



OCDE / CERl I.C.T. PROGRAMME

A Case Study of ICT and School Improvement at

"Escola EB 2/3 de André de Resende"
Évora Portugal

José Luís Pires Ramos (Co-ordinator)

Vicência Maria G. Do Maio

Isabel Maria M. Fernandes

Manuel Bacelar do Carmo

José Luís Carvalho

February 2001



1. SUMMARY

"Teacher, are these pictures going onto the Internet?" "Yes", I answered softly, so as not to draw the class's attention.... "Can we see them afterwards?" he insisted. "Yes!" I answered to cut the conversation short. "Do you want to see my football team's page?" "Did you create it?" I asked. "Of course! Look?! These are my friends... we get together on Saturdays, after helping my parents at work.... this is the captain of the team.... I'm the youngest. This page is in a public server, I put it there!"

(Research notes, 1st day of class observation in alternative education. Dialogue between a researcher and a student).

The Escola EB 2,3 André de Resende is a public school situated in Évora, an average-sized city (approximately 50,000 inhabitants) in the interior of Portugal. Its location on the outskirts of the historical centre of the city brings the school into simultaneous contact with the city centre and with the suburban neighbourhoods, meaning that it has certain contrasts in relation to the cultural standards and socio-economic level of the students.

Among the school population (845 students from the 5th grade to the 9th grade, aged between 10 and 16) there are some problematic students who bring with them a world of problems connected to learning difficulties, indiscipline and repeated failure. Experience has shown that integrating these youths in regular classes is very difficult and leads to frequent situations of these students leaving school before completing the compulsory basic education and of failure on different levels.

The School Management, joined by a group of teachers, put forward a project for the creation of alternative education for students who, due to their poor academic and social expectations, have very specific needs. The alternative education follows a different syllabus from that followed by the other classes and in most of the schools in Portugal and consists of a structured and planned measure in line with the needs of a specific group of youths. We are dealing with a reform whose legal framework foresees reinforcing the autonomy, seeing as the decision-making process is handed over to the school who identifies the needs and interests of the students and tries to get to know the parents' expectations, involving them in the process. Once stock has been taken of the human and material resources, the syllabus to be implemented is then drawn up.

The opportunity arose with the implementation of the Nónio XXI Century Programme in 1997 by the Ministry of Education and the school, which was preparing a new curricular reform – the creation of alternative education for the 5th grade – presented and approved a project with the integration of ICT in alternative education classes.

For these students alternative education represents a new opportunity: guaranteeing their general basic education in several areas, the programmes are very directed towards the connection with the working world and focus on ICT throughout the syllabus (the students use ICT 6-8 hours per week).

The reform is ensured by a group of teachers who, in their vast majority, have also led the process for the integration of the educational use of ICT. Open to innovation, these teachers appreciate the potential contributions of interactions and partnerships with the community. This approach, where the teachers are the "authors" of the change, requires an added responsibility, reason why the training and upgrading of these individuals have been a constant concern.

The table below presents some information on the school and on the reform.

Name of the School	E. B. 2,3 André de Resende
Address	Avenida Gago Coutinho 7000 Évora

<i>Telephone</i>	(+351) 266 739560
<i>Fax</i>	(+351) 266 739569
<i>e-mail</i>	eb23res@mail.telepac.pt
<i>Web</i>	http://www.eb23-andre-resende.rcts.pt
<i>Contact person</i>	Mrs Maria Beatriz M. R. M. Antunes
<i>Total number of teachers</i>	112
<i>Total number of students</i>	845
<i>No. of teachers involved in the reform alternative education</i>	21
<i>No. of students involved in the reform alternative education</i>	34
<i>ICT infrastructure</i>	(Annex B, Table 2)
● <i>total number of computers</i>	42 computers
● <i>rooms with ICT</i>	13 rooms
● <i>access to the Internet</i>	38 computers with access (2 local networks)

This is a true reform as the changes introduced cover the entire process (objectives, content, methodologies, resources, evaluation), which is only made possible because the school is fortunate to have a group of teachers who not only have solid pedagogical training and innovation capacity but also a broad experience in projects using ICT.

The connection between ICT and the alternative learning paths proposed by this reform, is, according to available data, the main factor of adherence and success achieved thus far. ICT are studied in one of the specific subjects but are at the same time used as a working tool in most of the other subjects.

After the positive results obtained in previous years with alternative education thanks to the mobilisation and preparation of the teachers in conjunction with the satisfaction of the minimum requirements in terms of resources, the school extended the reform to other groups of students with identical needs. In the current school year, 2000/2001, four classes (34 students), two of them 6th-grade and two of them 8th-grade, are directly covered by this reform. One of the 8th-grade classes, currently called the Learning Class, is already in the 4th year of the reform (initial group) and continues to work in partnership with the Institute of Employment and Vocational Training.

The students from alternative education range from underprivileged youths to privileged students with naturally positive self-esteem reflexes. By using ICT and developing associated skills, these students have significantly improved their personal relationship with the school and with learning.

Besides the alternative education, the educational use of ICT is a systematic, though not very extensive, practice in the school. At present, besides the curricular activities, which were not catalogued, two projects are being carried out within the scope of the Comenius programme ("**Raising Awareness to Interculturality**" and "**Developing ties among students**"); the **GrafiTICS** project to promote the BE/CRE (library/resource centre), where a group of students carry out a set of tasks to promote and update the site. The edition of the electronic newspaper is another project with some tradition in this school. Extracurricular activities that use ICT are also carried out in the **Clubs** (English and Mathematics).

2. THE PAST

The process of integrating ICT in Escola EB2,3, André de Resende started in 1989 with the MINERVA Project and with the creation of the *Centro Escolar Minerva* (CEM), promoted by a group of teachers. The Minerva project was developed until 1994 and contributed to equipping schools, animating projects and training teachers through actions held in the EU area and through actions promoted by the CEM team. Over the years, the number of teachers who have adhered to the training and use of ICT has increased and the school has tried different opportunities to enrich and update its computer resources through curricular and extracurricular projects.

In this period several projects that integrate ICT were carried out:

- **Writing Groups** with the objective of developing the writing process using the word processor. This project had a vertical articulation with associated schools of the 1st cycle;
- **Everyday Sounds**, a telematic project in the areas of musical education and the mother tongue;

This phase coincided with the implementation of a curricular reform where an interdisciplinary arena was created the *School Area* which revealed itself to be a good pretext to use ICT. In was in this context that a curricular and interchange project (English, Visual Education and History) was carried out. This project was called *Visiting Évora*.

Now that a dynamic among the teachers and an organisational and favourable management structure had already been created, conditions were ripe for an increase in projects and activities supported by ICT.

The following are mentioned as examples:

- The **RECTA** (I and II) *Rede Educativas em Ciência e Tecnologia e sua Aprendizagem* (Educational Networks in Science and Technology and their Learning) projects, supported by the Programme *Ciência Viva* (Live Science) of the Ministry of Culture and Technology (1996/97 and 1997/98);
- The *Ser e Conhecer* (**Being and Knowing**) interchange project in English on the Olympic Games in Atlanta (1996).
- The *Escrita Telemática Uma janela para o Mundo* (Telematic Writing A Window to the World) project, which was supported by the Institute of Educational Innovation (1996/1997).

In 1997, the school also participated in the **IIE Semana dos Media** (IIE Week of the Media) initiative, with the creation of the school web page. During the same year, the school co-organised and promoted the **Forum Aprender e Ensinar com a Internet** (Forum Learning and Teaching with the Internet), aimed at the educational community and with the objective of disseminating experiences and deepening partnerships (Town Council and University of Évora EU/Minerva Nucleus).

- The **Navegar através da Internet** (Surfing on the Internet) project was carried out over the 1997/98 and 1998/99 school years and provided the students with diversified learning using the various Internet tools.

The school dynamic has also been expressed in answer to challenges, evident in the regular participation in initiatives such as the Netdays week. Within the scope of Netdays2000, four classes participated with the creation of collaborative stories via the Internet in Portuguese, French and English and a new school page (created by students) won the second prize in the "Homepages" competition, promoted by the Nónio Programme. Also associated to the use of ICT is the award of the "European Stamp" in 1998 and in 2000 (in relation to the early learning of foreign languages) and naturally the recognition since 1998 as an innovative school in the use of ICT (ENIS) within the scope of the European Schoolnet.

3. THE PRESENT

ICT Infrastructure

This is an ENIS (European NetWork Innovative School) School and although computer equipment in the school has increased, it still does not meet the real needs of the school in ICT (as obstacles to the use of ICT with the students the teachers mention the over-occupation of rooms and equipment). At present approximately 10% of the school's general budget is assigned to ICT (acquisition, management and maintenance of the computer resources).

Besides the 42 computers, distributed in different rooms, the school has other equipment of general use, such as a scanner, a digital camera, a video projector, printers and a microscope linked to a PC. It also has approximately 50 different CD-ROMs. There are two network connections: one with RDIS access Internet in the School Programme which serves the BE/CRE (library/resource centre), the Executive Board, the administrative services and the Staff Room; another with analogical access Telepac which serves 4 classrooms, the Computer Laboratory and the Special Education Office (Annex B, Table 2).

Considering that 10 of the computers are aimed at the different management and administration services and sectors in the school, the remaining 32 computers are in fact accessible to the students.

Thus, the general ratio (in the school) is 26 students per computer. Nevertheless, in alternative education classes, each student has his/her own computer with access to the Internet as all the work done in class involving ICT takes place in the Computer Laboratory. The students are provided with help and support in the library/resource centre through a register sheet which identifies the software used. In the computer laboratory, the students are assisted by teachers.

Maintenance of the equipment is ensured by a technician outside the school and occasionally by teachers with more experience and knowledge in ICT area.

Effectiveness

Assessment of the effectiveness of alternative education should obviously take into consideration the characteristics of the students involved in this reform. Effectiveness should therefore be measured in relation to the initial conditions: students who failed repeatedly, who experienced problems of integration in the school community, who ran the risk of leaving school before completing the compulsory basic education and with learning difficulties. Adapting the syllabus to the interests and needs of the students as well as the transversal use of the information and communication technologies resulted in motivating and involving the students in learning.

According to the teachers, the reform brought the students closer together (classes with less students), enabled the diversification of strategies, gave rise to greater collaborative work opportunities with peers and created meaningful learning situations for the students. The relationship between teachers and students also improved substantially.

Other indicators of the effectiveness are the reduction in school absenteeism (number of student absences) and in indiscipline in school and in the classroom, the perception of more individual attention, the improvement of the students' self-esteem, the acquisition of knowledge and skills by the students in using computers and the possibility of acquiring practical vocational training. According to some teachers, the reform appears to benefit students with more learning difficulties as they have more time for the tasks and do more practical work than in regular classes where teaching is more theoretical.

Effectiveness is therefore an applicable concept but not according to regular teaching standards. When a student of this population manages to finish the compulsory basic education cycle, we can consider it a "small victory" for the school, for the teachers, for the parents and for the community seeing as almost all

the conditioning factors initially pointed to failure and/or leaving school before completing the compulsory basic education. If the result goes beyond this and the student continues his/her studies, within the framework of regular teaching, then the system worked and was effective.

4. MAIN HYPOTHESES

The main hypotheses of this study are related to the dimensions that were identified as especially relevant as regards the school's development and the potential contribution of ICT, namely: the dissemination patterns, the upgrading and involvement of the teaching staff, the role of leadership, the connections between ICT and the reform, academic rigour and equity. The data were catalogued, gathered, coded and classified so as to make it possible to create an empirical base and from this start the process of confirming or refuting the various hypotheses. The main conclusions on each of the hypotheses are now developed using as a basis the gathered data.

Dissemination patterns

The reform in course in this school called alternative education involves 34 students, grouped into small classes with very particular characteristics: students who have failed repeatedly, who experience problems of integration in the school community, who run the risk of leaving school before completing the compulsory basic education and students with learning difficulties. This reform arose as an innovative proposal with countless potentialities in the search for alternative solutions, adjusted to the diversity of cases which do not fit into regular school nor night school. Previous experiences within the system have shown the virtuality and positive results of this type of solution.

The Ministry of Education regulates the reform's legal framework and working conditions. On an optional basis, and within the scope of the autonomy regime established, the schools propose the creation and working of the alternative education for the groups of students they feel may benefit from this type of programme, after the diagnosis has been carried out and the contribution of the teachers has been ensured.

The reform consists of the possibility of, keeping the same validity of the regular syllabus, creating and developing a syllabus adapted to the interests and needs of the students. All classes have a school component and a practical component (artistic, pre-vocational or vocational). According to the partnerships that are possible to make via protocols the students may develop a practical component in an entity that takes on the students and orients their learning, in collaboration with the school, which ensures the school component of the training.

The evaluation system is also proposed by the school and approved by the Ministry of Education. All the students receive psychological and vocational orientation and the participation of the students in alternative education should be authorised in writing by the parents or guardians. As long as they request it, the students always have the possibility of returning to the regular syllabus.

This innovative proposal of concentrating on a specific group of students who are mostly from underprivileged socio-economic strata started 4 years ago by decision of the Pedagogical Board and was promoted by a small group of teachers, namely those who were more involved in the educational use of the information and communication technologies. It received contradictory feelings in this school but, in general, most are favourable to this solution because the school as a whole benefits from the reform in course.

The teachers involved in the reform feel it is a socially just and appropriate solution and in this sense they are its main pillar of support and its main defenders. They are highly motivated and involved from an

emotional and affective point of view and although the work involves a high degree of psychological wearing and requires great personal demands, it is also rewarding due to the fact that they are participating in the possibility of providing these students with a future that is certainly much better than the one which they would face if this solution was not implemented: failure, leaving school and other dreary possibilities. The reasons which lead these teachers to become so earnestly involved in this work have to do with professional ethics, social conscience and citizenship.

The teachers feel that alternative education makes it possible to create a solution adapted to the students and convergent with the Educational Project. The problems of indiscipline in class and in the school in general are also reduced with the existence of alternative education classes. Furthermore, with less students in the classes and more resources available, in their teaching practice the teachers have the opportunity of getting closer to the students and of dedicating more attention to each one individually and to his/her problems.

Working with ICT, especially as a support to the teaching and learning processes, without a doubt means some additional work and implies changes to the teacher's routines and ways of working. For this reason, many teachers do not dare to try this work perspective and prefer the more traditional form of work in which they feel more at home and which does not require an additional effort.

The teachers who adopted this innovation formed a team where experienced teachers and new teachers with pre-service training come together. They display the typical behaviour of adopters: the wish to earn the social acknowledgement of their involvement and dedication to the reform and the desire for other colleagues to adopt equally relevant attitudes and behaviour.

Those who resist more to the innovation are above all teachers who have been teaching for a long time and therefore feel they have a higher social status. In the case of alternative education, resistance seems to be more evident in teachers with an apparently higher status, while in relation to ICT, it is generally the older teachers. However, the age factor does not appear to be a determining factor as young teachers can be equally resistant. It is mainly a passive attitude and even one of indifference in relation to pedagogical innovation, whether it involves technologies or not.

A small group of dynamic teachers already involved in ICT area started the process of introducing and disseminating the educational use of ICT in the school. Despite the efforts of this small group of teachers (including training actions, mutual aid to colleagues, etc.), a reduced number of teachers (between 10 and 15, according to one of the more knowledgeable teachers in the school in this field) use ICT to support the teaching and learning processes (72% of the teachers affirm that they did not involve their students in collaborative learning via the Internet). The majority use the computer as a personal work instrument, namely to prepare their lessons. For those teachers who use ICT and are involved in the reform, the computer plays the role of catalyst: it was using the educational work proposals using ICT that the syllabuses were changed to include computers for study and as an instrument to support the teaching and learning processes, transversally to almost all the other subjects (musical education, visual education, English, the world around us, the Portuguese language, man and the environment).

A student from alternative education in this school uses the computer an average of 6 to 8 hours per week (while the school average, per student, is much lower). The word processor, electronic mail, searching the web, encyclopaedias and graphics programmes allow for the development of the students' autonomy and their language, communication and research skills, whilst simultaneously encouraging fluency in the mother tongue and foreign language. The strategies often involve interdisciplinary projects, privileging interchange and multiculturalism. Games and the play potentialities of ICT are equally explored as a form of making it easier for students to familiarise themselves with computers and also as a form of entertainment in the students' free time.

Upgrading and involvement of the teaching staff

The development and maintenance of the reform in this school rest on two pillars: the commitment of the teachers and the contribution of the management. The upgrading and involvement of the teaching staff were very poorly contemplated in the implementation of the reform. Some training actions, namely self-training, exchange of experiences and debate on the implications of the reform are the basis which teachers use to reflect on teaching practices and improve their own performance. According to the teachers, this area was clearly insufficient, demanding the capacity for self-learning and the resolution of highly-complex problems, enormous self-sacrifice and professional pride in order to be able to overcome the more complex situations. Although most of the teachers in the school attended training actions within the scope of the continuing training of teachers in various scientific and pedagogical areas, these actions were not directed at alternative education, or in other words, at the reform.

As regards ICT, for many years now since the Minerva Project (one of the projects of greater development of ICT in Portugal and was which in fact assessed by the OECD in a study under the co-ordination of this body) a small group of teachers has shown their interest and enthusiasm for the educational use of ICT and has regularly attended training actions in this field. These training actions are generally promoted by the Teacher Training Centres and Nónio XXI Century Competence Centre of the University of Évora.

It is this same group of teachers that is also involved in the reform. Although the teacher training in this field has generally been considered insufficient by the teachers, it has produced positive results for the school. For example, the school was awarded the European Stamp for the Initiatives on Raising Awareness to Foreign Languages and the status of Innovative European School in ICT area (ENIS), within the framework of the European SchoolNet Initiative. In the case of the reform, the regular meetings between teachers have also been used occasionally to discuss aspects related to the use of ICT by teachers, clear up doubts and create new curricular material.

The role of leadership

The leadership of the alternative education falls under the direction of a group of teachers who have committed themselves to this project since the very beginning. It started off being a small group of four teachers, gradually becoming bigger and now comprises 21 teachers. The dynamic, pragmatic sense of life, ability to lead in situations of uncertainty, strong social conscience, capacity for interpersonal communication and high degree of professional commitment are the main characteristics of these teachers. True team work can be observed.

Although the legal and juridical framework of this reform was well defined by the Ministry of Education, it is an example of the school exercising its autonomy, a path which is now starting to be followed in the Portuguese education system. The decisions to create alternative education classes, invite teachers to teach these classes and other organisational aspects (resources, rooms) are the responsibility of the school's management.

The everyday aspects related to the practical implementation of the reform fall under the responsibility of the teachers who voluntarily accept to teach these classes. The management culture in this and in other schools rests on a basis of collegial management. The importance and the role of leadership, although often not assumed, can be observed in the manner in which the resistance of some teachers, as well as that of parents and guardians, members of the community and partners of the school in this project was and is overcome. The ability to persuade becomes a vital factor. Keeping up alternative education in this school depends essentially on the desire to continue and the effort of the teachers involved. The difficulty in recruiting new teachers for this area is one of the major obstacles to the continuation of the reform in this

school.

ICT-Reform connections

The information and communication technologies play an important role in the framework of alternative education: work tool, support instrument to learning and privileged curricular content, from the perspective of future integration in the labour market. According to the board and to the teachers, this strong relationship between ICT and the reform can be explained by the fact that many of the teachers involved in ICT were the ones who joined the small group of teachers who drew up the proposal for the creation of alternative education classes, thereby putting into practice that which was the fruit of their experience: youths are strongly drawn to ICT and wish to learn through these tools. This would bring about gains in student learning and would improve their attitude towards learning and towards school. This observation is ultimately extended to students with more learning difficulties.

ICT have important motivational effects on the students, be it as a personal work tool or as a support instrument to learning. They help the teachers to create new learning situations, diversifying the educational work strategies and help the students by involving them in the learning process. A large part of the work is done individually or in pairs.

ICT provide "another form of thinking and looking at the syllabus" and in this sense they are catalysts and facilitators of new approaches and new strategies, although this situation applies to a reduced number of teachers in the school. Their motivational effect on the students and aggregating role, promoting interdisciplinarity are, according to the teachers, the aspects which link ICT and the reform. The teachers also associate the use of ICT to better results in learning, to new approaches and new contents, to the improvement in the quality with which students present their work, to better results in writing and to the development of communication and social skills. ICT are predominantly used as a personal work tool but they are also used as a source of information and to support student learning in specific areas (music, English, Portuguese, etc.).

ICT are already used in school on the administration level (timetables, salaries, registers, evaluation dates, etc.) and on the pedagogical level where they are gradually being adopted by the teachers (first as a personal work tool and later, by some, in teaching and learning processes). They generally start as work assigned to students (research on the Internet or in encyclopaedias) and move on to explore more specific applications, depending on the subject or work area and the ease of finding appropriate software.

The use of ICT depends on the type and nature of the problems to be resolved, thus making learning more significant. Not all teachers have been open to this field; some of the older teachers and even some of the younger ones, are not yet taking steps in this direction and when they dare to use the computer, it is merely to give their tests a better look, to create some worksheets and not much more than that.

As already mentioned, age is not always related to this aspect as there may be some older teachers with great capacity to innovate and reflect on the use of ICT in their teaching.

Obviously the fact that alternative education incorporates a computer sciences subject, as well as the fact that this education is "marked" by the expectation of using ICT as a catalyst of the reform, often leads to ICT being applied in other subjects, transversally.

It is also necessary to point out that the school management and some teachers from this small group of teachers were careful to install and set up a Resource Centre, associated to the Library (BE/CRE), which is an important structure that supports the development of ICT in the school. This structure has proved to be very important in the manner in which ICT are being adopted by the teachers little by little. This space is also important as it is the meeting place between students and between students and teachers and is also therefore a context that favours informal mutual learning. Here in the BE/CRE, the students are assisted in their use of ICT.

Equity

The Computer Room and the Library/Resource Centre play a vital role as regards equity, which is understood as the possibility that all the members of the school community have of accessing the computer means and resources available in the school. In this aspect this school has one particularity: by creating alternative education for a population with more learning difficulties and which runs the risk of leaving school before completing the compulsory basic education in which ICT are used as vital elements in the development of educational proposals, the school is providing these students with more access to ICT than students from regular education, at least in a systematic manner which is integrated in the syllabus.

This does not obviously imply discrimination but merely giving special attention by the school and by the teachers to the students involved in alternative education. All the other students have identical and free access to the library/resource centre, while no new computer rooms are created, where they can receive assistance in using ICT. From the outset, the potential differences between students who have a computer at home and those who do not, most certainly those students in the alternative education classes, are lessened.

Although no data were gathered on this aspect, it is natural to assume that the proportion of students with a computer at home is greater in the case of students who attend regular education than in the case of those who attend alternative education as these students generally come from more underprivileged socio-economic strata.

In other words, by adopting this solution for these students, the school is clearly contributing to reduce the possible differences which these students have in relation to this issue. Added to this advantage is the success in relation to the social and vocational integration of these students. This situation of apparent preference (in more regular access to ICT) seems to have an influence on the rest of the school as the other classes, which no longer have students at risk, seem to have gained, as a form of "compensation", a better social climate within the classroom and a reduction in problems related to bad behaviour and indiscipline.

The teachers are divided as regards the perception of who benefits most from ICT, the more privileged or less privileged students. Points in favour of the richer students who have a computer at home are more time for learning with computers, greater autonomy, greater capacity for selecting information, more time to be dedicated to Internet searches and having their parents' help.

Points in favour of the less privileged students are that, as they have less time with the computer, they rationalise their use and learning, not becoming as distracted, especially with computer games.

As regards gender, both boys and girls use ICT, there being no inequality in their access to and in the possibility of working with ICT. However, and although some teachers feel that there is no difference between boys and girls, some mention that girls do not take as much advantage from ICT due to the fact that they tend to be more inhibited than boys who tend to be more daring and adventurous.

The teachers are also not unanimous in relation to the impact of students having a computer at home or not. Students with access to a computer at home appear to have more time to use it (more *time on the task*), which could prove to be an advantage but, in reality, this effect still has to be determined since this additional time may simply be used in a computer game without there being serious repercussions on the development of the child/youth. It is not therefore merely a question of time and availability but also the manner in which the computer is used and the assistance provided by the family. In this particular case, there is no precise information in relation to the number of students who have a computer at home and the effects which this could generate.

Discussion of the Hypotheses

We reserved this space to discuss, one by one, the various hypotheses put forward for this study 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 total confirmation or refutation of the hypotheses given.

Hypothesis 1

Technology is an important catalyser of educational reforms, especially when these involve the Internet. The alternative hypothesis 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 the main hypothesis should be accepted and not the alternative hypothesis, i.e. technology is, **in this case**, an important catalyser of educational reforms, especially when these involve the Internet.

The data in favour are essentially three: this first is the association between the teachers who have been working with ICT in the school for quite a few years and the small group of teachers who, encouraged by the school management, set in motion the alternative education, including ICT, as a structural element of the educational work proposal put forward by the Ministry of Education; the second is the availability and allocation of the necessary human and material resources in the school to this project; the third is the generalised recognition between teachers and students of the benefits of the reform.

In this school and within the scope of the alternative education, ICT are used extensively, which includes a computer sciences subject and its transversal application in practically all the other subjects that form part of the students' syllabus. On average, students use ICT between 6 and 8 hours a week, which is quite a lot, especially if we remember that the syllabus is part of the framework of the basic schooling and compulsory.

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 hypothesis which upholds that the dissemination of the reform follows the traditional dissemination pattern of the reforms and innovations put forward by Roger (1995) can be accepted for this case study.

The data gathered are based on the strong association between the alternative education and the educational use of ICT in this school. In this sense, and despite the fact that this innovation is duly regulated by the Ministry of Education and is aimed at a very specific population, its exposure, adherence, involvement and adoption depend on the desire of the schools, on their management and on their teachers. A second point in favour of this hypothesis resides in the fact that the adoption of alternative education was based on previous experiences in the educational system which positively influenced the school and its teachers, leading them to try and adopt a similar strategy.

If we consider the history of the introduction and dissemination of ICT in this school and the way in which they were and are progressively adopted as vital resources in the everyday work of the school and the teaching profession, we find some elements that enable us to positively associate the reform and the technologies. The facts show that many of the elements and characteristics of Roger's model can be seen in this school, as regards alternative education and the educational use of ICT, namely the behaviour of

the early adopters, the importance of the interpersonal communication channels in the persuasion phase, etc..

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.

Hypothesis 3

The effective implementation 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.

There are essentially two points that support this hypothesis. This first has to do with the fact that the composition of alternative education classes assumes the possibility of focusing on the student so as to satisfy his/her personal needs and interests, thus creating favourable conditions for significant practical learning where ICT are seen as facilitators of the learning process and elements of great motivational effect. This assumption is realised by changing the regular syllabus with the introduction of the practical component, with the reduction of the theoretical component, with the drastic reduction of the number of students per class and finally with the access to ICT in a systematic and transversal manner (in almost all subjects). The second point is the high degree of professionalism of the teachers and profiting not only from their pedagogical and scientific skills but also from their social conscience which leads them to contribute in the creation of a better future for those children and youths *threatened* by failure and leaving school before completing the compulsory basic education.

The involvement of the teachers in the reform can be observed from the creation of the classes to the conception and elaboration of the alternative education proposal, its execution and evaluation. The dedication of these teachers and the sensitivity shown in view of the situation of students who have failed repeatedly, who run the risk of leaving school before completing the compulsory basic education and who have learning difficulties are determining factors in the sustainable development of the reform.

Given the circumstances and the evidence gathered and presented, there is no doubt in this case of accepting the main hypothesis since neither the technological infrastructure nor the skills of the students would be the determining factors responsible for the results of implementing the reform in this school. 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 that can guarantee unlimited and generalised access to all members of the school community and not only to those from the alternative education will certainly lead to a new equation of these hypotheses. This can only happen in schools which have a broad technological infrastructure and a much more favourable ratio of students/computers.

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 teachers are not unanimous on this issue. For example, some affirm that "as long as they have access, the differences are irrelevant, everyone rich and poor benefit", or "the poorer students who do not have a computer at home use it more avidly at school", "the richer students have opportunities [a computer] at home and outside the school and therefore show more autonomy because they probably use the computer more".

In other words, some teachers feel that these differences either do not exist or are irrelevant, others state that the richer students who have a computer at home have the opportunity of developing autonomy and access information more easily.

In the same way, many of the teachers prefer not to answer, stating that they do not have sufficient data on this issue.

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 and initially ruled out.

In conclusion: the main hypothesis should be accepted under the condition that the school ensures identical access to ICT for all children and youths and provides guidance and assistance through teachers who ensure that the students who become involved in learning processes in this field are given the necessary support.

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.

Youths are strongly drawn to ICT and wish to learn through these tools and this fact corresponds to gains in student learning and an improvement in their attitude towards learning and school. This observation is extended to students with more learning difficulties, those who experience problems of integration in the school community, those who fail repeatedly or who run the risk of leaving school before completing the compulsory basic education, as is the case of the school population registered in alternative education. It should nonetheless be stressed that a school's academic standards do not depend only 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, represent only a small part of the work which is carried out by the group of teachers at the school in a very specific population.

The findings in favour: 72% of the teachers did not involve their students in collaborative learning through the Internet with students from other classes; 61% of the teachers do not use technology to collaborate with other teachers; 61% of the teachers affirm that the use of computers by the students was

not considered in the evaluation of the learning.

These facts show that, despite some development of ICT in this school, it will be very difficult to relate only the development level of ICT in a school to the academic standards of its students. Other factors should be investigated and this issue should be discussed in more depth.

5. PROJECTIONS

Sustainability

The sustainability of the reform in this school depends on a set of factors, namely the availability of the teachers to continue working with these students. In fact, the most important factor seems to be the commitment and dedication of the teachers, without which it would certainly not be possible to carry out this work, considering even the personal and emotional wearing which the task involves. The results which are being obtained, both in relation to the alternative education classes themselves and in relation to the impact in the school, are an important factor to be considered in this process.

It is not a peaceful question and the discussion on the effectiveness and equity of this solution continues to be realised by the interveners, who consider the advantages and disadvantages of the alternative syllabuses. It should also be stressed that there will always have to be consensus between the school management, the teachers and the families who will always play an important role as the inclusion of any student in an alternative education class requires the written authorisation of the guardian.

Naturally more and better resources, more working room, more teacher training directed towards this type of situations, a compensation system awarded to teachers who become involved in alternative syllabuses would also be necessary to ensure the sustainability of the reform.

Dissemination

Although decree-law 22/SEE/96 allows all schools to implement this reform, to date this solution is being implemented in almost two hundred school countrywide. Whether this solution of creating alternative education classes will continue to expand or not, or even remain the same, is impossible to foresee. The teachers and management of this school have no doubts that it would be possible to extend alternative education to other basic teaching establishments and they even feel that this is an issue of social conscience and importance of the social role of the school since this reform is a very clear way of helping students who run the risk of failing and leaving school before completing the compulsory basic education. The school's management itself cannot guarantee the continuity of the reform as it does not know whether these teachers, who are now involved, will be able to continue this type of work given the high degree of wearing they experience.

Despite everything and taking into account the results achieved and the positive expectations meanwhile created and also the commitment, dedication and self-sacrifice of the teachers, it is hoped that this school continues along this line of work.

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 between November 2000 and January 2001. The semi-structured interviews on the teachers (10), management representative (2), specialist (1), and students (2), observation of classes (6) and surveys on the teachers in the school were the methods used to gather data used by the team. Two teachers were interviewed at the same time twice and the other teachers and the director were interviewed individually. The average duration of the interviews was an hour and a half or two hours, depending on whether they were carried out in pairs or individually. The interviews with the students and the specialist lasted for a hour and an hour and a half, respectively.

The interviews were recorded on tape and electronic medium using a portable computer. The observation data was registered in the observation grids and the observation sessions were filmed and photographed.

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/andreteresende/>

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

7. ANNEX B

Table 1 Summary of the data on the Teacher Questionnaire

<i>To what degree do you feel comfortable/capable of carrying out the following activities on the computer?</i>				
(% of teachers)				
	Very comfortable	Comfortable	Fairly comfortable	Not at all comfortable
1. Writing an article	61	33	0	56
2. Searching for information on the World Wide Web	44	22	11	22
3. Creating and maintaining web pages	56	17	28	50

4. Using a database	11	28	33	28
5. Creating a database	0	22	17	61
6. Sending and receiving email messages	39	28	6	28
7. Writing a programme	0	6	17	78
8. Drawing a picture or diagram	22	28	17	33
9. Presenting information (e.g.: using PowerPoint or equivalent)	11	22	17	50

How important are each of the following skills related to the use of the computer for your teaching?
(% of teachers)

	Very important	Important	+/- Important	Not at all important
10. Writing an article with a word processor	61	17	17	56
11. Searching for information on the Internet	50	44	6	0
12. Creating web pages	0	39	39	22
13. Using a database	17	33	28	22
14. Creating a database	0	28	28	44
15. Sending and receiving email messages	28	28	22	22
16. Writing a programme	11	17	28	44
17. Drawing a picture or diagram with design/graphics software	11	56	56	11
18. Presenting information (e.g.: using PowerPoint or equivalent)	28	28	28	17

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?

(% of teachers)

	Several times a week	Several times a month	Sometimes	Never
19. Using the World Wide Web	11	28	39	22
20. Creating web pages	6	6	22	67
21. Sending and receiving email messages	0	11	50	39
22. Using a word processing programme	11	33	39	17
23. Using a computer to play games	11	0	50	39
24. Using a spreadsheet	0	6	11	83
25. Using a graphics programme	0	6	22	72
26. Joining a discussion forum or chat room	0	0	11	89
27. Using a presentation programme (e.g. PowerPoint)	0	0	17	83

28. Using an educational programme (including simulations)	5	17	33	44
29. Using the computer for other purposes (specify)	6	0	11	83
(% of teachers)				
	Good	Fair	Weak	
30. How would you grade your capacity to use computers?	28	61	11	
(% of teachers)				
	Yes	No		
31. Have you ever considered the students use of the computer in your evaluation?	39	61		
(% of teachers)				
	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?	6	55	39	
(% of teachers)				
	Yes	No		
33. Did you create or modify a web page with some of your classes?	28	72		
(% of teachers)				
	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?	6	39	33	22
35. What part of using the computer for tasks assigned to the students was done individually?	0	61	17	22
Number of times (% of teachers)				
	Several times a week	Several times a month	Sometimes	Never
36. How often did you use the computer at home to prepare your lessons?	33	28	33	6
(% of teachers)				
	Yes	No		

37. Have you ever participated as a student or trainer in a virtual course via the Internet/World Wide Web?	11	89		
38. Have you ever involved your students in collaborative learning via the Internet/World Wide Web with students from other classes?	28	72		
39. Do you currently use technology to collaborate with other teachers (vocational chat rooms, forums or others)?	39	61		

Number of times (% of teachers)				
	> 11	5-10	<5	0
40. How many email messages do you send on average per week?	6	11	39	44
receive per day?	6	11	44	39
Number of times (% of teachers)				
	>5	1-5	0	
41. Have you ever changed the hardware of a computer?	17	11	72	
42. Have you ever upgraded a computer?	17	17	66	
43. Have you ever recovered a damaged file?	17	17	66	
44. Have you ever created a web page?	11	5	39	
45. Have you ever created a database	0	28	72	

Table 2 Equipment and its distribution

Rooms	No. of computers	Local network	Internet	Users
Library/Resource Centre	10	LAN *	X	Students, teachers and staff free access
Executive Board	2	LAN *	X	Members of the management body
Administrative Services	4	LAN *	X	Administrative staff
School Social Action Services	2	—	—	Staff of the SSAS

Psychology and Orientation Office	1	—	—	Vocational orientation team
Staff Room	1	LAN *	X	Teachers of the school
Physics and Chemistry Laboratory	1	—	—	Astronomy Club (students and teachers)
Special Education Office	1	LAN **	X	SEN students
Computer Laboratory	16	LAN **	X	Students and teachers in class
4 Classrooms	4	LAN **	X	Students and teachers in class
TOTAL	42			

*LAN with RDIS access (Internet in the school Programme) ** LAN with analogical access (Telepac)

Table 3 - Alternative education 2000/2001

No. of students from the Alternative Education	23
No. of students from the Learning Class	11
No. of teachers involved in the Alternative Education.	17
No. of teachers involved in the Learning Class	4
No. of students kept back in the Alternative Education	5
No. of students kept back in the Learning Class	3

Table 4 No. of students per class 2000/2001

Classes	5th	6th	7th	8th	9th
1	22	24	24	12	12
2	19	25	23	23	24
3	24	25	24	22	25
4	23	22	24	26	25
5	22	25	24	22	25
6	21	24	18	25	25
7	21	25	15	24	-

8	18	25	-	-	-
9	14	-	-	-	-
10	14	-	-	-	-
Learning Class	-	-	-	11	-
Sub-totals	192	195	152	165	136
Total 2nd and 3rd cycles	387		453		

Table 5 Students who left school before completing the compulsory basic education 1999/2000

Grade	No. of students
5 th grade	5
6 th grade	3
Total of the 2nd cycle	8
7 th grade	2
8 th grade	1
9 th grade	0
Total of the 3rd cycle	3
Total	11

Table 6 Pass rate/Rate of students kept back 1999/2000

Grade	Students who passed			Students kept back		
	Girls	Boys	Total	Girls	Boys	Total
5th grade	88	80	168 (87.5%)	6	13	19 (9.9%)
6th grade	97	86	183 (92.4%)	5	4	9 (4.6%)
Total 2nd cycle	185	166	351 (92.6%)	11	17	28 (7.4%)
7th grade	77	56	133 (87.5%)	5	11	16 (10.5%)
8th grade	71	64	135 (87.6%)	9	9	18 (11.7%)
9th grade	58	56	114 (83.8%)	8	14	22 (16.2%)
Total 3rd cycle	206	176	382 87.2%	22	34	56 12.8%

8. ANNEX C

Complementary information on Alternative Education, materials gathered during this research, documents on the school's Educational Project and a link to the School's web page are available on the Internet at the following address: <http://www.minerva.uevora.pt/ocde/andresende/>

CONTENTS