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A Case Study of ICT and School Improvement
Escola EB 2/3 de Santa Clara
Évora, Portugal

José Luís Pires Ramos (Co-ordinator)

Manuela Bacelar do Carmo

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1. SUMMARY

The School Library hall was literally crowded with people: students, many students, teachers and also many parents. There was a great bustle: video cameras, microphones, video conferencing equipment, technicians and a confusion of wires set the scene of that morning in June of the year two thousand. At a table, decorated with flowers and which the cameras insisted on filming, was Guilherme, dressed in his best suit. Always backed by the teachers, and feeling very sure of himself, Guilherme was ready to open the first session of the Youth Virtual Parliament.

The session started with a speech by the Project Co-ordinator and then one by the Minister of Education. After that, it was his turn. The floor is yours, Deputy Guilherme Silva, of Escola EB2/3 of Santa Clara in Évora. Welcome to this Assembly . Guilherme carefully pulled the microphone a little closer and started his speech. I am very honoured to address you on behalf of my School ... I am going to speak about quality in teaching...

Diário do Investigador, Évora, Escola Santa Clara, on 6 June at the session of the project "O Parlamento das Crianças e dos Jovens: a Escola e a Assembleia 2000 (The Children and Youths Parliament: School and the 2000 Assembly).

The reform which is one of the main pillars of this study is called Flexible Curriculum Management (FCM) and its aims are to introduce a gradual change in the organisation, orientation and management of basic education schools so as to create a more human, creative and intelligent school aimed at the complete development of its students; to create the conditions for more and better learning by the students from the perspective of developing their skills when they leave the Basic Education; the vocational development of teaching staff and of their decision-making skills in key curricular areas, adopting whenever possible collegial work structures among teachers; a greater involvement of the educational community in the joint development of educational and cultural projects aimed at a better quality and pertinence of learning. The main innovation of FCM is to introduce new non-disciplinary curricular areas: Guided Study, Interdisciplinary Project and Education for Citizenship.

The school joined the experimental phase of the Flexible Curriculum Management in the 97/98 school year and initially only two 5th-grade classes participated. In the next school year participation was extended to all the 5th-grade classes. By 99/2000, the entire 2nd cycle (5th and 6th grades) was involved and in the 2000/2001 school year all the 7th-grade classes are involved.

The impacts on the students can mainly be felt in a reduction in the weekly number of hours, a better social climate in the classroom, a greater diversity in the learning activities in the school and the possibility of acquiring study and self-learning techniques. According to the teachers, it also seems like the reform is helping students with less learning capacity, especially as far as Guided Study is concerned, while students with greater learning capacity are faced with new opportunities to develop their skills, especially in the Project Area.

To a certain extent, the students benefit from the reform owing to the fact that it focuses on them, appealing to their active (and responsible) participation and that it creates a situation which favours the introduction of new methodologies, due to the new organisation of time, space and resources.

ICT are viewed and used by the teachers as an important personal work instrument, an important source of

information, especially the Internet, and an additional motivation factor in relation to the participation of the students in the teaching and learning processes. ICT are used by teachers in their work with the students, particularly in the acquisition and development of new cognitive, social and relational skills, and as a means of improving the quality of the teaching materials produced.

2. THE PAST

This school, which was founded in 1979, initiated ICT integration process in 1986 on the initiative of 4 teachers who started a computer club (which is still operational).

The involvement of this school in innovative contexts/projects, such as The Cultural School and the MINERVA Project (1998/99), which led to the creation of a new dynamic in the activities carried out, particulary in the case of the MINERVA Project, was decisived for ICT.

The team responsible for the implementation of ICT in this setting was composed of a small group of teachers that remained more or less stable.

In the 1996/97 school year, a multimedia computer with free ISDN connection to the Internet was installed in the School Library by the National Programme Internet in School (under the responsibility of the Ministry of Science and Technology) and a second connection to the Internet via a Telepac account was also installed. During this year (and in the following years) the school carried out various projects of the *Ciência Viva* (Live Science) Project (Ministry of Science and Technology). In the 1997/00 triennial, it developed a project that applied ICT in Education within the scope of the Nónio Programme (under the responsibility of the Ministry of Education) and in the year 2000 it participated in the initiative Hannover Portugal , written by its students. It also participated in an event of wide-reaching importance as a result of a protocol between the Ministry of Education and Parliament, with the support of UARTE (under the Ministry of Science and Technology) called School and the 2000 Parliament . For the first time the voices of the members of this school community were represented in Parliament by a cyber-deputy, a student of this school, via a video conference.

The main obstacles overcome by the school were directly concerned with the human and material resources although the current situation in terms of the school s development in ICT is still far from what is considered ideal by both the teachers and the director. As far as human resources are concerned, the school did everything in its power to ensure that the teachers had access to continuing training in both ICT and other areas. It also tried to guarantee the collaboration of teachers with an incomplete or zero timetable. One of the library staff members with appropriate training ensured the maintenance of the equipment and trainees from technical and vocational courses were sought to assist the students. They were responsible for providing teachers and students with support and follow-up in the computer rooms as well as in the library. As far as financial resources are concerned, the school frequently drew up and submitted for approval proposals and tenders to projects and programmes in order to obtain the necessary funds to develop its activities.

3. THE PRESENT

This is a public school of the 2nd and 3rd Cycles of the Basic Education with students aged between 10 and 16. It is an urban school in the centre of an average-sized city (approximately 50,000 inhabitants) situated inland in a predominantly rural region of Portugal classified by UNESCO as a world heritage. The school is located inside the medieval walls in the historical centre of the city in a building that was formerly the old Santa Clara Convent. The architecture of the building limits its use for educational purposes   it has three floors (which are accessed by several flights of stairs) with inner cloisters and most of the rooms were adapted to form classrooms. There are 26 classrooms, 10 of which are used exclusively for science and art lessons. The school also has a staff room, 2 gynasiums, a library/mediatec, a common room, 8 offices, a computer centre and an

educational guidance centre. It accepts children and youths living in the city as well as in the surrounding neighbourhoods and those from private social solidarity institutions. Most of the parents are employed in the services sector and the socio-economic level of the students is predominantly middle-class.

The school has 605 students (289 boys and 316 girls) and 79 teachers. Only a small percentage of students change school before the end of the year (approximately 3.8%) and the teaching body remains stable throughout the year. The school calendar consists of 180 school days. The week is made up of 5 school days and school hours are from 8h30 a.m. to 5h35 p.m., with a maximum number of 8 hours of teaching a day.

The school is organised administratively in accordance with the new management model and is currently the main school of *Agrupamento no. 3* in Évora. It is ruled by the Executive Committee (Steering Committee), the Board and the School Group Assembly, which is still in the installation phase. From the teaching organisation s point of view, the school is divided into Departments, Disciplinary Groups and Class Councils. There is also an Educational Support Nucleus composed of three teachers (1 from the 2nd cycle and 2 from the 3rd cycle) who are dependent on the Educational Support Co-ordination Team. The school budget is granted by the State s General Budget. Another source of financial resources comes from the funding of projects to which the school regularly applies. Approximately 2% of the school s budget is allocated to ICT.

It should be stressed that this curricular reform is being progressively extended to more schools in the country and to other schooling grades.

ICT Infrastructure

The total number of computers in the school used by students is 22. There are other computers that are used exclusively by teachers (3), the director (1) and the school administration (6). The school continues to have two Internet connections and currently has 8 computers connected to the Internet, all of them available to the students. The computers are located in various places in the school: Computer Centre, Staff room, Science Laboratory, Physics and Chemistry Laboratory, Library, Executive Committee, Secretary, SASe, and the Educational Support Centre. The students/computer ratio is 27.5 students per computer, only considering the computers used by the students.

The most important structure as far as the development of ICT is concerned is the Computer Centre which has several computers connected to the Internet, an educational software library, printers, etc. freely available to both teachers and students. The Computer Centre counts upon the dedicated collaboration of several teachers who are experienced in the educational use of ICT and have solid teaching qualifications.

Effectiveness

According to the board, the reform is effective if we measure the positive results obtained up until the present. The reduction in failure rates is identified as the surest indicator of this effectiveness. Despite this, however, the board feels that this improvement still needs to be consolidated and carefully examined. This could imply greater investment in teacher training, in the acquisition of resources and in the generalisation of their access. An important aspect that should be taken into account is the clear shift in relation to the more traditional styles of teaching teaching is now more focused on the student, more open to new forms of learning and teaching, new educational work methods . An improvement in the social climate in the classroom is clear and objective and is the result of a less formal and rigid relationship between teachers and students and as an effect of the flexibility in the management of time, space and forms of learning . Today there is clearly a greater diversity of teaching and learning strategies and activities and this can only mean a shift in teaching practices due to a context that constantly demands interdisciplinarity, the sharing and communication of the products and results of the work carried out and, with a more innovative character, the provision of more individualised assistance to students in the form of Guided Study. The road opened up by the reform represents an invitation to the imagination and creativity of teachers and students in this school, in spite of all the difficulties. However, this is not easy to measure in terms of effectiveness, especially when teachers do not have time to do all that they would like. From the teachers point of view, the reform is especially effective with students who would normally have more learning difficulties. Higher ability students also benefit because they have more

opportunities to learn and to develop their skills due to the ease with which it is possible to define and ask for new tasks that are more suited to their capacities. We don t all have to do the same thing at the same time . Flexibility seems to be the cornerstone of this reform   Flexible Curriculum Management . The changes introduced allow for greater flexibility in terms of work methods, strategies, space management, learning time, opportunities, etc.

Nevertheless, the introduction of changes of this dimension gives rise to some difficulties which to a certain extent may contribute to a greater or lesser effectiveness of the reform: a greater overload of work for teachers (94% of the teachers in the school are involved in the reform); difficulties of some of the interveners in adapting to new situations (for example, the recent introduction of 90-minute classes); difficulties in adapting to partnership work among teachers (in areas where two teachers are present in the classroom simultaneously, as is the case in Guided Study and the Project Area); the new situations created by the reform imply a new work culture based on constant dialogue and negotiation, open-mindedness to face the sharing of responsibilities in the resolution of practical everyday problems.

Table   Characteristics of the school

Name of the School	E.B. 2,3 de Santa Clara
Address	R. de Santa Clara, nº 2 7000-517 Évora
Telephone	266 707329
Fax	Fax: 266 743303
e-mail	stclara@mail.telepac.pt
web	http://www.minerva.uevora.pt/stclara/
Contact person	Antónia Ilhéu
Total number of teachers	79
Number of teachers involved in the reform	75
Total number of students	605
Number of students involved in the reform	451
ICT infrastructure	
● *total number of computers*	32 (8 connected to the Internet)
● *rooms with ICT*	6
● *access to the Internet*	2

4. MAIN HYPOTHESES

Dissemination patterns

We are faced with a centralised innovation model in which almost all decisions are made outside the school and the adoption of the decisions taken is made via external imposition , as far as the users are concerned. According to available data, there are teachers who are very enthusiastic, others who are moderately enthusiastic and others still who are more sceptical or even resistant; the last are in general teachers with the traditional type of teaching styles.

The data further refers that the reform brought with it new demands and new problems (the need for resources, teacher training, management of work spaces and times); new challenges for teachers with the acquisition and development of new skills and capacities (research, selection, organisation and criticism of information);

innovative capacity in the production of teaching materials for the learning and teaching processes; capacity to confront the new sources of information and the capacity to adopt new roles and functions in the school.

The advantages most referred by the teachers are above all those related to the possibility of carrying out teaching activities in partnerships (to counteract the traditional isolation of the teacher); the reform makes it easier to get into and adopt innovations, this term being understood to be new forms of educational work , and the recourse to more active and participative methodologies.

The teachers feel that the curricular areas introduced are innovative. The Education for Citizenship area is considered necessary for the complete education of the student, the Assisted Study area is especially important in the first years (5th and 6th grades) and the Project Area is vital, at all grades.

However, they stress that this school is able to see the reform in a positive light because it is a school where a project culture is breathed; that is to say that for quite some time now projects have been developed in the most varied sectors, consolidating interdisciplinarity habits among the teachers.

The main difficulties are related to the increase in the work load for some teachers (the system does not foresee compensation mechanisms); difficulties in evaluating the learning as some teachers feel that the new approaches and the new curricular experiences should correspond to a new form of evaluation; for some teachers the reform proposes innovations more in form than in content; the programmes are practically the same, what is abandoned is the system of organising the times and manners of learning which, despite its vitualities, does not seem to completely satisfy some of the teachers.

According to the teachers in this school, the innovative use of the Information and Communication Technologies in the reform is successfully managed, although in a rather limited manner, by a group of teachers and predominantly in the Project Area.

For the vast majority of the teachers, ICT are mainly used from a computer perspective as a work instrument, with greater predominance outside the classroom (Computer Centre) and with less frequency in the classroom. This use is still far from having a systematic nature and is characterised by the use of the word processor (very often) and the Internet and email less frequently.

The small group of teachers who dynamise and offer the other teachers and the students support, the support of the school s management and the infrastructure (Computer Centre), play a vital role as far as the role of ICT in the reform is concerned and the manner in which the new technologies are made known to and adopted by other members of the school.

As far as the reform is concerned, the impact of ICT in the teaching and learning processes essentially results from the possibility of using the computer as a work instrument and as a source of information, as well as, less frequently, a means of communication. The teacher s willingness, availability and competence are vital factors to the success of the use of ICT in the reform.

Upgrading and involvement of the teaching staff

As to the upgrading and involvement of the teaching staff within the scope of the reform, the school, through the Ministry of Education, held training actions for the teachers involved in Flexible Curriculum Management. The offer of training was carried out via the teacher training centres and has contributed to the vocational upgrading of the teaching staff. This initiative, however, appears to be insufficient in terms of the content and topics of the actions and in terms of the number of teachers involved in the actions.

Also identified were some measures that could, according to the teachers, increase the effectiveness of the reform: a) increasing and improving the information and the training of teachers in topics related to the quality of the teacher s intervention within the scope of the FCM (reform), namely in evaluating learning, project methodology, multicultural education, education for citizenship, ICT and their curricular *integration*, and not merely their curricular use; b) providing human and material resources for the reform s demands; c) clarifying the objectives of the reform to teachers, students, parents and the educational community, thereby stimulating greater involvement and the participation of all.

As far as upgrading teachers in ICT is concerned, the vast majority of the teachers use ICT in the vocational activity, although in a rather limited manner. Between 80 and 90% of these teachers use them to write work documents, produce teaching materials, draw up small presentations and as a source of information (Internet) and means of communication (email), although the use of ICT as a means of communication is used less frequently (approximately 98% of the teachers interviewed stated that they do not involve their students in

learning activities with students in other classes or schools).

It should be noted that, as a result of the survey carried out, 84% of the teachers feel very comfortable or comfortable writing an article and almost 50% of the teachers use the computer at home to prepare their lessons, while 65% of the teachers do not send email messages and 69% do simply not receive messages. This data shows that the main use that teachers make of the computer is to prepare lessons and to produce supporting material, an aspect in which the teachers feel very comfortable in these tasks.

In this sense it should not be strange that in many cases ICT serve mainly as the teachers personal work instruments, shaped within the scope of projects, initiatives and activities outside the classroom. This fact shows that in essence ICT are an important work instrument within the scope of the teaching staff but that they are still a far way from entering the classroom. The target is that students have access to the tools of the information society in a systematic and generalised manner and in the context of their **ethos**: the classroom.

The training strategies of teachers are resolved by attending courses or actions supported by the FOCO-Prodep (a programme of continuing training for teachers backed by the Social European Fund, now incorporated in the new support communitarian framework programme (Q. C. III) through the Programme for the Development of Education in Portugal). Despite everything, the demand and need for training is clearly greater than the offer, reason why many teachers resort to self-training and self-study in order to overcome the difficulties in this area.

In this school, the support offered by the colleagues who form part of the small group of teachers who are more dedicated to ICT in the school has played a vital role. From the teachers point of view, the offer of training is insufficient, even due to the simple fact that computer programmes evolve very rapidly. Self-training and self-learning therefore become essential updating strategies.

The school also has a priviledged relationship with the local university which tries to contribute to the development of the school in this area through training programmes and the follow-up of projects. In collaboration with the Nónio XXI Century Programme Competence Centre of the University of Évora, many of the teachers of this school have attended training courses and actions in this area. The collaboration in educational projects in the area of ICT has also been a positive contribution, making possible new learning opportunities for teachers and students.

The role of leadership

The characteristics of the reform under discussion condition the leadership phenomenon and its potential role. Although the reform was decided on and planned outside the school, the school s management should be involved in it and should take the role of leadership as a result of its position of power inside the school. The implementation decisions related to the adjustment of the reform to the reality of each school to a large extent depend on the school s management: definition of priorities, management of human and material resources, space, equipment, etc..

Nevertheless, according to the board there is no leadership as such since the reform is taken on by the whole school. As the school is run by a collegial body, the responsibility is shared by all.

As far as the leadership within the framework of the development of ICT in school is concerned, a group of teachers regularly carry out a multiple set of roles that take the form of a phenomenon of shared leadership. This group provides teachers and students with technical and pedagogical assistance, controls the formulation of proposals and projects in this area (from the conception phase, writing up of the proposal, execution of the project and evaluation) and maintains a collaboration with the school s management.

In the school this group is known as ICT group ; it has a broad experience, acquired in the various projects in which the school has been involved, from the Minerva Project to the more up-tp-date Nónio Programme. Although the results are positive, they are far from satisfying these teachers who would like the issue of ICT in school to receive more attention. The number of hours they spend helping other teachers and students exceeds the hours they are assigned in their timetable.

When asked about this, they replied that they do not feel like leaders, they merely have more experience and knowledge in this field. They added that despite this they need more training in order to be able to improve their response capacity.

They stressed however that they have the unconditional support of the school management and that only with

this support was it and is it possible to do little but well of what is done in this field.

Nevertheless, according to this group of teachers, the small decisive step of using ICT to support the teaching and learning processes in the classroom seems to be much more difficult to achieve and it is also very difficult to make their use widespread. And the reasons are well known: the school lacks resources (human, material and financial) and teacher training, including the younger or more recent teachers in the school. If we add to this picture the natural resistance of some of the teachers, difficulties in the organisation of space (large classrooms and small classrooms), we are faced with a scenario that can only be changed with a strong strategic commitment to this area.

ICT-Reform connections

As far as one of the main problems of this research is concerned, there seems to be a slight connection between the reform and ICT. This connection seems to exist in both directions. On the one hand, FCM (reform) benefits from the existence and use of ICT, namely through the work carried out in the Computer Centre which acts as a logistic and human support. The teachers who provide support to this centre end up playing the role of dynamists of the reform itself. This support is essentially provided in the Interdisciplinary Project area and occasionally in the Guided Study. ICT act more like a personal work tool, a source of information and an instrument that supports the development of the students research and communication skills.

The Interdisciplinary Project area seems to be the area of the reform where ICT are more requested and used by the students.

Examples of activities are the access to information via the Internet, the writing and presentation of work done by the students, groupwork (controlled work and free work) and preparation of teaching materials by the teachers.

These initiatives are also incorporated in the Flexible Curriculum Management reform which foresees that the non-disciplinary curricular areas should be developed in articulation between themselves and the disciplinary areas, including a student work component with the Information and Communication Technologies .

Nevertheless, everything depends on the conditions in the schools and the options of the teachers.

Academic rigour

In a context of compulsory schooling, school results naturally take on a very specific importance. In Portugal, tens of thousands of students leave school before completing the compulsory basic schooling. This issue is a national concern and has led to several initiatives and programmes backed by the Portuguese Government (PIPS and alternative curricula, among others). In this context, evaluation does not have the sense of the traditional summative evaluaton, of classifying students for ultimate selection, but rather a clearly formative sense and objective. This is a central aspect in assessing academic rigour as a result of the reform.

Evaluation is normally carried out in the form of tests, exercises and work done by the students, either individually or in group. Participation in class and diligence are also taken into account.

It should be stressed that some teachers have mentioned difficulties in the evaluation area of the reform as it is more focused on processes than on products and, conversely, the traditional system of teaching is more directed towards products and contents.

In the following table, relative to the 1999/2000 school year, we can see the number of students who passed, those who were kept back and the percentage of students kept back.

Table 1   Students who passed, students who were kept back and percentage of students kept back in the 1999/2000 school year

Academic Year	Total number of students who passed	Number of students kept back	Percentage of students kept back
5th grade	172	28	16
6th grade	168	15	9
7th grade	81	23	28

8th grade	81	12	15
9th grade	78	9	12

According to the school management, one of the revealing indicators is the drop in the number of failures in the grades covered by the reform, although it is difficult to establish a cause and effect relationship between the reform and this data.

To give an example, the results of students from the school in the subjects of Mathematics and the Portuguese Language in two representative grades were as follows:

Table 2 - Students with positive results in the first term of the 2000/2001 school year

Grades	Situation	Portuguese language	Mathematics
6th grade	Reform	80 %	73 %
9th grade	No reform	78 %	54 %

On the other hand, a wide group of factors involved in the reform can easily be identified in the school which makes the association between one factor, isolated from the rest, and the results obtained difficult. If we add to this a context of change we have very complex scenario to evaluate this aspect of the problem.

In this sense, and until more profound studies can be carried out on this aspect, very little is known on the impacts of the reform and the educational use of ICT and on the academic rigour.

Equity

Management and teachers are deeply concerned with the social aspects intrinsically involved in the role of the school and in the role of the teachers.

Access to the tools of the information society and knowledge is not therefore an exception to the attitude of the teachers and of the school. In this sense, they are making every attempt to provide conditions of equity in the access to ICT by using various strategies.

One of these strategies, and despite its limited number, has to do with the distribution of the computers in various places in the school: the Computer Centre, Staff Room, Science Laboratory, Physics and Chemistry Laboratory, and the Library, allowing for distributed access and in this way reaching more students.

A second strategy lies in promoting and supporting structures and spaces, in the school, to occupy students free time and extra-curricular activities: Computer Club and Multimedia Laboratory that are open 2 hours a week to students, accompanied by teachers who dynamise the activities.

A third strategy is related to the access to the Computer Centre so as to ensure its use by teachers and students, independently (as long as it is not occupied with classes or other sessions), during school hours.

In this Resource Centre, support is offered by teachers who dedicate a large part of their time to helping their colleagues and students and also by a trainee from the Vocational Multimedia Course of the Vocational School in the Alentejo Region, who has training in ICT and helps the students. The Staff Room is equipped with computers and printers and the Library has a staff member with ICT training who helps students with the work the have to do and which involves the use of ICT.

Discussion of the Hypotheses

We reserved this space to discuss the various hypotheses put forward along with some of the constraints we wish to identify before the discussion itself. Some of the hypotheses, namely hypotheses 3 and 4, as we mention further ahead in the body text, are not in our opinion mutually exclusive making it difficult to make a decision in relation to the confirmation or refutation of the hypotheses given.

Hipothesis 1
Technology is an important catalyser of educational reforms, especially when these involve the Internet. The alternative hypotheses is that when a true reform is in progress, technology serves merely as an additional

resource and not as a catalyser, i.e. the driving forces behind the reform also encourage the application of the technology to resolve specific educational problems.

Analysis of the data gathered shows that this hypothesis should not be accepted but rather the alternative hypothesis, i.e. technology is used merely as an important additional resource but not as a catalyser of the reform in progress in this school.

There are mainly two facts that back the alternative hypothesis: the first concerns the nature of the change that was imposed on the school (the reform) and the fact that the reform stemmed from and was set up by external entities that are hierarchically superior to the school, with previously defined objectives and programming. From the moment the school decided to adopt this new curricular model, the participation of all the teachers became in practice compulsory. The degree of involvement of the teachers is variable although most have adopted the objectives and principles of the reform and have found advantages and solutions for some of the school s day-to-day problems. The diffusion of the reform, both internally (to other grades) and externally (to other schools), does not depend on the wishes of the intervenors.

A second fact in favour of the alternative hypothesis has to do with the scarcity of resources in ICT   the scarce proportion of teachers who use ICT in direct support to the teaching and learning processes in comparison to the proportion of teachers who use the computer as a personal work instrument, which in essence means that they are being used mainly to produce supporting educational materials.

Hypothesis 2
The dissemination of the reform (and consequently of ICT) follows the traditional dissemination pattern of the reforms and innovations described by Roger (1995). The alternative hypothesis is that technology operates differently from the traditional reforms and innovations and that its dissemination pattern therefore has distinct characteristics.

Findings show that the hyposthesis which upholds that the dissemination of the reform follows the traditional dissemination pattern of the reforms and innovations put forward by Roger (1995) cannot be accepted for this case study.

The main reason for this concerns the fact that the reform was decided on and planned by entities that are external to the school and hierarchically superior. The school announced its adhesion to the reform in an experimental phase and implemented the changes. Findings reveal that teachers ensure the adhesion to the reform and implement the changes set by the decree-law governing the reform with varying degrees of enthusiasm and involvement. In this sense the dissemination and adoption of innovations model does not apply to a reform with these characteristics.

As regards the alternative hypothesis, it should be accepted on the basis that the reform and its technologies have, in this case, distinct characteristics. As opposed to the reform, ICT are not imposed by decree: their exposure, adhesion, involvement and adoption depend on individual will and are subject to a dissemination pattern that is compatible with the proposal of Roger Clarke.

Findings in favour of the alternative hypothesis reside in the history of the introduction of the Information and Communication Technologies in this school and in the manner in which they were and are progressively adopted, as the individual will of the teachers and the directors allows for an ever-wider adoption of ICT as vital elements in the school s day-to-day work and in the teaching profession.

The private communication channels which are characteristic of the innovations dissemination standard proposed by Roger, observable in this school, really work and are in fact leading the school in this progressive adoption of ICT by most of its members. The facts show that many of the elements and characteristics of Roger s model can be seen in this school, as regards the educational use of ICT, namely the behaviour of the early adopters, the importance of the interpersonal communication channels in the persuasion phase, etc..

Hypothesis 3
The effective implentation of ICT depends essentially on the skills of the teaching staff in integrating ICT in learning. This hypothesis assumes that the effectiveness of ICT is associated to the mediation of teachers and that their academic value is positively related to the teacher s skills. The alternative hypothesis is that the school s technological infrastructure and the skills of the students, and not the skills of the teaching staff, in

ICT determines the results of implementing ICT.

The hypothesis that the effective implementation of ICT depends on the skills of the teaching staff in the integration of ICT in learning should be accepted since findings point mainly in this direction.

Findings in favour of this hypothesis are mostly based on the importance of the teacher s role of mediator in the educational interventions in populations of this age which strongly condition the level of autonomoy and independence of the students. A concrete example of this is that even the Computer Club and the Multimedia Library are directed and co-ordinated by the teachers, the same happening in the curricular activities in the classroom, when these are carried out. The teachers in this school clearly take on the role of mediators in this process and the potential of ICT is exploited and enriched when the teachers are skilled in this field.

Findings against this hypothesis are the reduced number of computers in the school and the reduced number of teachers who use ICT to support learning or in direct relationship to the curricular content: 75% affirm that only a tiny part of the use of the computer in the lesson was directly related to the curricular content and 98% did not involve their students in collaborative learning via the Internet.

However, accepting this hypothesis does not totally exclude the rival hypothesis, especially if we take into account the fact that the technological infrastructure and the skills of the students are also factors that facilitate or condition, positively or negatively, the teacher s role of mediator in the integration of ICT in learning.

The existence of a technological infrastructure dimensioned to ensure ilimited and generalised access to all members of the school community will certainly lead to a new equation of these hypotheses.

A second factor that would require more in-depth study is the evaluation of the students skills in ICT. We have only a vague idea, resulting from teacher observations, that some students, and increasingly more for sure, have a computer at home and certainly learn from using it. We do not know what they learn. But we do know that part of what they learn they take to school with them. They also take the curiosity of wanting to learn more and the desire to use the means more and more, both at school and at home. What is the importance of this factor in the effective implementation of ICT in learning? We will only find out by carrying out more in-depth studies.

More and more often students ask to use the Internet at this school, mostly as a source of information; and just as frequently teachers ask the students to perform research tasks on the Internet or in electronic encyclopaedias using the computers in the Library or in the Computer Centre.

Hypothesis 4
If all the students have identical access to ICT, the difference in academic performance between the poorer students and the less poor should not increase. The alternative hypothesis is that if all students have equal access to ICT, students who are less poor will tend to increase the difference in academic performance in relation to poorer students.

The main hypothesis (if all students have identical access to ICT, the differences in academic performance between the poorer students and the less poor should not increase) should be accepted under certain conditions. In line with the information gathered, access to computers is identical for all students and this fact is not reflected in difference in academic performance between poorer students and those less poor.

However, the formulation of the hypothesis does not define the context in which the hypothesis should be observed. It is therefore assumed that in this school where access to computers is identical for all students, according to the teachers, this fact does not reflect any differences in academic performance between poorer students and those less poor.

Once again, the alternative hypothesis is not totally excluded. The reason for this is that certain factors related to the problem should not be ignored: increasingly more students have a computer at home and access to the Internet; these students have an advantage and unless the school does not carry out educational interventions aimed at the students who need them (namely the poorer students), this advantage will increase the differences and not reduce them. The time dedicated to the task, a determining factor in learning and passing, is in this case very favourable to those who already have a computer at home. If in the short term this factor is not observed, due to the age of the students, in the medium term it may naturally be felt. For this reason the rival hypothesis should not be totally ruled out.

In this sense the school should ensure identical access to ICT for all children and youths, on the one hand, but

it should also ensure the presence of teachers/animators who can guarantee that students are given appropriate help during their learning in this field, on the other.

Hypothesis 5
An effective implementation of ICT will cause academic standards to remain the same or to increase in spite of the poor quality of many ICT materials. Academic standards depend on the expectations of the teachers and of the school and not on the level of manuals, of ICT materials and others. The alternative hypothesis is that the use of ICT will lead to a reduction in academic standards insofar as the students will spend more time on research with marginal benefits and on surfing Internet sites or curricular materials of low-quality.

The main hypothesis should be accepted given that the data gathered in this school supports this statement. The perception of the teachers reinforces the positive effects of ICT in academic standards, especially the development of research, social and communication skills, despite the reduced quality of many ICT materials. It should nonetheless be stressed that a school s academic standards do not depend <u>only</u> on an effective implementation of ICT nor on the quality of ICT materials. They depend on a much wider set of factors which are far from running out in parameters that are more or less related to ICT. Even more so when in this school ICT and the educational work which is done, with no doubt as to the merit, represents only a small part of the work which is carried out by the group of teachers at the school.
The findings in favour: 98% of the teachers did not involve their students in collaborative learning through the Internet with students from other classes; 93% of the teachers do not use technology to collaborate with other teachers; 89% of the teachers affirm that the use of computers by the students was not considered in the evaluation of the learning; almost 70% of the teachers practically did not receive or send email messages... These facts show that it will be very difficult to relate <u>only</u> the development level of ICT in a school to the academic standards of its students.

5. PROJECTIONS

Sustainability

The sustainability of Flexible Curriculum Management is ensured as this is a reform by decree and it is currently being extended to other schooling levels   7th, 8th and 9th grades   and other schools in the country. The reform has important impacts and implications in the school. It presents a programme of curricular change through the introduction of new fields which represent innovation areas that may lead to profound changes in teaching with greater concern: teaching with more space for individualised support, more opportunities for the development of research and communicative skills, more space for multicultural education and education for citizenship and more space for groupwork and the development of the students social skills; an appeal to the participation of the family and the community in school life, etc..
The reform s sustainability is ensured, just as its adoption and implementation, by governmental decree. It is something outside the school and at the individual will of each one of its members.
As far as could be observed in this school, some problems related to Flexible Curriculum Management still have to be resolved.
A reform with the nature and philosophy of FCM and with such wide-reaching objectives would need an appropriate infrastructure (and which in many cases would mean revised and/or enlarged) in terms of physical space, means and equipment. The school did not particulary benefit from interventions on this level. Only on the level of teacher training were training actions carried out. Despite the degree of acceptance and involvement of the teachers being very positive (a clear indicator is the fact that the teachers were involved in activities and tasks that far exceed their working time), this does not prevent them from manifesting their criticism for the fact that the reform does not contemplate interventions on the level of the infrastructures and equipment. Some implementation difficulties could easily have been overcome if the space and the equipment

had been correctly dimensioned to the number of classes and students.

As regards the sustainability of the development of ICT in the school, the factor that most contributed to this sustainability is the involvement, motivation and dedication of the teachers and the school s management not only in relation to the educational use of ICT but also in relation to the school. This fact justifies the true project culture that has existed in the school for many years. Being open to innovation, the calculated risk and the desire to learn throughout life form part of the culture of this school and the new members gradually acquire it. In spite of the difficulties and obstacles, that which is possible to do is done with intention and determination.

The school continues to pursue the objective of developing ICT and to use all the opportunities that arise to improve its response capacity: acquisition of new equipment and educational computer programmes, training of human resources, raising the awareness of the families and the community to the importance of their participation, searching for new sources of income, etc.. The sustainability of ICT in the school is recognised by the teachers and by the board as an upgrading factor of the quality of the teaching done by the school and in this sense the school would like to consolidate the progresses made to date.

Dissemination

As regards the dissemination of the reform, its generalisation both within the school and to other schools is equally ensured. It us in fact already foreseen in the legislation which has in the meantime been produced. This is a process led by structures of the Portuguese education system which are hierarchically superior to the school.

Nevertheless, the Ministry has promoted the dissemination of this reform through meetings and through the Internet where it has published pages with information on the reform and also via a forum operating on the virtual site of the Ministry of Education (available at: http://www.deb.min-edu.pt/nocf/gestaoflexivelcurriculo.htm).

The objective of this discussion is to gather information on the implementation strategies followed so as to adjust those aspects which possibly operate less well. The school has also participated in this discussion.

As regards the dissemination of the practices of using ICT for educational purposes, the teachers feel that the school will have to continue its efforts to acquire new equipment, install an Intranet, make better use of the space avaible and encourage the training of teachers in this field. The school has also made an effort to disseminate the initiatives and projects currently being developed in the school as well as the potential participation of the community by maintaining and updating its page (available at: http://www.minerva.uevora.pt/stclara/).

6. ANNEX A

The methodology used in this case study followed the instructions supplied by the OECD in the research manual. A research team was set up with a co-ordinator and four research assistants. The work plan and research protocols were drawn up by the team. The field work was carried out in a first phase in July 2000 and in a second phase in Decmber 2000 and January 2001. The semi-structured interviews on the teachers (5), management representative (1), specialist (1), guardian (1) and student (1), teacher observation (1) and surveys on the teachers in the school were the methods used to gather data used by the team. The teachers were interviewed at the same time and the director was interviewed individually. In the first phase, the average duration was two hours for every two sessions and two hours in the case of the management representative. In the second phase, the management respresentative was interviewed for two and a half hours.

The interviews with the student and the specialist lasted for an hour and an hour and a half, respectively.

The interviews were recored on tape and electronic medium using a portable computer. The observation data

was registered in the observation grids.

The complementary materials of the students, teachers and the school were catalogued and are available on the Internet at: http://www.minerva.uevora.pt/ocde/stclara/.

After the data was gathered, it was coded, classified and organised in the matrix that can be found in the research manual, the data supporting the hypotheses was catalogued, the individual summary was drawn up in line with the suggested structure and the respective conclusions were written.

7. ANNEX B

Number of surverys: 45

Return rate: 64%

1. To what degree do you feel comfortable/capable of carrying out the following activities on the computer?

	VC	C	FC	NC
1. Writing an article	53%	31%	7%	9%
2. Searching for information on the World Wide Web	13%	16%	27%	44%
3. Creating and maintaining web pages	2%	0%	16%	82%
4. Using a database	0%	27%	27%	47%
5. Creating a database	0%	4%	22%	73%
6. Sending and receiving email messages	16%	20%	13%	51%
7. Writing a programme	2%	2%	9%	87%
8. Drawing a picture or diagram	9%	20%	38%	33%
9. Presenting information e.g.: using PowerPoint (or equivalent)	2%	18%	22%	58%

How important are each of the following skills related to the use of computers?

	VI	I	FN	NI
10. Writing an article with a word processor	64%	24%	9%	2%
11. Searching for information on the Internet	31%	53%	16%	0%
12. Creating web pages	7%	20%	33%	40%
13. Using a database	13%	38%	38%	11%
14. Creating a database	7%	22%	49%	22%
15. Sending and receiving email messages	9%	44%	29%	18%
16. Writing a programme	9%	29%	18%	44%
17. Drawing a picture or diagram with design/graphics software	31%	44%	16%	9%
18. Presenting information (e.g.: using PowerPoint or equivalent)	13%	49%	24%	13%

On average, how often were your students involved in the following activities as part of the work assigned to them over the last school year?

	Several times a week	Several times a month	Sometimes	Never
19. Using the World Wide Web	2%	4%	42%	51%
20. Creating web pages	0%	0%	9%	91%
21. Sending and receiving email messages	2%	0%	13%	84%
22. Using a word processing programme	4%	33%	47%	16%
23. Using a computer to play games	4%	11%	24%	60%
24. Using a spreadsheet	0%	4%	13%	82%
25. Using a graphics programme	0%	4%	24%	71%
26. Joining a discussion forum or chat room	2%	2%	4%	91%
27. Using a presentations programme (e.g. PowerPoint)	0%	2%	7%	91%
28. Using an educational programme (including simulations)	2%	4%	31%	62%
29. Using the computer for other purposes (specify)	2%	7%	11%	80%

	Good	Fair	Weak
30. How would you classify your capacity to use computers?	4%	58%	38%

	Yes	No
31. Did you ever consider the students use of computers in your evaluation?	11%	89%

	No restrictions	Some restrictions	Only those indicated
32. If you asked your students to search the World Wide Web, what degree of freedom did you give them to surf on the Internet?	24%	36%	40%

	Yes	No
33. Did you create or modify a web page with some of your classes?	2%	98%

	All of it	Most of it	Some of it	Very little

34. What part of using the computer in your classes was directly related to the course content?	11%	13%	20%	56%
35. What part of using the computer for tasks assigned to the students was done individually?	2%	20%	31%	47%

	Several times/ week	Several times/ month	Sometimes	Never	Not able to
36. How often do you use the computer at home to prepare your lessons?	36%	13%	42%	2%	7%

	Yes	No
37. Have you ever participated as a student or trainer in a virtual course via the Internet/World Wide Web?	9%	91%
38. Have you every involved your students in collaborative learning via the Internet/World Wide Web with students from other classes?	2%	98%
39. Do you currently use technology to collaborate with other teachers (vocational chat rooms, forums or others)?	7%	93%

	>11	6_11	1_5	None
40. How many email messages do you				
send on average per week?	7%	4%	24%	64%
receive per day?	7%	0%	24%	69%

	Few 1-5	Many >5	Several (2)	None
41. Have you ever changed the hardware of a computer?	7%	2%	2%	89%
42. Have you ever made an upgrade on a computer?	16%	7%	2%	76%
43. Have you recovered a damaged file?	16%	2%	2%	80%
44. Have you created a web page?	29%	0%	0%	71%
45. Have you ever created a database?	16%	9%	0%	76%

8. ANNEX C

Complementary information on Flexible Curriculum Management, materials gathered during this research, documents on the school s Educational Project and a link to the School s webpage are available on the Internet

at the following address: http://www.minerva.uevora.pt/ocde/stclara/. One of the more interesting initiatives in which the school was involved, Parliament and School 2000 , can be found on the virtual site of the Ministry of Science and Technology, in the Support Unit to the Programme Internet in School: http://www.uarte.mct.pt/activ/parlamento/netvideo.html or in the virtual site of Parliament...

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