet wireless

1. Introduction

The Web@Classroom Project, an European and SOCRATES/MINERVA project, was the framework in which this research has taken place.

This project was action-research based involving four schools in four different countries (Portugal, Spain, Ireland and the United Kingdom) and more over than 200 primary school students.

Its main aims were to promote pedagogical innovation and change in the permanently Internet-connected classroom, and investigating the impact of educational ICT uses on teaching and learning outcomes.

The web@classroom was also a tentative to answer to some constraints on ICT integration in the classroom, pointed by scientific research literature namely the sporadic and unsystematic use of technology in the classroom and the lack of teacher training and support on using ICT in curricular subject (Threadgold, J. et. al., 2001).

Recent advances in computer technology means that mobile computing (laptops) and wireless networking are now a real and exciting possibility for the classroom. Having wireless laptops for some or all of the students it can open new ways of learning and teaching, some of which we have explored in this project.

Previously computers in the class were restricted to large boxes on benches and this had a great impact on how they were used. For example students would normally be sat in front of a screen, often isolated from their classmates.

Using laptops allow that the computer, and all of its benefits, be included in the classroom activities. Students can work in groups, the whole class, or individually with the technology, and without the restrictions of place. They can prepare assignments, follow presentations, and demonstrate their work to their peers or the class with a minimum of effort. The technology becomes another learning tool, not only a tool to be learnt.

With Wireless Technology (network access without the wires) it is possible to get the maximum benefit from computers in education. The network allows access to the information resources of the Internet, the ability to store work centrally within the school, and allows students to access shared resources such as CD-ROMs. Previously this access would have to be through a physical connection (a wire) but now using simple wireless technology these resources can be accessed anywhere in the school without cables.

Combining Internet wireless access with laptop computers completes the picture. Students are no longer tied to a single place to benefit from the technology and the benefits now include: flexibility; anytime, anywhere use of technology; in-class group working with access to resources on the Internet or school network; technology can be taken home if required; more efficient integration of technology into the learning environment.

As mentioned, introducing this technology into the school within the Web@Classroom project also implied training teachers for their involvement in some practical and research tasks, which had a formative added value for participating teachers (teacher training isn't just about ICT skills - it's about ensuring that teachers know how to make

best use of technology as part of their everyday teaching. It's also about ensuring that teachers know why, when and for what educational purposes they use ICT).

Considering the eventual results generalization to other schools and contexts it was also expected to underline the action-research collaborative work model as a basis for overcoming difficulties in ICT integration into the Curriculum; it was also expected the acquisition of knowledge and understanding of the innovation processes undertaken by teachers and pupils in a permanently connected classroom to the Internet. This knowledge and understanding should be very relevant in educational political decision making processes at European, national and regional level. Many of our institutions have decided to go through programmes and initiatives trying to facilitate the ICT integration into the Curriculum. But the most of the obtained results seems limited and far from the general expectations.

In this project we have explored new ways of pedagogical work, a new pedagogy for a new classroom culture: a classroom where the computer and the internet are always present and available, that can be used when teachers and students decide it can be used; a classroom where the teacher and pupils have a permanently window open to the world and where each classroom is part of a European collaborative work environment, a vital condition for developing European citizenship and the feelings of belonging to the European Union.

2. Methods

The adopted methodology was action-research based and it included multiple methods and techniques: systematic classroom observation of teachers and pupil work and learning activities; documentary evidence (teachers working sheets, schemes of work, interviews; questionnaires to all pupils and staff at intervals. This methodology implied the construction and testing of data collection instruments. Data was submitted to a qualitative and quantitative analysis.

In particular this research developed a web-based evaluation artefact (Arnedillo, S. & Tangney, B. (2002) that enables all the participants to partake in the processes of data input, collection, collation, categorization, display and most importantly analysis and conclusion drawing, elitist processes far too banned for evaluatees. The front end or user interface is a compilation of html pages arranged in the form of a website where all the information input is accessible to every single participant. The back end is a mySQL database specifically designed bearing in mind the underlying evaluation questions, however allowing for great flexibility so as to allow each stakeholder to pursue multiple inquiry avenues when retrieving data. The website and database are connected through PHP in order to enable participants to enter data as well as query the database. This methodology presented has indeed promoted Double Loop-Learning and collective knowledge construction as the participants are engaged in ICT enhanced questioning, information gathering, and reflection that enables them to question existing practice (Argyris & Schön, cit. by Arnedillo, S. & Tangney, B., 2002) as well as the primary values in learning organizations: authority, privacy and territoriality (Elliott, cit. by (Arnedillo, S. & Tangney, B., 2002).

3. Instrumentation

Above it is presented a synthesis of the studied constructs/variables and respective instruments used in this investigation, by country.

	University of Évora PT	Dublin University Trinity College IR	University of Extremadura SP	MirandaNet UK
Research constructs/ Instruments				
Pedagogical Practices	A, B, D,E	A,B,D,E,L	A,B,G,H,I,K,	A, B, D,F,D,E,G
Impact in the Curriculum	B, G, J, D,E	A,B, E,G, H,J,	A,B,E,G,H,J	H,J,G
Learning Outcomes	B, G, H,F	J,K,L,H	E,G,H,I,J	H,G,J,
Autonomous Learning Teachers and Family Involvement	C,I,G	C		C

A. ICT Practices Survey for Teachers (Initial and Final); **B**.ICT Practices Survey for Pupils (Initial and Final); **C**. Using Computer at Home; **D**. Activities Plan ; **E**. Activities Register; **F**. Observation sheets **G**. Interviews teacher; **H**. Interviews Pupils; **I**. Parents Survey; **J**. Pupils Works and Materials (content from the messages); **K**. Research notes; **L**. Video clips

4. Summary of Findings

In this text it is presented a summary based on the results and findings obtained from instruments, both quantitative and qualitative, above mentioned for all country. Nevertheless a more precise analysis will be done from data comparing data within and between countries.

Data from pupils' questionnaires show that pupils involved in the web@classroom project have gained ICT basic competences (of course, those who didn't yet had them) and feel more comfortable on using computers; in their answers, pupils reported a more regular and systematic access to computers and Internet (more time in the school, more time in their houses), a better parental participation in school life and more time to support schoolwork, better relationship between the family, pupils and the school, through technologies, and a greater diversity on curricular uses of ICT (as examples, pupils reported activities like writing, calculation, seeking information in encyclopedias and on the Internet, in almost subject areas; pupils also reported they felt more motivated for learning.

Data from teachers' questionnaires show that teachers reported the positive development of their skills, like the acquisition of research, communication and interaction skills by pupils; teachers reported the development of writing abilities and

more autonomy in using computers and Internet; working in pairs and small group of pupils were reported by teachers as the most usual mode of learning with ICT within the classroom; additional motivation was observed in almost all pupils and particularly with educational special needs pupils'. These pupils had used computers for writing and drawing activities.

Data from questionnaires "Computer at Home" show that computer was used at home by pupils and also by parents and relatives; pupils said they usually receive support from the parents and relatives. Data also show the majority of the pupils worked, during the project, in average, 1 or 2 hours per week. The way as they use the computer was for writing and drawing activities, but also for playing and to seek information in encyclopedias and, in lesser number, to search the Internet.

Data from activities' registration sheet show that computers were used in almost all the curricular areas, with preponderance for writing activities, researching and sharing information, (Internet and encyclopedias) presentations, using e-mail, image, etc.

Data collected by instruments are consistent with the idea that the permanently connected classroom had impact within the curriculum, in two ways: they show that technology had been used as a transversal area, along all disciplines, allowing teachers and pupils using it in all subject areas; another way is that data also show a more opened permanently connected classroom allows teachers and pupils to open the curriculum to others issues than the conventional ones. New issues are introduced as the collaborative activities are developed and some internationalization is coming to the classroom. The connected classroom also had impact on pupils learning, especially in the acquisition and development of research and communication skills.

In a short summary the results show that this project had a positive impact within the involved schools.

Some notes taken from the research reports show that the majority of teachers could see the positive pedagogical outcomes of integrating ICT into the curriculum. The school ethos of sharing ICT skills and providing training for teachers, as well as the use of laptops at home, is giving teachers the foundation to incorporate ICT across the curriculum; teachers and pupils report that the impact of ICT has been substantial on pupil attitudes to learning: One teacher said "the motivation and the way the children concentrate is the biggest value for me." The Head teacher said ICT had positively affected all the children's learning. Teachers said that children with special educational needs could produce high quality outcomes using ICT, which raised the pupils' self esteem and raised the profile of learning and achievement.

In all schools, once teachers possessed ICT skills, the production and storage of resources was significantly aided by the technology. "We do our planning on the laptops. We also do the end of year reports on the computers and we tend to keep all the schools records on the computers and do the analysis. I find it easier to keep things on the computer; it's easier to find it and to make changes." (UK teacher)

Within this project, teachers have access to formal and informal support networks for providing ICT skills. These networks included training courses at school, colleagues, family and friends. Access to the technology and a network of support has emerged as critical factors supporting change. One teacher said "The ICT coordinator has set up some ICT training sessions for those teachers and teaching assistants who don't feel comfortable using the laptops, those are building up people's skills and confidence. " The head teacher explained "Its part of being part of the school, wanting to show the

children that we're all learners. I don't mind going to ask someone if I can't do something on a laptop. We try to promote that openness so that they don't feel threatened when they don't know, then they're more likely to ask. Again, through the laptops, ICT has helped us to become a true learning organization."

The availability of laptops has enabled teachers to plan lessons and curriculum activities that not only integrated ICT into the classroom, but also enhanced the pupils' learning by focusing on the learning outcomes. Teachers used a variety of software such as word processing, presentations, spreadsheets and specialist software. One very enthusiastic teacher explained "the laptops can enable the teacher to focus on the learning objectives. I think for example of a newspaper article. I produced a template in a desktop publisher. The children could get straight into typing the newspaper article. I was able to focus more on writing in the style of a newspaper reporter". Another teacher enthused "We use a lot of PowerPoint. The children really like writing things in PowerPoint, animating and putting sounds on; they love doing that. I teach them to do it like a book they do a contents page with slides that link to the different contents. We do a lot of word processing work writing stories and editing it. We do spreadsheet work, teaching them how to do graphs, using the wizard to produce the graphs and then we put callouts on to interpret the graphs. I find this useful; because when pupils do a pencil and paper graph, it takes them forever to get it laid out right and they've had no time to interpret it. With Excel they put the data in and within a second they have a graph and they are starting to interpret it, once they have the ICT skills of course."

The collaborative web@classroom project with partner schools in Europe facilitated and encouraged the use of the Internet for curriculum work.

Another emergent issue is related with learning in the community and digital divide. Access to laptops was provided at school and at home is raising the profile of learning in the community (Leask, M., Ramos, J. & Younie, S. 2001; Younie, S., et. al, 2002).

In the UK, for example, but also in Portugal, Spain and Ireland, the laptop initiative has facilitated parents learning about ICT, and encouraged parents' ICT skills and confidence, raising their self esteem. Parents and grandparents were undertaking ICT courses provided through adult education courses run at the school and encouraged to build on them by continuing at higher education centers in the area. Certificates to recognize their achievements were presented in the school assembly. The head teacher explained "once the laptops started to go home, the parents became interested in the new technology. They didn't feel threatened by it because it was in their own home. They were coming to school saying 'my year 4 child knows more than me' etc. We could tell them about the ICT courses for adults and they would come along." The overall effect was to raise the profile of learning in the community and to provide a network of support for pupils and parents learning together. The evidence shows that 61% of pupils borrowing a laptop received help with their work from family or friends. 46 out of 47 pupils borrowing laptops reported that family and friends also used the laptop. ICT has been a catalyst for positive change in parent and pupil attitudes to school, schoolwork and to homework.

News perspectives have emerged from this and other research work namely a tentative of building the communal constructivism theory (Leask, M. et.al., 2001) evolving several researchers from different countries and ICT research centers in Europe.

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