

OECD / CERI I.C.T. PROGRAMME

A Case Study of ICT and School Improvement at *Escola do Ensino Básico do 2º e 3º Ciclos de Cabreiros* Cabreiros, Portugal

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1. SUMMARY



The Elementary School of Cabreiros (2nd and 3rd grades) is a school with 602 students from the five last years of compulsory teaching, who belong to this pedagogical area of influence, regardless of their economic situation, race, sex, ideology or religion. The students come from an underdeveloped social and cultural milieu; at least around 50% have several economical difficulties and a significant number of students have special educational needs.

Bearing in mind the characteristics of the milieu, periphery towards the large centres and the fact that the largest part of the school population comes from a rural surrounding, it renders services to many students with low expectations towards school, which tends to be reflected on the processes of school abandonment. Therefore, in a joint effort to prevent such a tendency and, simultaneously, to promote a greater connection of the students to the school life, a set of initiatives has been developed in the scope of the reformation and of the educational innovation with the ICT, so as to favour the involvement and the integration of students in the school.

The school's educational project is guided towards quality, developing a participated curricula and pedagogy, keeping in mind the full and balanced development of students in their diversity. It tries to justify, articulate and develop the educational activities, so that the school will become a place for the formation and success of all, trying to put in perspective the horizontal and vertical curricular articulation, throughout the basic schooling. However, there are still cases of repeated failure and school abandonment. The system used in this school over the past few years has, in a way, privileged the student since, when organising the classes for the 5th grade, it keeps them together with his colleagues from the 4th grade, joining two or more groups from different schools of primary teaching. The heterogeneity is accepted as a

way of avoiding their social and economic differentiation as well as the social selectivity and people are aware of the need for a greater individualization of teaching. In the following years, and except for contrary indications of the teachers of these classes, students are kept together in the same class that may integrate students who failed in previous years or who may have asked to be transferred for this school. Over the last years, the pedagogic organisation of the school has undergone some changes as far as the teaching staff is concerned. The teachers are now grouped in educative teams, which implies some changes in their working habits and methods. In this area, one should point out that this new organisation makes it possible to have less rigid timetables, by putting an end to the constant interruption of the teaching, reduced to a sequence of 50-minute classes, and that it favours the flexible management of the school-time as the team decides, in each case, who should carry out a certain activity with a specific group, when it should be carried out and how long it should last. It should also be mentioned that this new organisation of the lessons is still on an experimental stage and it isn't common to the whole school yet.

If, on the one hand, there is a significant group of teachers who defend this new organisation, stating that it has several advantages, among which the decrease of the inconveniences of the division of knowledge as it breaks away with partial curricula and it allows for an integrated and integrating vision of knowledge. On the other hand, there are some teachers who are used to a more traditional and individualised dynamics of work and who don't identify themselves with this system. Some even consider a disadvantage that will take to the disarticulation among different subjects thus harming their interdisciplinary character. Such an aspect means that the innovation and change of a new curricular organisation aren't equally perceived by all teachers.

The Direction of the school predicted some difficulties from the start, namely those related to the school areas with a calling for a traditional teaching, worsened by the school's overburden as well as the anxiety felt by students, teachers and guardians as far as the new situation was concerned. Therefore, it has carried out several elucidation sessions, before the beginning of and during the school year.

In this new school organisation, there has been a greater bet on the use of Information and Communication Technologies that may create stimulating pedagogical backgrounds, favourable to learning, awakening in these students some attitudes that may be propitious to discovery, acquisition and a gradual building up of knowledge, allowing for the exchange of ideas and stimulating the shared research which is the starting point for the development of communicating skills.

Thus, there are several rooms equipped with computers connected to the Internet. The research on digital sources, namely on the Internet, as a support for later accomplishments and for the work done in the scope of different subjects has proven motivating and useful. On the other hand, the use of the e-mail and of the IRC by students has been privileged, so as to promote the sharing of ideas and the interchange of enriching and socialising experiences. However, this whole process is still in an embryonic stage, even though it is being implemented in a steady and dynamic way.

From the start of the Project Nónio Século XXI, in the 1998/1999 school year, the school has acquired different computing material and it has benefited from several training programs carried out by the Centre of Competence of the University of Minho, by the school and by the Teachers Training Centre of Braga/South. Thus, the use of Information and Communication Technology has been gradually introduced and improved in the school. All home-room teachers attend training programs in ICT so that they will be able to use the applications for the management of classes made available by the school.

Aware of the need to follow the evolution of computing, many teachers have attended training programs, many of which are credited for progression in the teaching profession, but also others which will give them no credits but which will grant them some knowledge in the area of the ICT. In this field, teachers have asked for and participated in several training programs provided by the school.

At the same time, the school's teachers and students have been given electronic mail boxes, as long as they ask for them. Yet, the use of e-mails isn't a common and sustainable practice among teachers and students since only a small number has and uses this media of communication. Its growing use is, however, expected since the Principal's Office, together with the Centre of Competence of the University of Minho, has been assigning them at a very significant rate to both teachers and students.

2. THE PAST

The Elementary School of Cabreiros (2nd and 3rd grades) led, in 1997, a process which tended to form an assembly of schools of the primary teaching and of kindergartens of the area of their pedagogical influence, located at the confluence of the municipalities of Braga and Barcelos. Such a process culminated in the school year of 1998/99 with the creation of the Assembly of Schools of the Vale de Labriose.

A certain rural character is evinced in all the parishes of the area of pedagogic influence of the Elementary School of Cabreiros, especially in the parishes of the municipality of Barcelos. Yet, the main occupation of the students' parents is related to working for other people, in the secondary sector; they are poorly qualified workers with a low salary.

The opportunities of innovating ways haven't been overlooked. Based on the premise that the use of Information and Communications Technology allows one to create stimulating pedagogical backgrounds favourable to learning, countless projects have been developed. It should be mentioned that there is a Projects Team, whose coordinator, who is also a Counsellor for the Direction of the School, has a reduction of the teaching component, given by the school's Principal's Office, bearing in mind the autonomy granted by the law.

In 1988/89 the Informatics School Centre was established, in the scope of the MINERVA Program – the first ministerial effort to introduce informatics into elementary and high schools.

In the school year of 1992/93 the Informatics Room was equipped, in the scope of the project Protection of Birds.

In the school year of 1993/94 computers working in a network (BNC) were installed in the Administrative Services.

In 1994/95 the enlargement of the net took place. A computer was put in the Teachers' Room and informatics was introduced for the management of students, as far as the administrative aspects and the home-rooms are concerned.

In the following years, some devices were improved and the extension of the network was broadened.

In 1997/98, the participation in the project Building Up a Story, together with other schools and the Institute of Educational Innovation, should be stressed.

In 1998/99, one should refer the integration into the Program The Internet in The School, from the Ministry of Science and Technology, by equipping the Library with a computer linked to the Internet and connected to the school's network through the HUB, thus making Internet services available through the proxy server application.

After acquiring some equipment, in May 1999, with about half the sponsoring approved for the project Building Up an Adventure, in the scope of the Program Nónio Século XXI, of the Ministry of Education, it was possible to set up an informatics lab, in a room assigned for that purpose. This area, called Infoteca, may receive a class made up of twenty-five students, and it works on a Windows 98 network, together with the rest of the school's network, being able to access the Internet over the router. The applications installed include data processing, text, spreadsheets and image. It also has a very good videocassette recorder, bought with some sums from the school budget.

In the school year of 1998/1999, the diagnostic assessment was made through an inquiry to students and teachers on the use of computing tools.

During the 1999/2000 school year, teachers were given training into the use of basic computing tools and the Internet (the teachers involved wrote texts telling the history of the school). The students of this school were also given training into the use of the intranet and the Internet and a site of the project Building Up an Adventure was created in the address www.iep.uminho.pt/nonio/eb23cabreiros. The Infoteca is thus used in the scope of the training of teachers and students into the Information and Communication Technologies, in making operational the project Building Up an Adventure – Nónio Século XXI, of the Assembly of Schools Braga/West and in the support to a multiplicity of activities in the educational process, from teaching to writing papers, searching for information and communicating by surfing the Web and using the e-mail.

On Saturday, during the week called Netd@ys in 1999, between November 13 and 21, the Infoteca was open to parents and guardians, who became aware of the conditions in which their children work in the

scope of the project Building Up an Adventure . This project involves a huge and very dynamic team made up by a coordinator (a Maths and Natural Sciences teacher), two sub-coordinators (languages teachers, one from the elementary school and another one from junior high school), eighteen teachers from the Primary Teaching, nine teachers from Elementary School and eleven teachers from Junior High School. The team meets once a term, for planning, using a collaborative methodology. According to the project s own dynamics, it is expected to meet more frequently, with an executive character. The reformation process started in this context, with the introduction of the flexible curricula which, together with the development of the ICT in the school, aims at creating the conditions for the real development of the quality of the learning and teaching process, at forming new competences for the professional future of students and at promoting their full integration in the active society. However, in its first stage, the reformation/innovation project with the ICT suffered several hindrances related particularly to doubts concerning, on the one hand, the effectiveness in the educational development of the flexible curricula and, on the other hand, the poor sensitisation and the absence of mastery of the ICT by teachers (partly because they have no initial vocational education and training in this area). As far as this last aspect is concerned, there are still some elements such as the ignorance of the educational uses of the ICT and of the processes of change in the educational practices, namely in the area of the curricular integration of the ICT.

3. THE PRESENT

Groundwork of the TIC

The school s Direction is aware of nowadays impact of the new Information and Communication Technologies, which is inferred from the words of the Principal when he states *our aim is make today s Education be an Education where no tools of the past are used but rather an Education where we will use today s tools which are, specially, the tools that may prepare children for tomorrow, for the future. The working tools, from a social perspective, aren t exactly those used in the past, but rather some more effective and modern ones. Therefore, it is essential that the school keeps up with that pace and that it will also predict and prepare the social integration of those forms, of the new technologies.*

Nowadays, all the school computers (28) are connected to the network, except for those of the Ludoteca (4), over the local network, linked via RDIS. From a total of 32 computers, 24 are available for the students (which amounts to a ratio of 25 students per computer) and 8 are to be used by the services. They are installed in specific rooms, such as the Infoteca (with a video projector), the Library, the Videoteca, the Informatics Room, the Music Room (with a data-show), the Teachers Room, the Counsellor Office, the Administrative Services and the Ludoteca. The computers, as well as the Internet, are available for students during the whole day, from the time the school opens to the time it closes. There are 602 students, 43 of whom attend Tutoring classes. There are 53 teachers. There are no technological courses since it is an Elementary and Junior High School, with students aged between 10 and 15 years old. There are 2 employees whose job is to give support to the multimedia labs and to the rooms with computers, there are 15 janitors and there are 7 people working in the administrative area.

There is technical and logistical support given by the Principal and the Counsellor and it consists of solving the technical problems and also of an initial motivation. The *hardware* is repaired by two people (the Principal and the Counsellor) or by resorting to outside services. The *backup* is made in disks from other machines (as it isn t possible yet to use several disks at the same time). Students are given some support by teachers, janitors as well as by a worker who was hired specifically for the Infoteca. As far as teachers are concerned, that support isn t enough yet. They refer the need for more training, specially adapted to the school s needs. One should also stress the spirit of inter-help among teachers, reinforced during the interviews and the informal talks during which most teachers mentioned the help they got from their colleagues who are more skilled in the use of the ICT, especially from the coordinator of the Nónio project.

According to the expert in ICT, *as far as the human resources are concerned, there will always be someone leading the process of maintenance of the equipment. And in terms of assigning resources (...) the*

amount of the school budget dedicated to the new technologies will be increasingly bigger since it will improve the quality of teaching and of the services rendered to the community, in the information given to guardians and in the assessment of students and of their learning. The ministerial support is referred as essential, namely in what concerns the possibility of acquiring the equipment and the buildings needed to achieve the goals of Education. The greater problem faced in the support to the ICT, according to the expert, is the late arrival of the equipment to the school *when entities outside the school are responsible for their attribution.*

In what concerns nowadays use of informatics in school, outside the educative areas, we stress the intermediate management of students, whose digital support is a database, the data being updated by the home-room teachers. The registers of marks and the information sheets for the guardians are printed automatically. One can also complete forms and models, available on the internal network, concerning the Annual Plan of Activities, convocations, reports, documents for a critical reflection, among others and print all these papers. The making operational of the processes of pedagogical coordination (curricular departments) and of educative coordination (grade/class boards; home-rooms), made from two spots, one in the teachers room and another one in the home-room teachers room, may be completed by accessing the network from any room.

The groupings of the Library, the Videoteca, the lodgings and labs are all computerised.

Effectiveness

The issue of the effectiveness must be seen in the school's ability to carry on the development of the educational project, particularly in what concerns the resolution of cases of failure and of the integration of the students of the school community. In the scope of the reformation started in this school, the effectiveness involves the observation of the initial situation, which presented repeated problems of failure in school and risk of abandonment of compulsory schooling. It also involves developing the process of creation and implement of flexible curricula, namely to adapt this curriculum to the training needs of students, to have a follow up of the learning processes, to integrate the students into the school community and, finally, to assess the levels of motivation and involvement of the students in this project.

Implementing the flexible curricula has contributed in a decisive way for these students to conquer again their place in the school, either by the importance the school gives it or by the new situation of social and academic integration, conveyed in a greater personal commitment.

The project *Building an Adventure*, in the scope of the Program *Nónio Século XXI*, is still being carried out. This project is based on the assumption that the mother tongue lays the foundations for the development of the school learning. In this sense, the activities carried out by both students and teachers are articulated in the curricula domain, in the scope of languages, especially of the mother tongue, where an approach of the narrative text and its characterisation is made. The students are introduced to the narrative over the intranet, on forma of HTML pages, through a server with the Internet Information Server (Pentium II 400 MHz 64Mb RAM). Each of the educative organisations involved in the project *Building an Adventure* will get a computer and a printer (four primary schools have already received them), as well as documental supports in CD ROM, as soon as the conditions of safety of the equipments in each organisation, which were demanded from their protective autarchic authorities. The uARTE was also asked for access to the Internet, in the mentioned establishments, through the RCTS. This request deserved a favourable dispatch. It is on a stage of formal proposal by the autarchies.

The use of the computer by the teachers is efficient, since it is used to produce materials and also for the management of students. As far as teaching is concerned, it isn't used as it should, not only because it isn't available in the classroom yet, but also because the teaching and learning process hasn't fully integrated the technologies. It is most often used to produce materials, to make the management of students, to carry out researches on the Internet both individually and with the students. Its use is linked to an integration in activities of projects, such as the project *Building an Adventure*, or to the production of works on issues related to the subject, even though they aren't necessarily done during the classes.

The measures for a responsible use are also in the area of prevention. The functioning skills of each

specific room are set and the way they are used must match those aims. The monitoring is made by a supervising assistant (a monitor) who is on the spot to assist the students. There have been no abuses since the monitor as a preventive action. According to the School's Principal, there is a complete independence of students in the use of ICT and, when any problem arises, the monitor is able to solve it.

According to the Principal, there is a very high rate of use of the ICT by the students and most of them are quite autonomous. The percentage of students who have a computer isn't very significant (between 10 and 15%).

Concerning the reformation, the Principal says there are several innovations under way and states, concerning this issue:

As soon as I arrived to the school, I tried to make the area of Informatics more dynamic, from the use of the ICT by students to the General Office. [The process] started in 91/92 and in 92/93 with the processing of the teachers' salaries. From then on, there has always been an attempt to improve the educational activities in several aspects, namely to use informatics in the administration. For the home-room teachers, for the absences of students, for the registers, we have been using an application suited to the management of students. The social and economical supports and the SASE (Services for Social and Economic Support) started two or three years ago. By this time, except for accountancy, all the services in the administration use informatics.

The Principal hopes innovation will have an impact on both students and teachers. One should start with them as, according to the Principal, *if teachers aren't at ease with the new technologies, it will be more difficult to implement them among the students.* He hopes it will also have an impact on the rest of the staff (those who aren't teachers), such as the administrative services (the Administration) and the rest of the janitors, who have also begun to use the new technologies in activities of support to students.

4. MAIN HYPOTHESIS

The main hypothesis of this study involve the dimensions identified with the development of the Educational Reformation and with the Information and Communication Technologies, particularly in the impact of systems of communication mediated by computer, to implement the processes of educational innovation, namely: dissemination patterns, upgrading and involvement of the teaching staff, the role of leadership, connections between the ICT and Reformation, academic rigour and equity.

According to the methodology and the tools of the study, the data were collected, catalogued and dealt with, thus allowing for training with an empirical basis, from which we started the process of presentation of each dimension and of discussion of the hypothesis being studied.

Dissemination patterns

From the point of view of the Principal, the school itself, by trying to give an answer to the increase in the number of students due to the enlargement of the compulsory schooling to nine years, has *tried to find the means suited to solve that problem, since students with an inborn motivation to learn aren't the only ones to attend school.*

According to the Principal, the school and his Office introduced the process of change, and some teachers have tried, inside the classroom, to innovate and to integrate the less motivated students. Most interviewees confirm such an opinion. The younger teachers were the ones who more willingly adhered to the innovation and to the introduction of the ICT. Those who have long been part of the system are more resistant to them, as they are filled with customary attitudes and they don't feel very much at ease with change and with some impositions. Nevertheless, generally speaking, the ICT were introduced in this school in a self-learning and informal way (according to a teacher, even in an emotional way), for self-trainings purposes. One teacher mentioned that Maths and Physics teachers are usually the first ones to adhere. Others refer the displeased attitudes common to some teachers (partially and not as a whole). Others state that students were the first ones to welcome them and that they were the ones who motivated

teachers. The reformation has been tried globally and with some curricular flexibility. Its advantages were perceived gradually, namely when one noticed that *students are more at ease in school and in what they learn*. However, the innovation involved breaking away with routines and motivating people, which implied training and commitment.

According to most teachers interviewed, there was a change for the best. This change was necessary and adapted to the milieu. The school became more visible for its milieu and for the other schools that see it has a different dynamics. A resistant teacher states *this school is a real find and nowhere else can one find what we have here*. Another one refers that *the students marks and behaviours changed for the best* after these changes.

Innovation/improvement always creates new problems. According to the Principal, after the stage of fear and phobia, there is the stage of search and self-training, of seduction and, finally, the hardest period, during which one must go on using and updating the technologies and the tools that were already known and used and when one must learn to use new tools. The new problems are concerned with the educational system and its evolution.

The educational teams working on the curricular flexibility are made up of teachers of many different subjects, establishing among them a close working connection that translates in a joint educative action over a group of students. There is thus a greater contact among teachers and a spirit of familiarity and spontaneity typical of small communities, where everyone teachers and students know each other very well.

This new organisation involves deep changes in the organisation of the curricula, in the timetables, in the grouping of students, teaching methods, didactic material and equipment and even in the very structure of the school building. There is a cooperative participation among all the members of this team to plan, develop and assess the teaching process and also to hand out the most suitable tasks to each member of the team. Therefore, there may be an internal specialisation inside the team and the personal resources of each teacher may be better used. From the activities planned in group to satisfy the educational needs of the students assigned to the team, the teacher carries out the tasks for which he is more skilled and in which he is more interested. On the other hand, the notion of a class as a closed unit and a private portion of each teacher disappears. The teacher freely accesses all classes and groups, sharing with the other members of the team the information concerning each and every student, and all teachers are jointly responsible for their learning.

The students interviewed consider the changes in this school, namely the significant introduction of the ICT has brought about an improvement in the learning process. They were all unanimous in considering the school has been undergoing positive changes, at the level of the infrastructures and of the ICT. Even students who don't use the new technologies so often, have already attended the specific rooms, which is a start in the development of methods of work including the new technologies. Rarely did the students use the ICT during the classes. They are mostly used during the students' free time, on their own initiative or because teachers asked them to do some research time.

The guardians think teachers won't be ready to use the ICT but they also recognise they don't know much about these technologies themselves, stating that their children know much more about the ICT than they do. The guardians are aware that the use of the ICT by their children, whether inside or outside a school context, implies an improvement in learning and it is essential for their future in professional terms.

As far as the positive and negative impacts of the ICT are concerned, the Principal stressed out their use by students, even without being asked by the teachers, as well as the preservation of the environment (re-use of supports, decrease in the number of photocopies) and the fact that, even though the school has three rooms equipped with these technologies, they aren't enough to meet the students' demands. The expert points out that the positive effects are unavoidable and its tendency to generalisation and globalisation, due to the demands of students but also to the reformulations in the curricula leading to that. The teachers who use these technologies point out the motivation, concentration, the optimisation of information and of files, the speed, the possibility to reconvert and to re-use. One of these teachers referred that she once thought the computer might harm the teacher and student relationship but she then realised thanks to her practice

that it is still an important figure in terms of support, continuity, demand and guidance. As for the negative aspects, a resistant teacher points out a small deepening of the subjects and another one mentions a decrease in the intercourse between people.

Upgrading and involvement of the teaching staff

The professional valuation has been made through the daily informal support (by the Principal and the Counsellor) and through credited training in the area of the technologies in the scope of the Program FOCO. It should be stressed that teachers consider that some of that training is insufficient, too theoretical and incoherent with the practical needs. There are incentives to the use of the ICT, namely the support by the Principal's Office, which convey the idea of their indispensability. A teacher who uses them states that the fact that there is *a computer connected to the Internet in the teachers' room* is, on its own, an incentive, but a resistant teacher stresses that *the little availability of teachers* is a hindrance.

There is already a very strong dependence on the ICT, even though it isn't seen in the classroom or in more complex applications. Since there isn't a curricular area specifically dedicated to the teaching of the ICT, they have become integrated in transversal processes. The ICT have already become essential for the teachers who use them, not only for teaching but also to prepare materials, to communicate and to exchange materials over the Internet with other colleagues. The resistant teachers are less dependent on these technologies.

According to the Principal's Office, there is a decreasing need for training in the teachers who first arrive to the school, even though it is still insufficient as far as the technical training is concerned. In an attempt to make up for some of the gaps felt in this area, demonstrations of the informatics material existing in the school are made at the beginning of each school year.

From the analysis of the data collected in the ICT Practices Survey for Teachers (Compare Annex B), some important aspects should be stressed. The teaching staff is mostly made up of women (64,2%), aged between 29 and 40 years old. Most of these teachers have been working for a period between 6 and 10 years (17%). As far as men are concerned, there is a more equitable distribution in terms of the time of service. With a careful exam of the answers given by teachers, as far as the use of the Information and Communication Technologies is concerned, we noticed that the greater the degree of technical difficulty is, the less comfortable the teachers feel. While 49% of the teachers feel quite comfortable about writing an essay, only 3,8% of them feel comfortable when using or developing a database.

Generally speaking, teachers consider it important or very important to use the word processor and to search for information on the Internet, but they don't consider it the least important to create Web pages, to develop databases or to write a program. As far as the use of e-mails is concerned, teachers don't think it is very important. Thirty two percent of the teachers believe it isn't important to send or receive messages or information through this media. This fact seems quite significant since only now has the school started developing the use of e-mails by teachers in a systematic way.

Concerning the periodicity in the use of the ICT, teachers don't use them a lot – most of them use them on a monthly basis or just occasionally. Some of the tools that require a greater technical knowledge aren't used at all by most of the teachers interviewed. The teachers of this school feel they are reasonable or even poor users but they are all aware of their difficulties and, generally speaking, they all look for training in the area of the ICT. Only one of the teachers interviewed referred he had created or modified Web pages with his classes. Therefore, rarely is the use of computers by students taken into account for their assessment. When teachers ask students to make some research on the Internet, some limit that search by imposing some restrictions on them, whereas others refer some non-significant restrictions. In the classroom context, the computer isn't always directly related to the content of the subject since the curricula don't imply a direct use of the ICT. However, most teachers states they often use computers at home to prepare their classes.

The role of leadership

The teachers think the Principal's Office is responsible for these changes, namely today's Principal (who is

faced as a dynamic and very strong willed person), but they affect the whole school. However, they also state that change doesn't lie in the hands of a single person, but rather in the hands of a group of people, that is, of the whole school community. There is only the need for someone to cause things to happen. Two teachers stated that the reformation process started at the time of teacher Madalena Araújo (when today's Principal was still a Vice-Principal) who introduced the ICT in the scope of the MINERVA and that the experience of the flexible curricula was supervised by the University of Minho (Institute of Children's Studies). It may be said that there are some evidences that, in the future, the process of innovation and change in terms of ICT will involve an increasing number of teachers and it will stop being attributed exclusively to the Principal.

Connections between TIC-Reformation

The Information and Communication Technologies play a very important role in the scope of the implementation of the flexible curricula and in the rest of the activities related to the teaching and learning process of school.

The high rate of use of the Infoteca by the students should be referred as an example. It should also be added that the ICT are a vehicle for the development of the processes of integration of students in the school life, thanks to the School Clubs, namely the Environment and the European Clubs.

This becomes obvious in the rate of frequency of the use of clubs and of the Infoteca by students, the strong adhesion to and the use of the new *media* as tools for building up knowledge, specially in informal situations of individual or group work, such as making school works and researching for information. It is thus through the unrestricted adhesion of students to their new working environment that the success of the implement of innovation and change becomes obvious.

Some teachers feel at ease working with the changes and they try to keep informed, to adapt and to evolve. One of the teachers who uses the ICT says she didn't see any advantages in the curricular reformation and that she feels lost, despite considering there was an improvement in terms of equipment and of the classrooms.

According to the expert in the ICT, they are linked to innovation and to the improvement in the school, since they contribute to an improvement in all the fields related to the organisation of the school and to rendering better services in the scope of pedagogic issues in the school's educative project. In any of these fields, the ICT are essential tools, of which we should take the greatest advantage possible, benefiting from all their potential. According to the Principal, *as far as the (...) official production is concerned, the role [played by the ICT in the academic program] is still very little*, that is, there isn't any curricular area specifically dedicated to the teaching and learning of the ICT. However, as far as the *new management of the curricula related to the needs of students, some training [has been implemented] in the third hour of the home-room teacher, in that area, on the Internet and on the e-mail*, which has made it comprehend every single student and, in a way, to avoid the info-exclusion. This time, the ICT appear as a curriculum's transversal area.

From the point of view of the teachers who use them, using a computer motivates students for the practise of writing; it develops their creativity and autonomy, apart from causing them to acquire more vocabulary. Such a reality was described in an interview to one of the teachers following the project *Building an Adventure*, claiming that *the ICT have in fact brought about some advantages for the students. They are more motivated. Whenever I tell them we are going to the computers' room, they are in a different mood. They are more enthusiastic and awoken*. This teacher of the Portuguese Language also finds some advantages specifically as far as the subject she teaches is concerned. Since *the computer is a working tool that is different from the traditional one, it arises much interest and it can give more attractive answers than a book or a handbook. Quality is also very important, especially as far as writing is concerned. Using the automatic corrector, the correction is made easier and there is no need to do the work again*. The work made with computers is motivating and students often present their written work resorting to the word processor and to some research made on the Internet.

However, one of the teachers involved in the project feels sorry that, *as a teacher of Portuguese, I am*

limited in writing texts because, sometimes, I have to teach them to process before starting the real process of literary creation. In this school there is an effort for people to use the ICT but this is still difficult. In this teacher's opinion, there should be more training for both teachers and students, and it shouldn't be given based on the teachers' good will, but rather with a reduction in the teaching component for those teachers who are interested and motivated by training or with some teachers dedicated specifically to the training of colleagues and students. This won't necessarily act as a subject but rather as a club, so that it will be less formal and even more tempting. Most teachers don't teach students how to work with the ICT because they feel they aren't really prepared for it (except for the expert, the Drawing teacher and one of the teachers mentioned above). They think the level of students in what the ICT are concerned is quite fair, since they can use them and they know how to search for the information they need. However, they have some difficulty in using specific applications and in making a critical analysis of the material selected. Such difficulties may be related to their age.

Academic Rigour

The issue of academic rigour appears traditionally in the kind of use of the ICT and of its impact on quality and on the practices of the teaching and learning processes. However, the academic rigour isn't dependent exclusively on the materials, but rather on the attitudes, competences and strategies of teachers for the use of the ICT in education.

The use of the ICT appears as a means of promoting the quality of learning and its curricular integration is an essential issue, especially when the teaching and learning process is centred on the student and on the development of his autonomy. In that sense, it is essential to think about the strategies for the follow up of learning in a new environment, for which the development of new attitudes and competences by teachers is needed.

The teachers who use them state that these Technologies have set another rhythm and a change in habits, namely the presentation of works processed in the computer. As far as the students are concerned, the Principal refers that while some learn by themselves, others, who have no appetite, get training. In this sense, the ICT act as a valuable motivating tool. The non-resistant teachers mention that, in spite of not using them a lot, they are aware they are very important (opening up new horizons and other realities) and contemporary in a world where the image is essential. The resistant teachers also share such an opinion. Teachers who use these technologies state that there isn't much *software* specifically for the subjects they teach. They use the ICT whenever they can, for researches, to carry out some work with digital dictionaries and encyclopaedias, to explore the CD-ROM and for word processing.

Equity

Despite the obvious advantages of introducing the ICT in school, some teachers believe that as far as acquisition of knowledge is concerned, the weaker students are still in disadvantage, especially those coming from the less well-off milieus (some don't even have electricity at home). However, the fact that the school gives them other opportunities makes them feel more motivated to work.

One of the greater disadvantages of the curricular reformation in this school is the decrease in the level of learning and of skills since by being more comprehensive, those who have more skills are harmed by the slow rhythm imposed on them, which causes them to be less motivated in terms of their personal course. On the other hand, the difference between the good students and those with lower grades is more noticeable with the introduction of technologies. A resistant teacher states that *more skilled students always want a bit more and the less skilled ones have difficulty getting there*.

On who benefits the most, the Principal is peremptory when he states *we are all the ones who benefit*, but particularly the students. The statistics of occupation show that boys are the ones who look for these rooms more often and that the girls look for these rooms specially to make works, whereas boys use them mostly in entertaining activities, such as games. The main difference is between good students and those who aren't so good. The formers commit themselves and carry out self-learning activities and the latter prefer playing games. From the point of view of the expert, an empirical and systematic study is still needed to

try and perceive the students who take greater advantage of these technologies, since two things are obvious. On the one hand, some students have a computer at home and they use them more easily at school; on the other hand, those who don't have that resource at home, see in school the possibility of being able to use computers and even, according to the Principal, *a certain greediness in the need to use them*. To start with, it might seem that better-off students would take more advantage of these technologies but, in fact, the less well-off students use the ICT in school, which implies *a certain equity and there isn't a reproduction of these social differences*. This point of view is reinforced by the fact that there are no restrictions or discriminations in the access by any students, whether in terms of the skills and of the frequency in their use or in terms of their wealth. The school thus works as an equalising element. In the opinion of the teachers who use them, all students take advantage of these technologies. Yet, some benefit more than others: *those who are better-off, who have more opportunities in terms of studies, who acquired the basic knowledge in childhood (...) learn more easily and get there more quickly*, even if access is free and similar. According to a teacher who uses these technologies, the one who doesn't benefit from them is the student *who isn't motivated and for whom school doesn't mean a thing (...) [who fights] other problems that often go far beyond the school*. Generally speaking, all teachers state that computers cause a great enthusiasm in most students. They noticed that, in the beginning, boys adhered more than girls and that they have different aims (boys prefer the *chat* and games whereas girls concentrate more on investigation and research).

Discussion of the Hypothesis

It's up to us to discuss each one of the assumptions put forward for this case study. However, we should state that, from our point of view, in assumptions 3 and 4, the statements aren't mutually exclusive, since they occur concurrently on several situations.

Assumption 1

Technology is an important promoter of educational reformations, especially when they involve the Internet. The alternate assumption is that, when there is a true reformation under way, technology is only an additional resource and not a promoter, i.e. that the stimulating strengths behind the reformation also promote the application of technology to solve specific educational problems.

According to the data collected, the main assumption should be accepted and the alternate one refused. Technology is, in this study, the support for the development of reformation, through the creation of flexible curricula, even though they may be experimental ones. These flexible curricula are essentially supported by the information technologies.

The evidence in favour of this idea involve: i) the sensitivity of the Principal's Office of the school, which has implemented the process of creation of the flexible curriculum, for the educational use of technologies, which has a pioneer character, both regionally and nationally; ii) the existence of a small group of expert teachers who has secured the support of this initiative; iii) the creation of conditions for putting the learning into context, through the transversal use of technology; iv) and the recognition by the vast community of teachers of the impact technology has on the development of learning processes, promoting the broadcasting in school of practices of using technology with an increasingly larger dimension.

Assumption 2

The broadcasting of the reformation (and, therefore, of the ICT) follows the traditional pattern of broadcasting of reformations and innovations described by Rogers (1995). The alternate assumption is that the way technology works is different from that of traditional reformations and innovations and that its broadcasting pattern thus has different characteristics.

According to the data collected, the main assumption should be accepted and the alternate one refused. The model for the broadcasting of reformation (and of the ICT) in this school follows the broadcasting pattern put forward by Rogers (1995), *innovation, uncertainty, broadcasting, adoption/rejection*.

The evidences for accepting this assumption are based on the following aspects: i) the adoption and the broadcasting of reformation/innovation were the result of the school's initiative and will; ii) the existence of a group for its initial implementation influenced the community in a positive way, acting on its uncertainties and insecurities before the complexity of the projects (flexible curricula and innovation with the ICT); iii) and the development of communication channels, inside the community, through which it is now possible to promote the dialogue and the development of consistent individual representations of the dimension and the impact of ongoing projects in educational practices.

The creation of the flexible curriculum is closely connected, in this school, to the development of educational innovation with the ICT. In this sense, the guiding model for the creation of the flexible curriculum is also a project of educational innovation with the ICT.

The community's adherence to the process of implementing the reformation and the ICT has developed at the same time either in the involvement of the members of the community in the process of reflecting on the integration of the ICT in education and in the training people for using the ICT in educational contexts. It should however be stressed that this development is the result of a commitment of the first people who started using these technologies (the Principal's Office and the group of expert teachers) in the adoption of the reformation/innovation and in the inter-personal communication channels and processes through which it has become possible to widen the number of people using these technologies in the school.

Assumption 3

The efficient implementation of the ICT depends basically on the skills of the teaching staff to integrate the ICT in learning. This assumption considers that the effectiveness of the ICT is linked to the mediation of teachers and that their academic worth is positively related to the teacher's skills. The alternate assumption is that the school's technological infrastructure and the students' skills, and not the teachers' ones, as far as the ICT are concerned determine the results of their implementation.

According to the data collected, the main assumption should be accepted. The evidence for accepting this assumption is that the implementation of the flexible curriculum depended greatly on the fact that there are teachers with pedagogic skills in the area of this reformation, and in the development of the integration of the ICT in the learning and teaching process from a perspective centred on the student.

However, accepting the first assumption doesn't completely invalidate the second one, considering that the infrastructures and the students' skills were also important elements for the efficient implementation of the ICT. The existence of a technological infrastructure that secures a general access of students to these technologies, allows us to say it was and still is essential in the continued success of the reformation.

Assumption 4

If all students have a similar access to the ICT, the differences in academic performance between the poorer and the not so poor students won't increase. The alternate assumption is that in similar conditions of access to the ICT, the better-off students will tend to increase the difference in terms of academic performance in relation to the less well-off students (the poorer ones).

The data collected show that the main assumption should be accepted with some reservations and that the alternate assumption shouldn't be excluded, based on the evidence that the teachers' perceptions aren't unanimous for the assumptions being discussed. In fact, evidences suggest some controversial aspects that will be presented.

On the one hand, most opinions gathered suggest that there are no differences in terms of the performance of the two groups under analysis, in similar conditions of access to the ICT. However, the access under similar conditions in school, for both groups, according to some teachers, has very different indexes of use at first. These differences decrease and tend to become uniform as the activities are carried out. From this point of view, we may validate the main assumption, bearing in mind that there are no differences in terms of basic performances.

On the other hand, teachers also refer that, despite the situation of similar access in school, students carry

into the classroom a very large set of experiences, which in this area, clearly reflect the advantage of having a computer and access to the Internet at home. For these students (the better-off ones), experience is an advantage for using them in school, even when there are equal conditions of access at school.

In this sense, and according to the opinions collected, we may not exclude the alternate assumption, since a small difference today will be tomorrow's advantage, even though this small difference tends to decrease at school, especially when it is committed in building the educational innovation with the ICT and in creating conditions for an equal access.

Assumption 5

An effective implementation of the ICT will maintain or increase the academic patterns, despite the reduced quality of many ICT materials. The academic patterns depend on the teachers' and the school's expectations and not on the level of the handbooks or on the ICT materials or others. The alternate assumption is that using the ICT will lead to a reduction of the academic patterns since students will spend more time carrying out researches with marginal benefits and surfing the Internet for low quality contents and curricula.

The data collected advise us to accept the main assumption and to refuse the alternate one. Evidences show that an increase in the academic patterns is directly connected to the models of implementation of the ICT, namely thanks to the following aspects: i) the teachers' attitudes towards the opening up to innovation; ii) the teachers' skills in using and integrating the ICT in educational contexts; iii) the development of strategies for the use of the ICT in the teaching and learning processes; iv) the development, in students, of a critical reflection concerning the use of the ICT as a tool for building up their learning processes.

The experimental project of a flexible curriculum is supported by a whole new approach in the conception, planning, management and follow-up of the situations of learning with the ICT. The conditions for the success of this project aren't so much the existence of the media but rather the strategies for the use of those media.

From this perspective, the learning situations that teachers promote with the materials, and not the materials themselves, play a positive role in the development of the patterns of teaching quality.

5. PROJECTIONS FOR THE FUTURE

Sustainability

The sustainability of educational innovation/reformation with the ICT in this school depends essentially of the continuity of the processes of involvement and sharing among the members of the community of teachers, for building together the reflection on innovation, their representations and implications for the development of education.

From our opinion, sustainability also depends on specific elements in the area of implementation of reformation, such as: the teachers' availability to carry on a project of innovating work that requires a high degree of participation, as well as the ability to articulate the different stages of development of the project with the expectations of both the community and of guardians.

In terms of educational innovation with the ICT, sustainability comprises the specific dimensions of sensitisation and training of an organisation that has all the characteristics needed to become a learning organisation, guided for an opening up to the cycles of innovation, change and assessment of their performances.

It should also be mentioned that the sustainability of this school's project lies mostly in the development of an organisation with a growing ability for internal training, through a continual process of reflection, sensitisation and development of skills for the use and integration of the ICT in educational practices and processes, according to their members' needs and aims.

For the introduction of the ICT in school to be carried out in a sustained way, the Principal's Office doesn't overlook any opportunities for supplying the school with computing equipment. The Infoteca, which can receive a 25-student class at a time, isn't enough to respond to the increasingly more frequent daily requests of students and teachers, in an educational context. It is now essential to equip with multimedia

material (able to project data/video in a portable system) all the places where educational activities are carried out since they are already equipped with the access to the web. It is also important to update the equipment and the *software* in the school's administrative services. This leads to the starting point that the school wishes to change in the short term, bearing in mind the pedagogic and administrative point of view. For that purpose, the school applied to Action 9.1. (Equipping Schools with Informatics Material and Connections to the Internet and to the Intranets) of Measure 9 Information and Communication Technology (ICT) in Axis 3 LEARNING SOCIETY of PRODEP III. This application awaits ministerial dispatch.

Should this project be approved, the school intends to equip, during this school year, each one of the places where educative activities are carried out with computers, to update the intranet server, make available two portable systems for the projection of data/video (portable computer + projector), for activities in the teaching and learning process activities and, also, to train teachers from the school grouping (from pre-school teaching to the 9th grade) for the use of the computer, in a net, in a context of the curricular class. The replacement, in the short term, of the Intranet server, is still planned.

According to the Principal's Office, such an investment on the Information and Communication Technologies aims at decreasing the rate of school abandonment, to improve the school results at a global level and for taking advantage of the net's resources in a more effective and efficient way.

Therefore, as soon as it is allowed by the Ministry of Education, the acquisition and instalment of the equipment and the configuration of its *software* in the classroom in the seven educational organisations from the school grouping. As far as the pre-schools and the primary schools are concerned, the safety of the equipment will be dealt with, in each case, by the autarchy and the association of parents.

In what the administrative area is concerned, the Principal's Office wishes to update the equipment and the informatics applications. Such an update implies replacing the old-fashioned computers of the administrative areas in the: Management of Staff (including the salaries processing), Management of Students and Management of the Services of Social and Economic Action, and implementing the Computerised Management of Public Accountancy. At the same time, the net server will also be updated and the bet on the training of administrative staff will go on, resorting, when necessary to the support of the Training Centre from the Association of Schools of Braga/South.

In the attempt to assess the impact of using the ICT for the school innovation, this school intends to carry out a comparison between the levels of school failure in 2000/2001 and those of the last three years, trying to establish the correlation between the changes in the results and the introduction of the computer in the classroom. It also wants to compare the rate of school abandonment during the 2000/2001 school year and those of the last three years, trying to establish the same kind of correlation.

To carry out such an assessment, an inquiry, designed in the scope of the Coordination of Projects, will be applied to the students (two aleatory samples of 30 students) in the middle of the 3rd term, so as to assess the frequency of the use of the computer in the classroom with the following purposes: to exploit educational software, to solve problems, estimate and confirm results, and also to research and communicate information. Teachers will also be questioned (an aleatory sample of 30 teachers, from the different levels of teaching) in the middle of the 3rd term, so that the degree of the pertinence of using the computer in the classroom as far as the activities developed in the scope of the teaching and learning process will become noticeable.

By the end of the school year, a report will be written by the Team for the Projects Coordination, based on the statistic studies mentioned above, on the results of the students' evaluation and on data on precocious school abandonment. This report will be presented to the Pedagogic Board and its summary published in the school's Web page. It will also be sent to the higher hierarchic structures, responsible for its assessment and control.

As far as the administrative services are concerned, the Principal's Office wants to study the degree of the improvement of the services rendered and of the users' satisfaction. For that purpose, an inquiry will be

applied, based on interviews to both the users and the administrative staff.

Dissemination

The possibility of transferring the processes of change and educational development is closely connected to the kind of involvement and participation of the actors in the fulfilment of change, as we have tried to present in this study, since it deals with forming attitudes and not only with acquiring the skills needed to use the ICT. The large amount of elements that characterise this scenery doesn't allow us to define a dissemination model, but rather indicators that may contribute for this purpose and which are based on the good practices achieved by this educational community, as well as on the model of analysis and evaluation which is being implemented by the Principal's Office.

Apart from aspects related to the regulation of the implement of the reformation, its dissemination thus implies the mobilisation of teachers for becoming aware of the social role of the school in the promotion of equality in the access to education and knowledge.

In this sense, the dissemination of the educational innovation through the ICT will, as this school has been doing, imply a reflection on the importance that both the space and the time of learning have for the student, by trying to place the learning processes in the new spaces of mediation of knowledge offered by the ICT.

The school's Principal, together with the coordinator of the projects team, has been leading the innovation process, but a significant number of teachers have already been given training in the area of the ICT in Education. This group of teachers has been developing activities and projects, contributing not only to stimulate their students' learning but also that of teachers who are less skilled in terms of the ICT.

To contribute for a greater and better use of the ICT in an educational context, training in this area is already secured, comprehending all the schools of this Grouping (kindergartens, Primary schools and the EB 2,3 de Cabreiros School) in the next school year, in the project Global School, which aims to broaden training and to disseminate both knowledge and materials.

6. ANNEX A

The methodology used to develop this case study followed the recommendations of OECD for carrying out the study.

The research team was made up of five researchers, members of the Centre of Competence of the University of Minho.

The school was selected according to the criteria defined in the research handbook and a preliminary visit was made to present the members of the research team and the aims of the study and also to become familiar with the environment of the school and to organise the plan of work together with the Principal's Office.

The fieldwork was done at the beginning of January 2001 and the data were collected through semi-structured interviews to the Principal's Office, teachers, students and parents, surveys to teachers, outside-of-classroom observation forms. Documents related to the students' works as well as the photographic record of the activities of the students in the classroom, labs and the school outside areas were also collected. The data gathered were catalogued, classified and organised according to the matrix in the OECD research handbook.

A representative of the Principal's Office, an expert in technologies, eight teachers, eight students and three guardians were interviewed, 53 surveys to teachers were collected and four classes of the interviewed teachers were observed.

The teachers and the representative of the Principal's Office were interviewed individually, lasting an average of 1 and a half hours, with a length that varied between one and two hours. The interviews to students lasted around 45 minutes. The interviews to parents lasted around one hour each.

All the interviews were fully recorded in an audio and digital format and notes were taken about the interview, resorting to a portable computer.

The school's complementary materials and the students' works were catalogued and are available on the Internet, in the site <http://minerva.uevora.pt/ocde/cabreiros/>

7. ANNEX B Inquiry into the ICT Practices for Teachers

Age Groups / Sex	Female	Male	TOTAL		Time Working (year) / Sex	Female	Male	TOTAL
1. [23, 28]	15.1%	3.8%	18.9%		1. [1, 5]	13.2%	5.7%	18.9%
2. [29, 34]	17.0%	7.5%	24.5%		2. [6, 10]	17.0%	5.7%	22.6%
3. [35, 40]	17.0%	9.4%	26.4%		3. [11, 15]	13.2%	7.5%	20.8%
4. [41, 46]	7.5%	3.8%	11.3%		4. [16, 20]	7.5%	3.8%	11.3%
5. [47, ...]	5.7%	7.5%	13.2%		5. [21, 25]	5.7%	5.7%	11.3%
Won't say	1.9%	3.8%	5.7%		6. [26, 30]	3.8%	1.9%	5.7%
Total	64.2%	35.8%	100.0%		Won't say	3.8%	5.7%	9.4%
					Total	64.2%	35.8%	100.0%

How comfortable are you with using a computer to do each of the following?

(% of teachers)

Question	Very comfortable	Comfortable	Somewhat comfortable	Not at all comfortable
1. Write a paper	49.1	28.3	15.1	7.5
2. Search for information on the World Wide Web	13.2	20.8	35.8	28.3
3. Create and maintain web pages	3.8	5.7	17.0	75.5
4. Use a data base	3.8	15.1	41.5	37.7
5. Develop a data base	3.8	3.8	18.9	71.7
6. Send and receive e-mails	17.0	20.8	18.9	41.5
7. Write a program	3.8	7.5	13.2	69.8
8. Draw a picture or diagram	7.5	17.0	49.1	24.5
9. Present information (e.g. use PowerPoint or equivalent)	9.4	18.9	22.6	43.4

How important is each of the following computer-related skills for your teaching?

(% of teachers)

	Very Important	Important	So-So	Not Important
10. Write a paper with a word processor	41.5	35.8	11.3	7.5
11. Search for information on the World Wide Web	15.1	50.9	26.4	7.5
12. Create Web pages	1.9	13.2	35.8	45.3
13. Use a data base	11.3	32.1	37.7	18.9
14. Develop a data base	5.7	20.8	32.1	39.6
15. Send and receive e-mail	0.0	30.2	37.7	32.1
16. Write a program	1.9	15.1	34.0	41.5
17. Draw a picture or diagram with graphing/drawing software	18.9	45.3	26.4	9.4

18. Present information (e.g.: Use PowerPoint or equivalent)	18.9	41.5	24.5	15.1
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<i>During the past school year, how often did your students on average do the following for the work you assigned them?</i>				
(% of teachers)				
	Weekly	Monthly	Some times	Never
19. Use the World Wide Web	5.7	45.3	39.6	7.5
20. Create web pages	0.0	0.0	15.1	81.1
21. Send and receive e-mails	3.8	1.9	11.3	75.5
22. Use a word processing program	1.9	20.8	56.6	17.0
23. Use a computer to play games	5.7	7.5	30.2	50.9
24. Use a spreadsheet	0.0	0.0	20.8	75.5
25. Use a graphics program	0.0	0.0	26.4	64.2
26. Join in an on-line forum or chat room	0.0	0.0	7.5	83.0
27. Use a presentation program (e.g. PowerPoint)	0.0	0.0	18.9	75.5
28. Use an instructional program (including simulations)	0.0	3.8	20.8	71.7
29. Other computer uses (specify)	0.0	1.9	9.4	32.1

(% of teachers)			
	Good	Fair	Poor
30. How would you rate your ability to use computers?	9.4	45.3	45.3

(% of teachers)		
	Yes	No
31. Was student computer use ever evaluated for grading?	18.9	81.1

(% of teachers)			
	no restrictions	some restrictions	designated sites only
32. If you assigned World Wide Web searching, how much freedom did you allow students in locating sites to visit?	17.0	26.4	15.1

(% of teachers)		
	Yes	No
33. Did you create or modify a Web site with any of your classes?	1.9	94.3

(% of teachers)				
	all	most	some	very little
34. What portion of the computer use in your classes was directly related to the course content?	22.6	1.9	26.4	49.1
35. What portion of the computer use that you assigned was done by students individually?	11.3	17.0	20.8	35.8

(% of teachers)					
	several times a week	several times a month	some times	never	has no computer
36. How often have you used your computer at home to prepare your classes?	9.4	37.7	45.3	1.9	3.8

(% of teachers)				
	Yes	No		
37. Did you ever participate as a student or instructor in a virtual course through the Internet/World Wide Web?	9.4	88.7		
38. Did you ever involve your students in collaborative learning over the Internet/World Wide Web with students from other classes?	7.5	88.7		
39. Nowadays, do you use technology to cooperate with other teachers (professional chat rooms, forums, or others)?	5.7	92.5		
Number of times (% of teachers)				
	>11	6-11	1-5	none
40. How many e-mails messages do you usually send each week (on average)?	3.8	9.4	30.2	54.7
receive each day?	3.8	3.8	26.4	60.4
41. Did you make changes to a computer s hardware?	3.8	1.9	20.8	71.7
42. Did you update an application program?	5.7	1.9	32.1	58.5
43. Did you recover a damaged file?	3.8	1.9	30.2	62.3
44. Did you create an Internet page?	1.9	1.9	11.3	79.2
45. Did you develop a database?	1.9	1.9	13.2	79.2

1. ANNEX C

Extra information concerning the flexible curricula, material collected during the research, documents related to the School s Educational Project and the School s Nónio project and the link for the school s page are available on the Internet, in the site <http://www.minerva.uevora.pt/ocde/cabreiros>