OECD/CERI ICT PROGRAMME

A Case Study of ICT and School Improvement at

Escola Secundária Padre António Vieira

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1. Summary

We consider Escola Secundária Padre António Vieira (ESPAV) a successful example among Portuguese schools as regards the implementation and vulgarisation of Information and Communication Technologies (ICT) in the educational process. For quite some time now ESPAV has participated in events on ICT, developing projects in this field. Currently, it is participating in the European project of ENIS Schools. Although it is a relatively old school in Lisbon, it has kept up with the major changes which it has faced. Confronted with problems of school failure, largely due to a change in the student population, the school recently joined the reform programme "Flexible Curriculum Management" which has enabled it to put in practice the experience it has gathered throughout years in the field of the educational of ICT, which is in fact its reform plan.
The image below is the cover of a CD-ROM produced in 1997 by a group of students of a subject offered by the school called "Multimedia Workshop". We chose this image because we feel that it reflects the school spirit. On the one hand, it is oriented towards what is new and increasingly more relevant in our society – multimedia communication – on the other, it is connected to humanist ideals which are portrayed in the work of the school's patron, Father António Vieira, "missionary, public speaker and writer and a major figure of the Portuguese culture who also defended the Indians in Brazil at a time when their rights and dignity were at stake" and who lived in the XVII century.

The following sections of this report contain not only detailed information on the school but also an evolution of the innovation project which is essentially based on: the dissemination of ICT in the school, the curricular and extra-curricular activities and on the use of ICT as a medium for the creation of a school "that aims at being a work community where everyone, students, teachers, employees and parents/guardians contribute to the creation of a space for learning, development and self-realisation".

2. The past

Escola Secundária Padre António Vieira started its activity towards the end of the sixties as a high school for boys. The school is integrated in a predominantly middle class and upper-middle class residential area of Lisbon. Owing to its quality, the school's architectonic project is mentioned in Lisbon's Urban Guide. Even today it is considered a very pleasant place due to the green areas which not only surround it but also form part of it.

Throughout the years, ESPAV, as it is known by its members, has undergone profound changes not only as a result of the social, cultural and economic changes that have characterised the last decades, both nationally and internationally, but also as a consequence of the educational reforms that have taken place in Portugal since 1974 and of the specific changes that have occurred in the area where the school is located.

Among these changes, the most important, as a result of the reforms undertaken after the revolution in April 1974, is the transformation of the school from a high school for boys who, in the vast majority, wished to pursue their studies on a university level to a high school with the 3rd cycle of the basic education attended by both boys and girls from the neighbourhood as well as from the surrounding areas which socially are slightly more underprivileged.

As a high school with the 3rd cycle, the school now has under its responsibility the last three years of compulsory basic education which, in Portugal, goes until the 9th year of schooling. As a high school, it offers both vocational and general courses (which are the direct path to pursuing tertiary education studies).

As a consequence of the aging of the inhabitants of the neighbourhood where the school is located, the student population of ESPAV has been decreasing or has progressively been replaced by youths from other areas, some closer, others further away, from the so-called "Greater Lisbon".

In brief, ESPAV has changed from a school that was previously characterised by homogeneity both in terms of the social class and educational objectives of the students to a school that is now characterised by the diversity and multiplicity of proposals aiming at educating youths from different social, cultural and ethnical backgrounds and with very different interests and motivations.

The school's new situation, which was analysed by the teachers of the different subject groups and discussed in terms of the school's different organisational structures, is characterised in detail in ESPAV's Educational Project for 1998-2001[1] and identifies **school failure** as the main problem. This failure in part results from

"the inadequacy between the school (the learning situations) and the characteristics (tastes, values, priorities and skills) of the students and also from the inadequacy between the curricular plan and the new demands of the changing Portuguese society". This diagnosis leads us to the conclusion that "it is urgent to create a new teaching relationship based on a change of the roles of the teacher and of the student in the building of learning, and on the creation of everything that becomes necessary to bring about this new relationship". In identifying the possible causes of failure, the school's incapacity to "keep up with the rapid economic, social and **technological** changes of society" is explicit.

Once the major problem has been detected i.e. the poor achievement of the students, and the possible causes have been identified, the school's reform plan for the referred period is called "Educating for integration and citizenship" and has the following general objectives:

- “Promote a profound horizontal and vertical structuring, in the curricular organisation, namely in the Basic Education, that will enable active, rational, pedagogical and global management;
- Promote a school policy which, by resorting to partnerships, back-ups, Community with space and school services, will lead to the creation of material (infrastructures and technologies) and human conditions that will make it possible to achieve the above general objective;
- Develop and requalify transversal learning areas, i.e. situations (space and time) for curricular and non-curricular activities that give preference to overall knowledge, the individualisation of learning and know-how, play, the taste for discovery and the civic dimensions of education;
- Organise a systematised and coherent teacher training plan in interaction with everyday teaching life in accordance with the needs felt by teachers;
- Promote school dynamics that encourage the adoption of social rules of behaviour and knowing how to communicate that lead to conscious and responsible citizenship".

In order to meet the proposed objectives, guiding principles were drawn up that encourage active teaching methods, the articulation of different subject areas and the participation/bringing together of all the members of the school community. Also defined were minimum objectives and respective evaluation criteria, support to school projects, complementary curricular activities, general restructuring of the support, post-basic and post-secondary curricular offer, creation of workshop/technological and language learning areas and offering basic education students access to the subject of Introduction to Computer Technology.
The most important necessary physical resources listed in the project are: restructuring and equipping the study rooms, associated to a Resource Centre, so that they can be used by teachers and students, creating fun-time areas for cultural, sports and scientific animation activities, the dynamisation and equipping of the school radio, video and television clubs so that civic learning areas can be created.

The deterioration of the school facilities has for some time now been one of the management bodies’ concerns. Since approximately 1988 they have suggested building a technological space equipped with infrastructures that are “capable of providing levels of excellency required for the future”. As far as resources are concerned, the school has created back-up classrooms and has acquired computer equipment and provided access to the Internet in order to widen the possibilities of educational action and the offer of new technologies courses.
This educational project which arose from the discussion among the teachers of the different subject groups and was approved in a Pedagogical Council (by the Teaching Council) in 1998 follows on from previous educational projects in the school, started in 1994 and integrated in the start of the “Cultural School”. Since then the school has been concerned with the development, within the school community, of attitudes and values oriented towards citizenship under the motto “being a citizen of the world” (Coutinho, 1997). One of the consequences of such prospects has been to encourage the organisation of free-time and extra-curricular activities by creating Clubs, by integrating these activities with the formal curricular activities, by involving all the members of the school – students, teachers, parents, staff members – and by setting up collaborative work or partnerships with other institutions.
Within this scope, innovative proposals in the curricular and extra-curricular fields have been put forward and implemented using Information and Communication Technologies (ICT). These have been seen as “work tools

that generate new learning and communication processes" (Coutinho, 1997, p. 7). Some of the agents who participated in these initiatives were teachers with ICT experience, namely teachers who had formed part of the Minerva project team from the Faculty of Sciences of the University of Lisbon. The objective of this project, which ran between 1986 and 1993, was to disseminate the use of computers in Portuguese schools. This experience led to the creation of a nucleus of ICT teachers in the school that made it possible to continue the tendencies brought about by the Minerva project on the educational use of ICT and also to the realisation of different activities aiming at the achievement of successive educational projects which were generally approved by and received the support of the school's managing bodies.
From among these activities, the following are highlighted:

- the creation of the "Travessias" project which started in 1996 and whose aim was to create a communication space through the publication of a magazine – "Travessias" – and the creation of video material, designed and produced by both students and teachers. Participating students could be either from basic or secondary education and, at the start of the project, two classes (60 students) from the Communication Area participated permanently in the initiative;
- the "Environmental Education Club" whose aim was to carry out projects in the environment and nature conservation area. This initiative integrated the European project from the Comenius programme "Young environmental reporters" which involved using the Internet. Within the scope of the activities of this club, the students, as "journalists", published the results of their research in school newspapers and in the regional or daily press and exchanged opinions via the Internet with their European colleagues who were researching identical problems. ESPAV participated in this project in the 1996/97 and 1997/98 school years;
- the "3D Space" or graphic information, three-dimensional modelling and computer-assisted animation *atelier*. This space started as a club which lasted for two years, from 1987 to 1989, and is still advertised in the school's dissemination leaflets. This initiative seems to have given rise to the "Multimedia Workshop" subject directed at secondary school students;
- the "Technological Training in Multimedia Production" course, supported and co-financed by Prodep and which, in conjunction with the "3D Space", provided the teachers involved with experience and provided the foundations for the conception and realisation of the courses currently offered;
- project assignments within the scope of the "Introduction to Information Technologies" subject (an optional subject of basic education) developed by teachers from the Mathematics, Portuguese and Geography subject areas;
- creation of two circles of study in collaboration with a FOCO training centre called "Pedagogical dimensions of ICT in everyday school life" (which started in the 1997/98 school year) and aimed at training the teachers from the school on ICT.

In 1996, the Ministry of Education launched a new programme promoting the use of ICT in the educational process called Nónio in which competing schools could participate by submitting projects where it would be possible to request financing for different purposes, such as for the acquisition of hardware, software, training and specific project support. ESPAV entered with a project called "Citizenship on the threshold of the XXI century" which was approved and received partial financing and which permitted a significant approach of its objectives, i.e.:

- "to provide a follow-up to the activities previously developed in the school in the ICT field;
- to strengthen operative skills in the use of ICT, seen as generating a renovation of the teaching/learning process and of the teaching relationship;
- to help students and teachers to develop research and organisational skills as well as the ability to construct new teaching/learning models;
- to create an information community with a view to active, democratic and participated citizenship on the threshold of the XXI century".

This project was also designed to provide greater coherency between formal teaching activities in the

classroom and extra-curricular activities in which the school already had significant experience, such as consolidating the school's computer network so as to generalise the use of ICT by all school members, which would imply a "greater rationalisation in the pedagogical use of the existing computer equipment", among others.
Besides pursuing the projects already in progress in the school, the creation of a project with the following activities was also proposed: the creation and maintenance of a school Internet site, the creation of an Intranet to facilitate and encourage intra-school communication and the consolidation of a Resource Centre in the Mediatec. The project was approved and received financing to start the proposed initiatives. Given the standards of the competition, according to which each competing school should associate itself to an institution that could offer it support in achieving its objectives, ESPAV associated itself to the Nónio Centre of the University of Lisbon's Faculty of Sciences.
In order to encourage the use of ICT in the teaching/learning process of the different subject areas offered by the school, the project considered the following fields, directed at a target public composed of both students enrolled in the respective areas and teachers:

- Scientific – involving the Mathematics, Physics, Chemistry and Biology areas. The objectives clearly define the intention of promoting the use of the different computer resources that currently exist in support of teaching activities, namely with an audiovisual support as a source of simulations and games in "exploration and investigation experimental activities", in project assignments, in stimulating teachers to work in groups, thereby ending their isolation, and in supporting students with different learning rhythms;
- Artistic – involving the Graphic Computing (3D Space, mentioned above, and Multimedia Workshop) areas. The objective is for students to develop the capacity to visualise and construct three-dimensional objects and to use computer tools in a graphic perspective. The aim is also to encourage the teaching staff to use these resources in the classroom;
- Communication – which, in general terms, involves the school's initial projects already mentioned in this report, such as "Travessias" and the nucleus of "Young environmental reporters". It also includes new initiatives such as the creation of a "CD-ROM space" with the participation of a 12th-grade class, the aims of which are to familiarise students with the potentialities of the new technologies, to integrate this technology as a resource in everyday school life and to inspire in students the capacity to gather, interpret and reconstruct animation; the "EXPO98" project whose objective is to study the urban renovation process of a previously degraded area that gave rise to the 1998 International Exposition; collaboration in projects in the Psychology, Portuguese, History and Technological areas. These projects, which encourage students to use ICT as common resources for the success of their projects, are integrated in or use as resources many of the materials and know-how produced in other projects or subjects that form part of ESPAV's set of initiatives that use ICT.

The stability of the teaching body and the age group in which the majority are included (between 30 and 50, the latter having increased significantly), simultaneously express a high degree of vocational qualification and, possibly, also a natural resistance to change and innovation. For this reason, the School's Educational Project refers to the need to create specific training actions so that the previewed reforms can occur. According to the data of a questionnaire conducted on the teachers by the school's Executive Board, most of them have a positive assessment of the school, like what they do and were open to the fact that the school needs to join the autonomy process which was much in discussion by the Government at the time. Nevertheless, the school dynamic, which becomes evident with the previously mentioned projects in course, reveals a significant involvement of the teachers in the reform in course.

In the 1999/2000 school year, ESPAV joined the reform project promoted by the Ministry of Education "Flexible Curriculum Management" for basic education which in general terms "aims at promoting a gradual change in curricular management practices. The intention is to improve the effectiveness of the educational response to the problems brought about by the diversity of school contexts and to ensure that all students learn more and in a more significant manner"[2]. Flexible Management enables each school, within the limits of the national syllabus, to "autonomously organise and manage the entire teaching/learning process. This process

should be adapted to the different needs of each school context and may contemplate the introduction of local and regional components in the syllabus".
Joining the Flexible Management project gave the school not only the legal support to meet some of the objectives listed in the educational project but also the motive to disseminate the foreseen initiatives as well as others conceived later among the different members of the school, among which we highlight the teacher training actions carried out in the school.

3. The present
The observations included in this case study started with a visit to the school by different members of the research team during the "School Day" which was composed of artistic, cultural and sports presentations included in the "Science Week" which today is regularly commemorated in many Portuguese schools. The following report on the use of ICT made by a Brazilian colleague currently working with the team from the Faculty of Sciences is a good start for a description of the school at present as far as its reform and innovation project is concerned:
"The school has computers linked to the Internet where students can do their assignments. It also has a multimedia kit on each floor for teachers to use in their classes. This kit consists of a computer, a video, a tape recorder and a television and video cassettes or programmes can be viewed on the computer using very good sound equipment. The Communication students were presenting an assignment they had done in one of their subjects and they clearly used the material (ICT) with great ease.
We watched the presentation of a project that caught my attention. It involved the participation of black students where the presence of ICT made the difference. The students handed out stories and poems written by African artists and passed round photographs of themselves or of their family, showing the culture of their people. The presentation was very elaborate, using a data-projector, text and music.
In the Mathematics and Physics areas, rather academic experiences were presented, with no connection to or contribution by ICT. According to the principal, the teachers mainly use the Internet to do research work but not as a medium for teaching. One of the reasons for not using computers is because the assessment is done traditionally and due to the amount of time available. With traditional classes it is possible to finish the syllabus; however, if computers are used, it takes a lot longer and not everything in the syllabus is covered.
I noticed that the administrative staff use computers as the rooms and offices have networked computers.
The teachers we contacted were very pleasant and receptive. The students felt rather shy with the presence of strangers during the presentations. There was quite a lot of excitement in the school with the festivities and there were many visitors.
I think the school is well equipped but that it needs to encourage teachers to use ICT as a MEDIUM in their teaching".

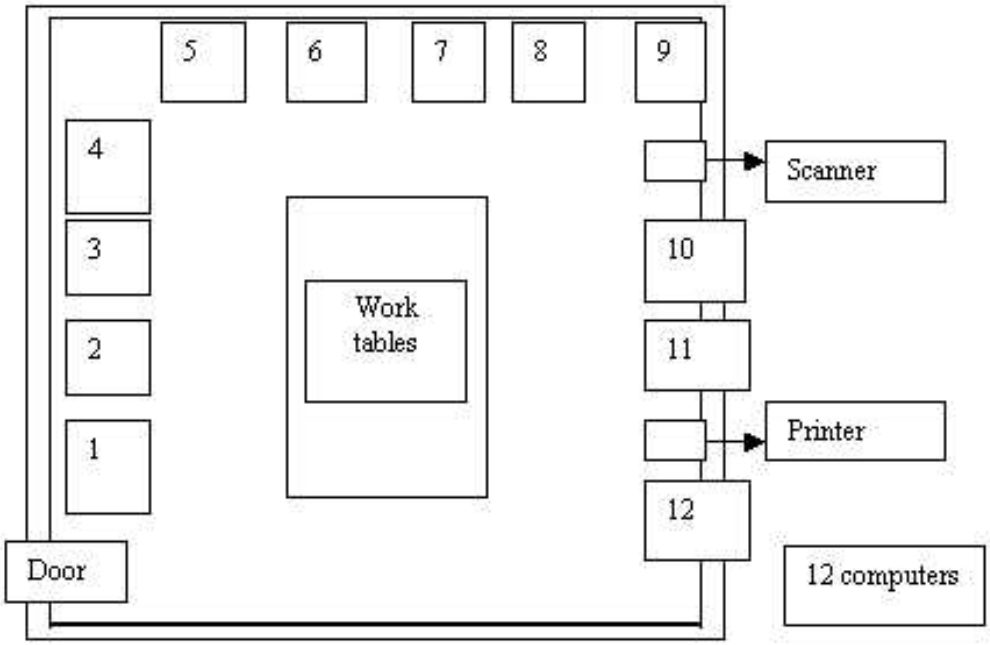
This report mentions some vital aspects of the current situation in the school:

- the development of projects within the scope of ICT carried out by students and integrated in formal subjects of the school syllabus;
- the creation of conditions to make available computers, multimedia hardware and a connection to the network to enable the effective use of these resources by students and teachers;
- the creation of appropriate areas where these resources made be used as a support to the curricular and extra-curricular activities;
- the exchange and sharing of knowledge and experiences among all the members in a perspective in keeping with the principles of the School's Educational Project "Education for Citizenship";
- the positive atmosphere that can be felt in the school, among all the school members, expressed by the availability for communication, exchange of ideas, collaboration and mutual help.

Among the initiatives included in the reform and which express the current state of the school, we highlight the following as these were the ones mentioned in greater detail by all the people we contacted.

ICT Resources available

ESPAV currently has five rooms entirely equipped with just computers (picture 1) which at certain hours of the day are clearly insufficient given the number of users. This situation has raised the need to create more computer rooms available for the students and to hire more staff capable of not only managing the activity in these rooms but also of resolving simple technical problems that may arise.
There are also computers located in many other rooms in the school: the staff room is equipped with four and the parents/guardians' room has two which can also be freely accessed by the teachers. Most of the offices of each subject group has a computer. There are also four computers available in the resource centre or mediatec which can be freely accessed by all the students who request it via a requisition system. This system enables the administrative services to manage the activity in the mediatec and also to control the type of use made (it can ban access to less advisable sites).



Picture 1. Model of a computer room

The administrative services, the secretaries office and the Executive Board are also equipped with computers. The ratio is one computer per 6 students, which corresponds to an unusual and enviable situation in terms of Portuguese schools.
All the computers are networked and linked to the Internet in two ways: via RDIS (Digital Network with Services Integration), whose usage costs are paid by the school, and via the RCTS (Science, Technology and Society Network) network, under the responsibility of the Foundation for National Scientific Computing, whose access is free for all Portuguese schools.
One of the school's major objectives is that all classrooms have access to the Internet, enabling it to be used as a source of information and clarification (for example, access to an electronic dictionary) and also as means of communication between classes or between schools. Access to the Internet in the classroom may also be, according to the predictions of the teachers who usually use ICT, a form of encouraging their more unwilling colleagues to use ICT as a resource in the teaching/learning process.
As a contribution to the dissemination of ICT and a better functioning of these technologies in the different curricular subjects and to the promotion of greater interactivity among the different subjects, the so-called "multimedia trolleys" (or "multimedia kits") are being created. These are mobile metallic structures that can be transported from one place to another: a computer, a screen, a video recorder, a DVD recorder, a data show and a webcam. The computer has appropriate software installed making it possible to use the potentialities of all this hardware to the fullest and can be easily connected to a suitable point in each classroom. In the classrooms

with Internet connections, it will be possible to watch or participate in videoconferences or in other real-time communication activities. In this way, teachers from different subjects may communicate from one room to another. Students may be speaking from one room to another and see each other via a video camera, which is lots of fun and very motivating. The idea is for there to be one kit for every three floors in the school. Currently there are two kits and all that is necessary to complete the third is a computer.
The trolley also came about as a practical need to be able to move the multimedia equipment to the classrooms with greater ease because the school is unable to equip all the classrooms, with at least one computer, due to financial reasons. The idea came from teachers in the school who participated in a meeting with other ENIS schools in Denmark in 2000 where they were introduced to a similar resource. The use of the "multimedia trolley" in ESPAV is still in an experimental phase. Training sessions are currently being held in the school so as to familiarise the teachers with this new resource. Response to these training actions has been very positive.

The school site and the creation of an Intranet
The school has had an Internet site for quite some time if we compare it with other schools of the same level of teaching in Portugal. The site contains general information on the school, its origins, who its patron was, its location and the characteristics of those who attend it. It has also published the school's educational project corresponding to the 1998-2001 period, the internal regulations and the school's curricular organisation, details on some of the subjects, a reference to the projects – national and European – in which the school is involved and also includes some pages with work done by some of the teachers and students. Nevertheless, according to the explanations of all of the teachers that were interviewed, including the principal, this site has been at a "standstill" for quite some time now as it has not been updated regularly as defined in the current rules of publication and maintenance of a WWW site. This fact has been a concern for all and after lengthy discussion among the school members that are more involved in this initiative, conditions have been created with the objective of resolving this situation. The solution involves training a group of teachers on Internet publishing and the creation of an Intranet that will later give rise to the reformulation of the existing site or the creation of a new one.
The existing site was created by the former principal and involved the participation of some colleagues, namely a Physics and Chemistry teacher, currently on sabbatical leave, who regularly published the work of his 9th-grade students, a Philosophy teacher who used a page he had created as a contact point with his students and which is known by everyone in the school, and an Arts teacher who also published his own personal page. According to some of the teachers contacted, the site was concentrated around a small group of people, had a relatively low participation by the students and needed to transmit a more global picture of the diversity of the activities in course and of all the school members. For its reformulation, a group of about 12 teachers from different subject areas was created. These teachers are currently attending a training action in the form of a project within the scope of continuing teacher training. This training action, which is held in the school and is co-ordinated by two of its teachers, broaches the topic of how to publish on the WWW, including the use of the Frontpage application and the design of the structure of the site. The primary objective is to create an Intranet, or in other words, the school's internal page.
This group is very heterogeneous. It consists of teachers with vast experience in the ICT field (at least two of them co-ordinate the training action) and by others who consider themselves as self-taught individuals. The group also includes teachers who have participated in training actions organised by the ENIS programme and other who volunteered to participate simply because they are interested in the subject and would like to collaborate.
According to the teachers involved, this internal site will take into consideration a set of objectives, the most important being:

- *the transfer of information on an internal level*, using a sort of internal mail through the creation of personal folders to which all the information that arises will be channelled. In this way, given the ease with which it is possible to access the existing network in the school, each teacher can easily and comfortably keep up to date on the events in which he/she has to participate. He/she can also have access to other important information that is constantly being received by the school's central bodies by regularly checking his/her personal internal mailbox. This resource will not be limited to the teachers but will be extended, in subsequent phases, to the students and school staff;

- *the dissemination of the use of this resource*, first among the teachers, aimed at the more reluctant ones who in this way may feel more motivated to check their mailboxes, and later in an attempt to make the best use of all the other resources available and to progressively familiarise themselves with ICT;
- *the promotion of "internal interactivity"*, facilitating and encouraging communication and collaboration among the teachers, which is important in itself in the field of the vocational development of teachers, particularly in the field of making better use of ICT in their own subjects, and which can also facilitate partnerships between subjects, which is one of the objectives of the reform project of flexible curriculum management;
- *encouraging the use of this resource as a work tool between teachers and students*. The pages of the Intranet can be used to publish the following: class newspapers, information and study materials, worksheets for students with solutions and tests for them to do, with the quick and individualised response of the teacher. Each subject can have a dedicated space where the following are included: the programme, links to other relevant sites, work done by the students and other documents that may be of interest as a back-up to the teaching/learning process of these subjects;
- *making available important documentation to the whole school community*, such as, legislation, courses and programmes offered by the school, data on the students' progress and suitable jobs on the labour market so as to help 9th-grade students who do not wish to pursue their studies and 12th-grade students who wish to choose between a middle-level course or a university course, access to sites with information on the programmes and courses offered by higher education institutions;
- *allowing access to and the requisition of works from the Mediatec's database* by any member of the school from any computer thus avoiding going to the Mediatec unnecessarily.

The teachers involved in this process are convinced that the Intranet is a very strong work instrument as it grants almost instant access to the Internet due to a wider band. In addition, if it is in fact conceived, which implies that a number of decisions have to be made as to its structure, contents and differentiated access, the teachers will feel more at ease in publishing their first piece of work and in this way they will feel encouraged to use this resources and to invent new ways of using it.
Creating this Intranet will also involve an experimental phase to understand and discover the best way in which the students can participate in the creation of materials and publication on the Web. Some teachers are a little apprehensive about the way students can use the Internet, not only as an information resource but also as a place for publication when the school page is once again available. The idea is therefore to include students in the creation of the Intranet. These students will be chosen from those whose teachers are involved in this process and who are developing multimedia projects. Students who are currently members of the school radio and cinema clubs and those belonging to the Student's Association will also be contacted.
Once the conception, construction, publication and testing of the Intranet is completed, the team involved in this project will then create the school's Internet page with the materials that are considered suitable to be made available to a wider public. It is thought that throughout this process not only will the teachers directly involved increase their skills in the field of publishing materials on the Internet but they will also provide colleagues who continue to have difficulties in using this resource with support. Everybody implicitly expects the Intranet/Internet to be used both students and teachers not only as a source of information but also (and most importantly) as an original communication and resource tool for new learning processes adapted to the reform programme associated to the P.E.E..

New Information Technologies – new subject offered by the school
The main reason that led the school to join the "Flexible Curriculum Management", better known as "flexibilisation" among the teachers, was the serious problems of school failure registered in the school. The existence of students from basic education (to whom this reform programme is exclusively directed) with many needs and difficulties of various types prompted a work group involved in curricular development that was created in the school to try and find forms of changing the teaching and working practices in the school in such a way as to bring about greater autonomy. This was made possible through the development of certain skills and knowledge that could be useful for most of these students who predictably would not pursue their studies in secondary school after completing the compulsory schooling[3].

Long before the launch of this reform project, the teachers in the school were already convinced that students should learn to use ICT as from the start of the 3rd cycle of basic education – 7th grade. There were different reasons to back up this argument: the unequal preparation of students at this level due to not only the enormous differences between them as regards access to a computer at home, but also due to the significant differences in the education offered by the different 2nd cycle schools where the students came from.
As from 1995, therefore, the so-called "workshops" were created where students accompanied by their teachers could develop projects, generally integrated in the curricular subjects, using ICT. This was one way of dedicating themselves to their studies whilst simultaneously learning to understand the possibilities which these technologies offer. Here they learnt how to make searches on a database and on the Internet, how to gather and process pictures and how to work with the basic tools: word processing, spreadsheets, databases and presentation applications. These learning processes were important not only for those students who had no intention of pursuing their studies but also for those who wished to go on to secondary school. Currently, students at this level of schooling are increasingly expected to have acquired a set of skills in using ICT and well prepared for approaching the different curricular topics.
This prior experience led the work group involved in curricular development, together with the school's Teaching Council, to create a new optional subject called "New Information Technologies" (NIT). This name was chosen so as not to confuse it with another optional subject that already forms part of the national regular syllabus: the "Introduction to Information Technologies" which basically consist of the introduction to computer sciences studies and which has mainly been chosen by students who wish to pursue their studies in this field.
The NIT aim to familiarise **all** students in the school with ICT and to widen their horizons as to their possibilities as work tools, not limiting their use to games and IRC platforms. This is a transversal subject and fundamentally serves to complement their other subjects, providing recourse to ICT. There is therefore no set pre-established programme. The teachers who volunteer to lecture this subject meet at the beginning of the year to define some general objectives and to create a very general programme. The most common learning methodology is project work encouraging the exchange of experiences and collaborative work, where students with more knowledge and experience can help others. The students develop projects chosen by themselves, or at the suggestion of teachers from that subject or from other subjects who would like students to study a specific topic in greater depth. In this subject it is also possible to work within the scope of the two Comenius projects in which the school has been involved.
The weekly duration of this subject is two hours – the last two hours of the students' timetable, allowing those students who did not enrol in this subject to leave school earlier and to have time to dedicate themselves to other activities. The NIT run for the three years that make up the 3rd cycle. The organisation, although very flexible, is as follows: in the 7th grade the basic principles of using ICT are introduced, involving the topics mentioned above in relation to the experimental workshops before the implementation of the "flexibilisation". In the 8th grade, students will apply ICT to the scientific subjects and to Mathematics. The 9th grade will be dedicated to art and art expressions.
Each class has two teachers. Most of the teachers volunteered to lecture this subject in the different grades and it was necessary to hire the services of teachers outside the school due to student demand. All the students from two of the three 7th-grade classes enrolled. Many students from the third class were unable to enrol due to other activities held outside the school. In 2000/2001, teaching of the subject started in the two 8th-grade classes and it is expected that in 2001/2002 teaching of ICT will start in the 9th-grade classes.
Although it is generally felt that this initiative is producing positive results in the learning processes and in the participation of the students, the teachers comment that a very big effort is being made due to certain pedagogical, sociological, psychological and technological factors (as regards the speed with which the existing resources become out of date) that need to be faced and overcome. The most important of these are:

- some students are somewhat lazy to create something original. They generally limit themselves to "copying and pasting" what they find on the Internet;
- some students are not interested in or sensitive to the composition and aesthetical aspects of their work. They merely go on working without first designing what they would like to do;
- the reactions of the students in relation to the limitations of the technology are very different. Some want

everything to happen “now!”, becoming impatient and losing interest in the work. Others are more patient (perhaps because the material they have access to is of better quality);

- there are some students who have no inclination towards ICT and sometimes have destructive behaviour in relation to the existing materials;
- the 8th-grade classes are particularly difficult, perhaps because of the age of the students (teenagers) or lack of interest for scientific topics. In this case, it was decided to create a newspaper for each class, which led to greater interest and participation.

Despite everything, a lot has already been done of which the school community is aware: on the school day, many articles written by the students were displayed and could be read by the other students, by the parents and by other visitors to the school; at Christmas, the school sent Christmas cards which they had created in these classes and the school newspaper, the most complex project, is progressing slowly. Each class created its own logotype and is currently working on the topics they chose to be published. In future, these newspapers will be available on the Internet and later they will be selected for publication on the school site.

Multimedia Workshop – One of the prides of ESPAV

On a secondary level, the school offers integrated courses in 4 groups[4]. Each of these groups provides the necessary courses to pursue university studies, the so-called “general courses” and two technological courses (of a vocational nature) which are the “Arts and Trades” courses, included in the 2nd group and the “Communication” course included in the 4th group. The syllabus of all the integrated courses, in all of the groups, includes a subject called “Multimedia Workshop”, better known as “MMW”. The number of teaching hours of this subject is different in each group, the maximum being six hours a week in the technological course “Arts and Trades” and the minimum being two hours a week in the courses of the 1st group.

This subject started in 1996/97 when it was possible, through funding obtained via the PRODEP, to offer 12th-grade students or those who had already completed it an after-hours course. The final result was an interactive CD-ROM containing the work produced. The cover of this CD-ROM is included in the introduction to this report. The success of the course and the possibility of additional funding from PRODEP permitted the creation of a new course with the same title but this time directed at 10th, 11th and 12th-grade students from the technological courses, and during normal school hours. The good results achieved gave rise to a proposal, presented to the Ministry of Education, for the official creation of the “Multimedia Workshop” subject as part of all the secondary school courses offered by the school. This proposal was accepted and the course is currently in full operation.

The objectives of the MMW are as follows:[5]

- to understand the importance of the new technologies in the creative processes, in the production of cultural goods and in their dissemination;
- to understand the importance of computer means in the economy of investigation and projection processes, namely through the two- and three-dimensional representation of the project components;
- to understand the importance of computer means in the economy of the dissemination processes of cultural goods and knowledge, namely through hard digital media (CD-ROM), interactive databases and the Internet;
- to access projection, in the two- and three-dimensional and interactive forms, with recourse to computer applications;
- to understand the operative methodologies of the new technologies so as to ensure permanent updating and learning throughout active life.

The methodology used is project work based on problems that are put forward throughout the classes. Both collaborative group work and individual work are encouraged, depending on the tasks that are being carried out in the context of the problems addressed. The classes are generally given on a partnership basis when there are more than 6 students per class.

The main topics covered are: basic hardware and software concepts, saving mechanisms, communication networks; operative systems and controls; projection methodologies, representation systems and specific applications; vectorial design and raster pictures; two- and three-dimensional modelling; sound and video digitalisation; script and hypermedia integration.
The teachers that are currently in charge of this subject feel more like dynamists than teachers. They have basic training in architecture and throughout their vast experience acquired at ESPAV they have dynamised and participated in training actions of graphic computing. They have, also, in their own words "learnt with their colleagues and with the students!"
The results obtained by the students have been considered as excellent by the teachers, which is proven by their high marks. The teachers' perception is that in general the students like the subject as they are very dedicated and are capable of devoting a lot of their time to the success of a specific project. According to one of the teachers interviewed "this happens because the students wholeheartedly enjoy what they are doing! It's more related to them, it's more related to the world outside the school".

ICT as a tool in the different curricular subjects
The use of ICT as a tool in the teaching/learning process of the different curricular subjects, both on a basic and secondary level, continues to pose a problem in the context of ESPAV's reform programme.
Judging by the comments made by those interviewed, by the observations carried out and by the results of the teacher surveys, there are very few of them who feel capable of innovating their teaching practices through the application of the different possibilities of using ICT as aids in the teaching/learning process. The teachers generally feel conditioned by a programme where basic school students are assessed on a school level while secondary school students are assessed on a national level. For this reason, in formal classes, and particularly at a secondary level, they prefer a clearly transmissive and demonstrative teaching model.
For at least 15 years now a group of teachers from different areas, especially from the Physics, Mathematics and Language areas, many of them former participants in the Minerva project, has been concerned with this issue and has taken initiatives to train their colleagues and to disseminate ICT as a tool for learning within the scope of the syllabus. The initial idea was to organise an area with computers where this kind of learning could take place and which interested teachers could use to learn new perspectives, discuss how these could be brought about and obtain information on how possible problems could be resolved. These initiatives produced positive effects and little by little some teachers started integrating ICT in their teaching practices.
With the gradual increase in the equipment available and accessibility to ICT, the fact of being associated to a teacher training centre (approximately 20% of the teachers are trainers in this centre) and the very dynamic that currently exists in the school, the number of teachers who use ICT has been increasing but the practice is not yet generalised.
A teacher belonging to this initial group explained to us that the idea is to disseminate not only the technologies themselves but also the methodologies for using these technologies as a support to student projects. The objective is to "create a spirit in the school to integrate the technologies naturally in the syllabus, in the subject areas, both as far as the compulsory syllabus is concerned and in transversal areas". The circles of study continue to be held in the school, dynamised by a large group of teachers. Nevertheless, many difficulties persist, the most important being:

- a specific form of resisting to the change. It is currently accepted that ICT can benefit learning and make the classes more attractive to students; there is also some degree of mastery of many of the ICT modalities that exist at present. However, the teachers feel that they still **do not know everything** and fear that something may go wrong during a class;
- the students themselves are a limitation. There are some students who know more about computers, about the Internet and how it works than the teachers. Some teachers feel threatened by this fact and are therefore intimidated to use ICT while others are capable of taking advantages of these situations and use them to integrate the class and to have these students help the others;
- the classes are more complex and require a lot more preparation time; the teacher needs to prepare him/herself on the specific technology that is going to be used, many times requiring practice in using the hardware and software, as well as on the didactic structuring. As this form of teaching is basically focused on the students it is very different from that which the teachers, especially the older ones, are

used to applying;

- the running of the classes. Having the students bunched together in groups, facing the computer, often completely absorbed by what is going on there, with their backs to the teacher, speaking to each other and then suddenly impatiently calling the teacher, asking for clarification on a variety of doubts, creates a new type of "confusion" that is far from the "confusion" which experienced teachers are generally used to managing;
- the volunteer basis on which the teachers work. With the exception of some indications on the Mathematics syllabuses on the use of graphic calculators, there is currently no educational policy in Portugal that clearly defines the educational use of ICT in the teaching/learning process in the curricular subjects;
- the inexistence of evaluation mechanisms in the ICT field integrated in the curricular subjects. In this way, the skills which research has shown to be possible to develop in students through the use of ICT are not presently taken into consideration and consequently are not included in basic or secondary school assessments.

These last two factors are obviously not associated to the school but rather to a national situation that must be resolved. The assessment issue has already been discussed in ESPAV. According to the Director of the Executive Board, this issue has been addressed at different moments in the current school year, namely by the Teaching Council, where the assessment criteria in this field and the respective weights to be given to each have been examined. The traditional idea of an assessment based on the results of tests has been questioned lately by the introduction of ICT in the teaching/learning process due to the new skills which the students display and the different types of activities carried out in the classroom. It is necessary to think of some alternative forms of assessment which express what the students are learning in a valid and reliable manner.

4. Main Hypotheses

After the days we spent in the school, speaking to its members, observing what went on there, analysing the data and trying to understand the role which the ICT have played in the school, the hypotheses which gave rise to this study now seem to be too reductive, not to mentioned simplistic. What is happening is much more complex than comparing two different perspectives, one as an alternative to the other and to make a clear choice for one of them.

The two alternatives possibly coexist, or not, or there are perhaps others; possibly factors that were not thought of before are present, significantly conditioning that which we are trying to study.

Despite these limitations which are part of the actual design of this study, it is possible to discuss the hypotheses put forward and, based on the data obtained, to make a contribution to understanding a technology which already has a clear influence on our lives and which may play an even bigger role in our education and training, the future of ICT being difficult to predict.

Hypothesis 1

In the case of ESPAV, technology has clearly been a strong catalyst of the school's reform. Even before the Internet and due to the conviction and intervention of a group of early adopters of ICT, to which the president of the school's Managing Board belonged, important decisions were made which had the following consequences:

- the creation of new types of classrooms – computer rooms – which in turn gave rise to new learning environments, expressed in different types of activities, different attitudes in the classroom (both of the students and of the teacher), interaction among students, between students and teacher and possibly between other participants with whom it is possible to work given the new resources;
- the use of new aids in the teaching/learning process, often on the initiative of the students but which make possible a new approach to the topics to be studied and most importantly of all, greater participation of the students in this process by carrying out projects on topics of their choice or suggested by the teachers, whose products can then be placed at the disposal (and criticism) of the school community and outside it;

- the modernisation of the school library, the Mediatec, to include a resource centre granting access to a much wider variety of reference resources than those which were available in the beginning. In this school, research work has become an essential activity as a complement to the learning acquisition and construction procedures;
- the specific training of teachers, leading to a diversity of action modalities incorporated in the national continuing teacher training plan, carried out by teachers in the school in collaboration with a training centre;
- the creation of new curricular subjects that bring new contents, skills and teaching methodologies to the basic and secondary syllabuses;
- the creation of an Intranet that will enable not only new communication mechanisms and habits among the school members, but also new forms of working among teachers and between teachers and students.

Nevertheless, these innovations may lead to an improvement in the school's failure rate, ESPAV's big problems, and may contribute to the "Educating for integration and citizenship" which is the school's major target at present. Many of the innovations brought about by the application of ICT may give rise to opportunities to meet the objectives of this project.
It thus becomes difficult to define the borderline. In ESPAV's case, ICT appear simultaneously to be an indispensable catalyst of the reforms that have taken place in the school and a medium with its own potentialities that will make it possible to solve specific educational problems. In the particular case of ESPAV, the fact that **all** the students have the possibility of acquiring basic training in the use of ICT should be highlighted as this does not happen in many Portuguese schools.

Hypothesis 2
What was possible to describe in this case study seems to follow the traditional dissemination pattern of reforms and innovations described by Rogers (1995). In brief, it is possible to identify aspects observed in this study which are contemplated in Roger's theory:
According to Rogers, an important factor in the rate of adoption of an innovation is the compatibility between the values, beliefs and past experiences of individuals in specific social surroundings. ESPAV, as a social surrounding, is characterised by a teaching body with vast experience in shared work. Past experience reveals the sharing of ideas on the importance of innovation in the ICT field. The ability to implement a School Educational Plan that involves negotiation between the school members, organised according to the different administrative bodies (on which parents/guardians and students have a seat on some) reveals the existence of compatibilities or the capacity for negotiation between its members. In addition to these characteristics are others, also referred by Rogers, such as: **the innovators are members of the school** and, in general, they are prestigious members not only due to the knowledge and experience they have in the ICT field, but also due to the positions they have held and the initiatives they have dynamised in the school. One of the initial innovators was principal of the school for several years and the current principal, besides supporting this innovation is also an ICT user in different activities, namely in the teaching/learning process of Mathematics, of which she is a teacher; **the dissemination of ICT is oriented towards its clients**, in this case the teachers. The many training actions and the availability shown by the innovators to clear up doubts and to offer support when asked are examples of this.
As regards the innovation-decision process, there are five different stages: 1) knowledge; 2) persuasion; 3) decision; 4) implementation and 5) confirmation. The observations carried out in the school show that the dissemination process of the innovation that took place here is at stage 4. Different initiatives are in full operation while others (application of ICT in regular classes) are possibly still at stage 3 – decision. The school appears to be going through a particularly sensitive period in this process, i.e. the continuation of the successful dissemination of this innovation will possibly depend on the results of the implementation.
Rogers considers different categories of people in the field of adopting the innovation. There are: 1) the innovators; 2) those who adopt them from the start (early adopters); 3) initial majority; 4) later majority; 5) latecomers or those who do not adopt them at all. It is possible to predict, in a given innovation dissemination process, the relative percentages of each of these types. In ESPAV's case, although there are no data available to make a precise identification, na initial majority situation can be predicted, which corresponds to the fact

that approximately 34% of the teachers in the school are in full process of adopting ICT in their practices.
The brief experiment that has just been carried out serves to reaffirm the usefulness of the theoretical and practical basis which Rogers' work provides. However, in the case of the innovation dissemination process in the school environment, certain issues should be addressed, namely those related to the school culture and to the vocational development of the teachers, to mention just some of the two lines of research in education that may contribute more to an understanding of the factors which determine the adoption of ICT in the educational process.

Hypothesis 3
The data obtained point to the confirmation of this hypothesis because, without teachers who are interested in adopting ICT and without competent teachers to integrate ICT in learning, effective implementation is not possible. Nevertheless, this is not the only element, and the effectiveness of ICT may involve this aspect but it also involves all the others which are presented in the alternative hypothesis. Thus, the results of the implementation of ICT are determined by a set of factors which, on the basis of the study carried out, are highlighted: the culture of the school, expressed here in the consideration of all the members of the educational community, in the relationships that are established between them and in the environment that can be "felt" of these relationships; the management of the school as playing a decisive role in the different decisions with implications in the implementation of ICT; the support offered by the governmental bodies, granting an opportunity of time and, most importantly, acknowledging the initiatives and the efforts of the innovators, the equipment, which should be updated on a continuous basis and kept in good running order; the students who need to be heard and who need to be given opportunities for more active participation. The issue should not be put simply in terms of skills but also in terms of the feelings, perceptions and expectations of the people involved.

Hypothesis 4
The data point to the alternative hypothesis. This situation does not refer specifically to the issue of ICT implementation but has been present in many innovations in the field of education, namely when an attempt was made to disseminate the new teaching/learning methodologies of sciences by discovery. Students of rich parents generally tend to always benefit more from the innovations than those of poorer parents. The gap between them widens instead of narrowing. This means that if an effective implementation of ICT in education is intended, it is not enough for students to have access to the technology and respective training in the school, but that mechanisms should be created to support those who have difficulties or who cannot ask for support outside school. In this case, Rogers' model may be insufficient to understand these innovation dissemination process, as was previously seen in the approach to hypothesis 2, but resort should be made mainly to the knowledge brought about by different lines of research in the field of sociology of education.

Hypothesis 5
The data obtained in the present study are not sufficient to back this hypothesis but they are also insufficient for a more in-depth discussion that these statements deserve. What happens is that, having as a foundation application methodologies based on the experience in the school and in educational research, ICT bring a new contribution to the education and development of youths and are a resource that widens the research and communication possibilities in a way in which, until now, no other resource has been able to do.
The use made of each resource depends on each individual. A good educational project will certainly guide a youth of any age to make maximum use of the potentialities which this new resource can provide. Despite the difficulties, the mistakes (with which one learns) and limitations, the practices observed in ESPAV point in this direction; and certainly many other schools throughout the world will share this perspective.

5. Projections for the future
Table 1 below summarises some of the data obtained throughout this study.

Table 1 – Organisation of the data gathered

Evaluation of the Change	
1. Dissemination patterns	• School's Educational Project • Appropriate equipment • Creation of an Intranet • Creation of new subjects • Teacher training • Informal support
2. Upgrading and involvement of the teaching staff	• Growing involvement (encouraged by an initial group of approximately 20% of the teachers) • Voluntary work • Personal, vocational upgrading • Weak upgrading by the Ministry of Education
3. The role of leadership	• Implementation of the School's Educational Project • Support to the initiatives involving the reform • Development of the relationships/meetings between the different school bodies
4. ICT/Reform connection	• Very close relationship. The Flexible Curriculum Management reform programme on which the school embarked made it possible to put into practice many of the ICT implementation initiatives
5. ICT infrastructures	• 5 classrooms prepared with 12 computers each • Mediatec/resource centre • Internet (currently being reformulated) • Intranet (currently under construction) • Ratio: 1 computer per 6 students
6. Effectiveness	• Variable according to the initiatives: success of the new subjects (NIT, Multimedia Workshop); increase in the use of ICT by students and teachers; diversified and appropriate teacher training; use of ICT in the study rooms and in the project areas.
7. Academic rigour	• No data are yet available that would make it possible to establish a cause and effect relationship between the results obtained and the initiatives taken within the scope of the reform. All that is available at the moment are the perceptions of the school members.
8. Equity	• All the students may enrol in the NIT • Great heterogeneity in the computer resources of students at home • Different support offered by the parents • Girls show more difficulties initially but their work is of better quality than that of boys.
9. Sustainability	• Very stable teaching body • Evaluation in 1998/2001 of the School’s Educational Project • Negotiation in 2001/2002 of a new Educational Project • Application for funding • Parents approve the initiatives involving ICT learning • Establishing protocols and partnerships with higher education institutions

The reform process is still in course and very little data is yet available to permit a more secure outlook on the sustainability of this process. Nevertheless, given the school's experience, the results achieved so far and the continued initiatives to encourage the generalised participation of the teachers, it is foreseen that the project will continue and will bring about positive results. It should be highlighted that, as referred in the discussion of the study's hypotheses, the many aspects that were investigated in this study are not, in themselves, enough for an effective implementation of ICT. The contribution of other areas of investigation, as well as a more detailed understanding of the culture of this school are important factors for a more reliable prediction of the future. In any case, the above summary table which mentions the types of action that should be implemented can serve as a basis to other schools who wish to pursue ICT implementation processes.

6. Annex A - Methodology

The study started with a series of contacts with teachers from the school who could give us an idea of the school's receptiveness to the study. A teacher, whom we consider a key-contact, gave us a first description of the current situation of the school and of the possible limitations of carrying out all the data-gathering mechanisms foreseen in the study plan.
It was also this teacher who contacted the Chairman of the School's Executive Board who accepted to have a first meeting with this study's team leader, Isabel Chagas. Present at this meeting were, besides Isabel Chagas, the School Principal and the Teacher with whom we made the first contact and who, throughout this study, offered her support in the accomplishment of all the planned activities.

Entry negotiation
We were told that the school has undergone many studies and investigations, reason why the teachers are fed up with answering to all the requests, and especially to all the questionnaires that have come up. In view of the limitations identified and having as a reference the programmed study plan for the current investigation, it was decided:

- To interview the Chairman of the School's Executive Board who was willing to give us her support and to provide us with explanations whenever necessary. This teacher, an active participant in the school's reform process, also provided the necessary explanations on this aspect;
- To interview 5 teachers involved in the different initiatives within the scope of ICT. Some of these teachers are on the school's Executive Board which meant that they were able to give us their opinion on the reform process. One of these teachers, with vast experience in the application of ICT in school, including the implementation of computer rooms, of areas with access to ICT and the creation of the Internet, also answered some of the questions foreseen in the script for the interview with the technician;
- To interview 6 students in a group and students at the end of the observation of some classes;
- To observe at least 10 hours of classes in subjects at the school's choice;
- To issue questionnaires which were placed in the teachers' lockers. We were warned that the response rate would be very low as teachers were fed up with answering this type of documents. In fact, the response rate was very low – 18%;
- Owing to the difficulty in setting up appointments with parents/guardians, it was decided to contact class directors who have data on the reactions of the parents/guardians in relation to the reforms processed in the school or to add questions on this issue to be asked to the teachers and students interviewed;
- To place documentation at our disposal. A considerable amount of information on the school is available, namely via the Internet site, the documentation produced and also via the newspapers it publishes;
- To publicise all the school's initiatives to which the team would automatically be invited to assist, as for example, the science week and the school day;
- The period for collecting the data widely exceeded what was foreseen in the study plan. It lasted for

approximately 15 days but was interrupted for several reasons, namely the Carnival holidays, which significantly delayed the gathering and processing of the data, as well as the drafting of the report.

Mode of operation of the team
The team, composed of four members, initially consulted the documents sent by the this study's organisation. Essentially the data-gathering documents were discussed and decisions were made as to their adaptation to the study's objectives and to the limitations which the school could present. These limitations would be oriented towards the objectives, but with a great deal of flexibility, so as to be able to gather other relevant information. All the interviews were recorded and transcribed. The analysis of the content was made on the basis of these transcriptions. The teacher interviews were carried out individually and lasted approximately one hour each. The students were interviewed in groups so as to achieve their more active participation.
The guidelines for the class observations were used very flexibly. It was decided to draw a narrative of each class from the notes that were periodically taken by the observer.
A detailed analysis was made of the school site and of the documents to which we had access. This analysis was oriented by the study objectives and by the various hypotheses.

7. Annex B - Documents used for analysis

- ESPAV's Educational Project for 1998/2001
- ESPAV's site on the Internet
- ESPAV's Regulations
- Flexible Curriculum Management Programme
- Nónio Project - Citizenship on the Threshold of the XXI Century - under ESPAV's responsibility
- Report on the Visit to the School Day written by Estevão Ribeiro from the Universidade de S. Catarina, Brazil
- Development of Graphic Computer Sciences at ESPAV - document presented at the exhibition organised within the scope of the 1997 Netdays
- Getting to Know Africa. Prospectus distributed by the Communication students during the presentation made on the School Day
- School Newsletter
- 5 numbers of the *Travessias* Magazine
- 1st number of the “Tok’a Ler” (Let's Read) Newspaper, which is part of the “Travessias” project.

8. Annex C – Application of ICT in a curricular subject
A teacher's story

I – An how do you integrate ICT in your classes? What kind of work do you give your students...
T – Well, I have different lessons. The subjects, they are all subjects as well... there is a completely different integration. For example, I have an area related to Technologies, the subject is actually called Technologies related to the Communication course, which is a Technological Course, and it's obvious that in this class we always use the computer. But we don't always use the computer. Why? Because the aim of the subject is to integrate the computer in assignments that the students are going to do. And at the beginning of the year, of each term, we take stock, first we talk to the students about the projects there are in the school, which the school has and which the students can voluntarily join. Then the students present a different project in which they would like to participate. On what subject? Well, we have a school project, an individual student project and an individual class project. It normally takes about three weeks to define the strategies that we're going to use, the projects that we're going to integrate, who, the division of tasks among the students and the creation of

a work file where they know exactly what they have to do. We then decide what the activities are and what has to be done to produce the materials. And at that time we often have to go outside the school, we often go outside the school, to... we are a team of reporters, not just photographers, who do reports outside the school and carry out interviews and surveys. So, all of this is done on the computer, but we go outside the school. These students are from the Communication area so the aim is to simultaneously create the spirit connected to the Communication's field today. We also go out often to see exhibitions, for example. At the beginning of the year we go and see the power of image at the World Press Photo Exhibition, which is on at the CCB (Centro Cultural de Belém) every year. We carefully analyse the power of image so that we can understand how to use image on the computer, how image works as a much more powerful force than text, how to create subtitles, how to find what is essential and remove what is accessory, how to set up an interview. We will then use the computer to reorganise all the material we made outside the school or in the school. So, the students from those areas are all working with me in projects, either the same project... or different projects.
And they have set times to deliver the final product. Therefore, each of them already knows that by the end of the month, by the end of the term, they have a set path to follow.. if they have to perform certain activities, carry out certain types of research, and they also have the Internet, but they also have all the other resources... We work very hard, for example, to examine a research topic. What does the Internet provide and what does the Mediatec provide, what does a book, an encyclopaedia, an interview offer that is different from what the Internet provides, so that they don't think that Technology provides everything, no way. Know how to make a careful selection, take only that from the computer and restructure it. In other words, always have a critical outlook, not only towards the information that is gathered, comparing it with what exists in encyclopaedias, in books, etc., but also know how to go about selecting the vital elements. In other words, Technology helps us to develop a critical spirit, a spirit or research, the designing of materials. As far as designing materials is concerned, I'm very strict, in terms of the graphic designing of the documents they are creating. The students started... for the past two days we've been visiting all the bookshops and have found books related to design, etc. to see the design of the elements. What is a logotype, how is that book paginated, the importance of colour in certain elements, how do words stand out in relation to other elements, so that when creating their own documents they also start defining their own exigency in the final presentation of their documents so that these are well done... appealing, we are living in the era of appeal. These students' work is also related to publicity, marketing, so they have to create this spirit. And this is exactly what the computer does, it allows them this possibility. So, in these areas we work in this perspective.
In terms of Language, we work in another perspective. When the students produce texts, for example, both creative texts and critical commentaries, it is interesting to see what their starting point is and what their ending point is. In each class, therefore, we print... we always print the work that is being done so that when the student reaches the end of the work, we have all the phases in the writing process and we can understand how the computer made it possible to change, cut, manipulate, add, we can see which are the... the start of a document, the path where the words were dominant and how these words are changed as we go along, how they disappear or change, or how other words are added until we reach the end. So, it is work related to writing. It is work on designing. And here it is very important work. Because it's not a case of "typing" a text, we never "type" a text. There are elements that they remove and research that they add. They are elements that they produce in a continuous process and which they reorganise at the end. And the computer allows them to reorganise the elements. It's not typing a text. This they do in the mediatec, if they need to, then they transfer it. There. But it's to see the creation process of a text... of a text... the evolution.

9. Annex D. Study of the Sample - Portugal

1. Schools/places per Region

	1st and 2nd cycle	3rd cycle and Secondary school	
North	-	2	
South	2	1	

Total	2	3	5

2. Information on the places

	André de Resende	Santa Clara	António Vieira	Braga 1	Braga 2
Address			R. Marquês de Soveral 1700 Lisboa		
Telephone			351-21-8484111		
Principle					
Home-page			www.esec-pde-antonio-vieira.rcts.pt		
e-mail			espav@mail.telepac.pt		

3. Characteristics of the reform or curricular innovation under study

	André de Resende	**Santa Clara**	**António Vieira**	**Braga 1**	**Braga 2**
Name			Implementa-tion of ICT/Flexible curriculum management		
Schooling levels involved			3rd cycle of basic and secondary education groupings from 1 to 4 with two technological courses		
Number of teachers involved			All the teachers in the school		
% of teachers who have completed their vocational training periods			Approximately 95%		

Number of classes involved			Within the scope of the flexible curriculum: 7th grade -3 8th grade -3 9th grade – in an initial phase Secondary: difficult to quantify: all the classes have contact with ICT in one way or another		
Number of students/class			Basic: 20-25 Secondary: very variable		
Students with special educational needs			Inexistent. Only about 8 with profound learning difficulties		
Number of rooms			5 computer rooms 24 regular classroom		
Library			Yes - mediatec, resource centre		
Study room			In the library - 1 area dedicated to study. One big room subdivided into two study areas		
Social activities room			Students' room Canteen and esplanade Covered room with tables, chairs, different games (e.g. table tennis)		

4. Characteristics of the Schools (existing technologies)

School	Stu-dents	Teach	Technologies

			Computers				Internet Access			
			Location				Location			
			Library	Computer room	Other rooms	Total/ ratio *	Library	Computer room	Other rooms	Total
André Resende										
Santa Clara										
António Vieira	640	100		5 computer rooms with 12 computers each	Staff room (4) Study room Multimedia kits(3) Secretaries office Parents/guardians' room (2) Executive board	1 comp. per 6 students	Yes	Yes	In most cases, connections are being set up in all the classrooms	
Braga 1										
Braga 2										
Total										

* in this column indicate the total number of computers and the ratio of students per computer

5. Methodology

		André Resende	Santa Clara	António Vieira	Braga 1	Braga 2	Totals
Interviews							
	Teachers	10	4	5			
	Principals	1	1	1			
	Students	2	1	6			
	Parents	-	1	0			
	Specialists	1	1	1			
Surveys							
sent				100			
received				18			
Rate of return				18%			
Class observations				10 hours			
	Subjects/Time						
	Total	6 ?		10			
Materials							
	Web page	Yes		Yes			
	Projects	1		5			

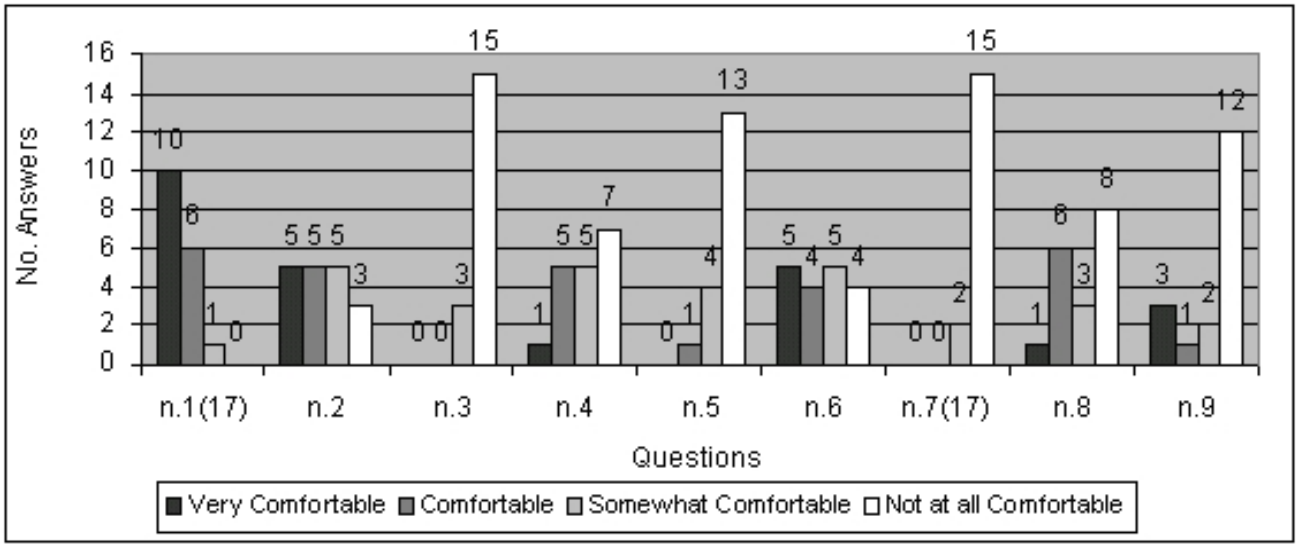
	Student materials	Yes ?		Yes – 1 CD-ROM			
	Photographs	yes		no			
	Videos	yes		no			

10. Annex E – Data on the Teachers' Survey

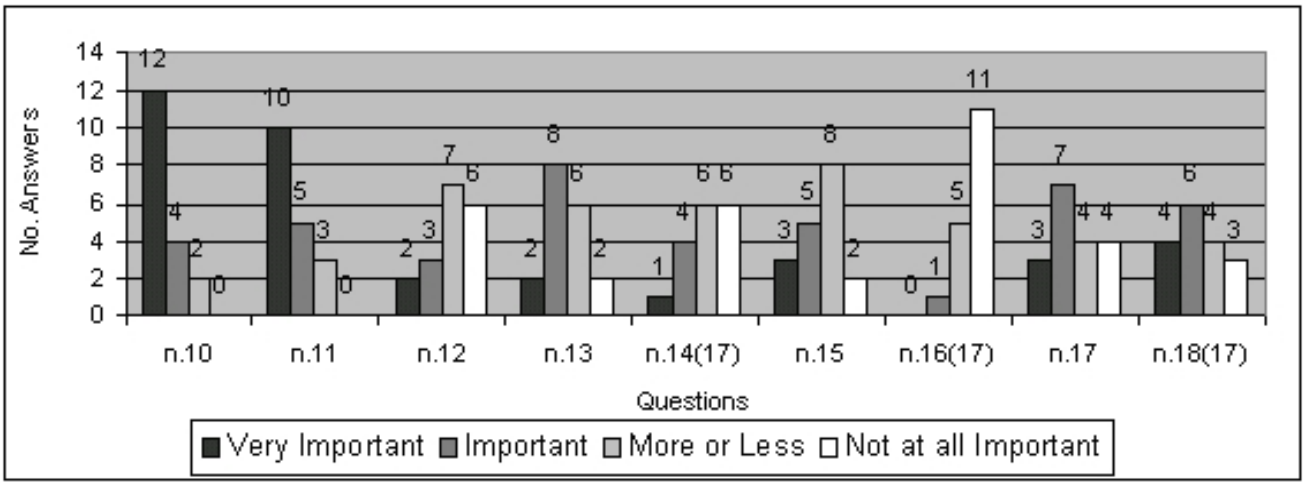
The response rate was very low (18%), which makes it impossible to use this document as a basis on which to evaluate the extension to which ICT are used in ESPAV. These data should be interpreted together with the data resulting from the interviews and the observations carried out.
It is interesting to note that, in view of our comments on the reduced number of answers, many of the teachers we contacted and interviewed told us that they had not replied because they had already spoken to us. Thus, these data may correspond to a situation of teachers who do not yet have much experience in the use of ICT.

SURVEY ON TEACHERS' ICT PRACTICES

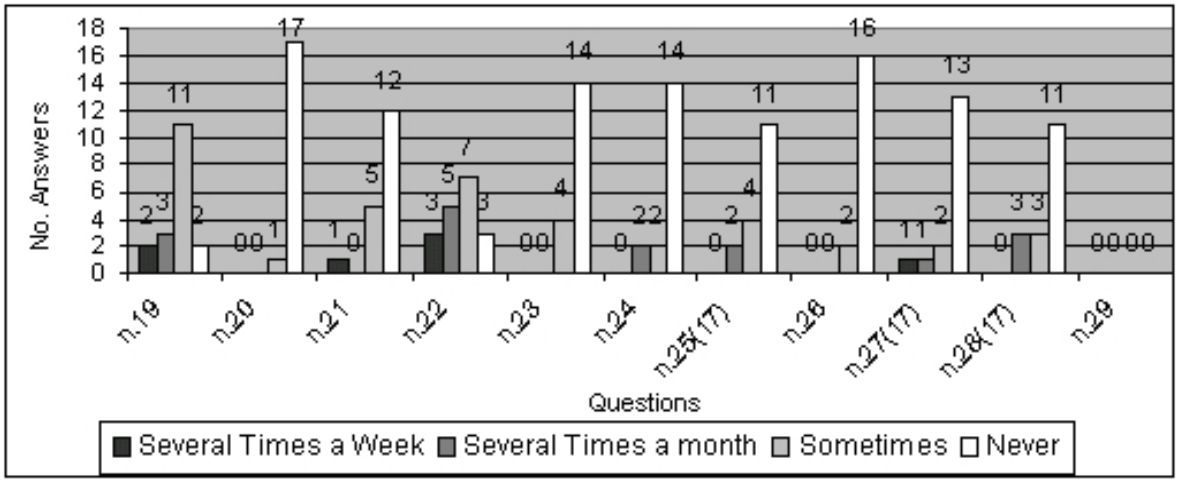
Questions	VC	C	SC	NC
n.1(17)	10	6	1	0
n.2	5	5	5	3
n.3	0	0	3	15
n.4	1	5	5	7
n.5	0	1	4	13
n.6	5	4	5	4
n.7(17)	0	0	2	15
n.8	1	6	3	8
n.9	3	1	2	12



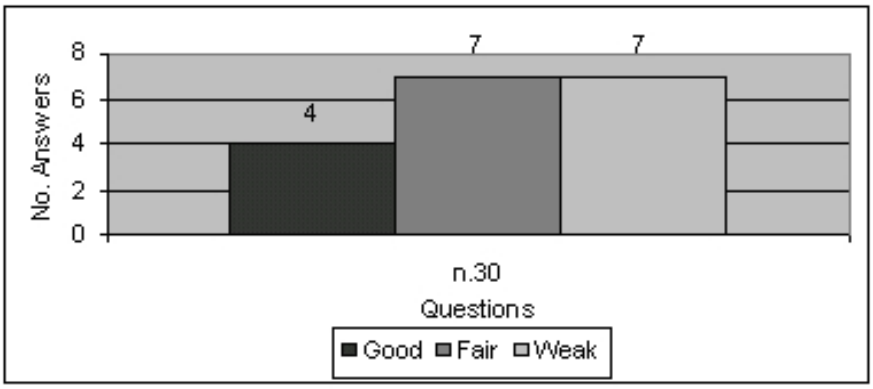
Questions	VI	I	ML	NI
n.10	12	4	2	0
n.11	10	5	3	0
n.12	2	3	7	6
n.13	2	8	6	2
n.14(17)	1	4	6	6
n.15	3	5	8	2
n.16(17)	0	1	5	11
n.17	3	7	4	4
n.18(17)	4	6	4	3



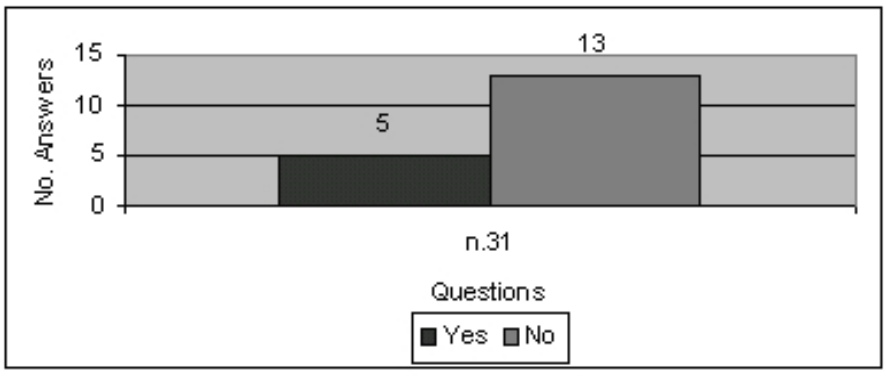
Questions	SW	SM	S	N
n.19	2	3	11	2
n.20	0	0	1	17
n.21	1	0	5	12
n.22	3	5	7	3
n.23	0	0	4	14
n.24	0	2	2	14
n.25(17)	0	2	4	11
n.26	0	0	2	16
n.27(17)	1	1	2	13
n.28(17)	0	3	3	11
n.29	0	0	0	0



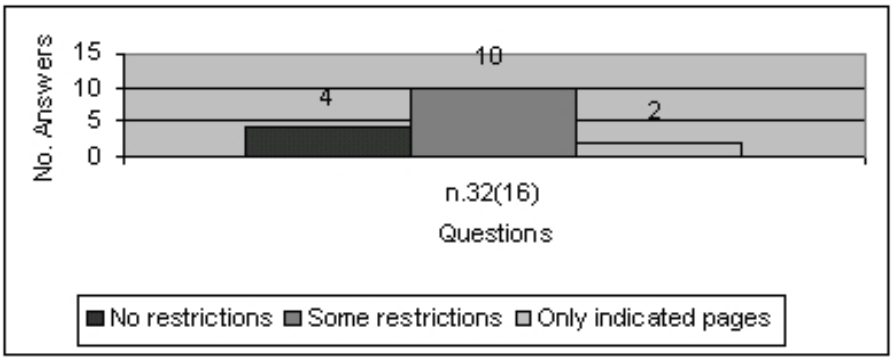
Questions	G	F	W
n.30	4	7	7



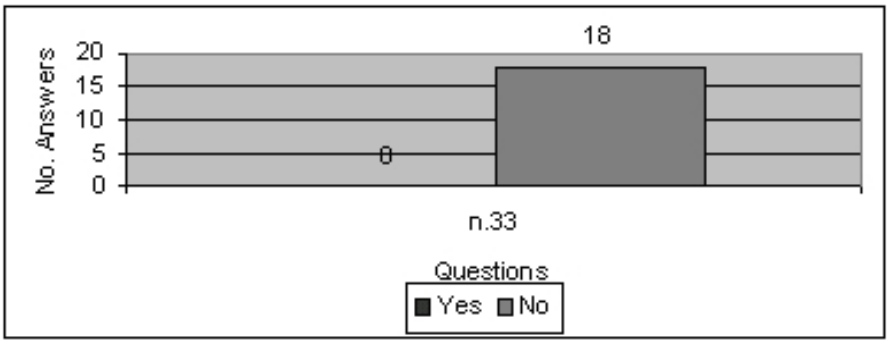
Questions	Y	N
n.31	5	13



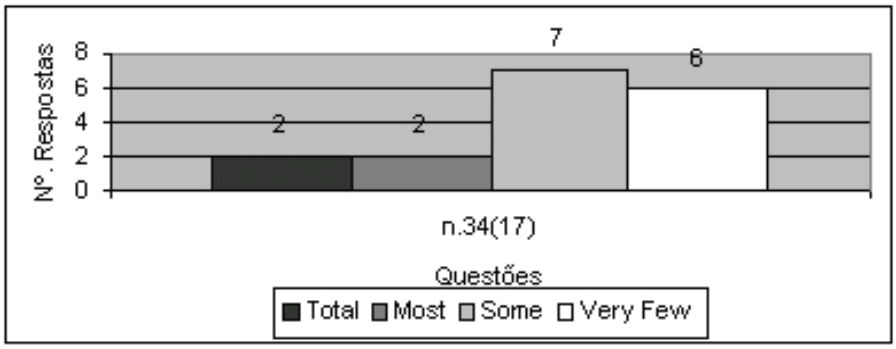
Questions	NR	SR	OIP
n.32(16)	4	10	2



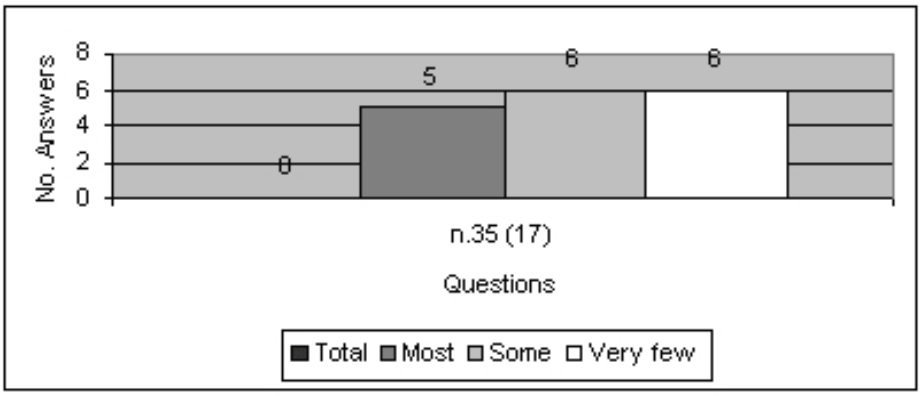
Questions	Y	N
n.33	0	18



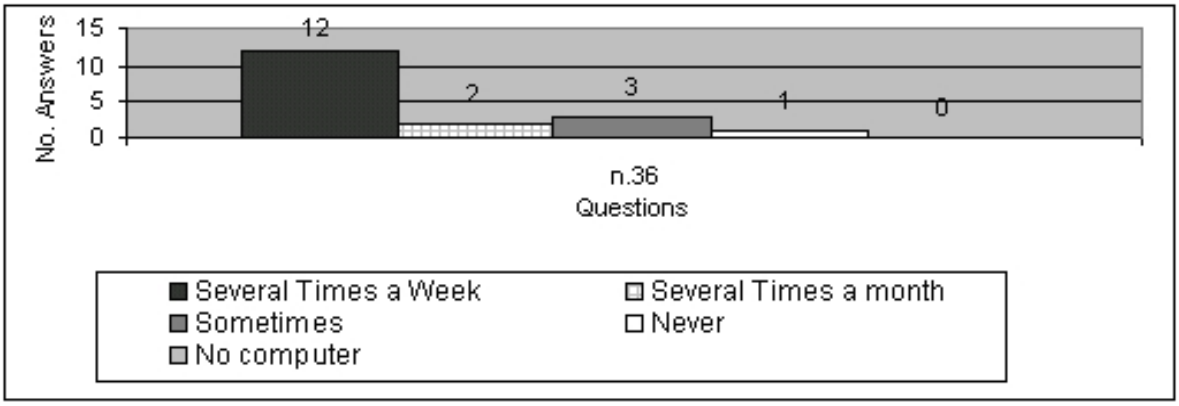
Questions	T	M	S	VF
n.34(17)	2	2	7	6



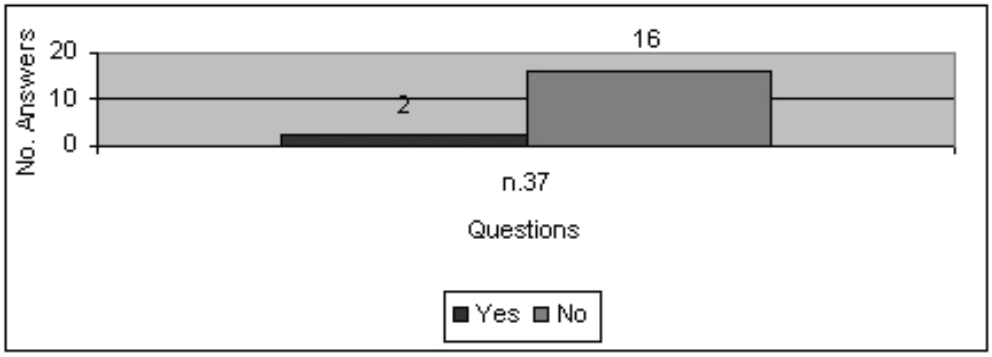
Questions	T	M	S	VF
n.35 (17)	0	5	6	6



Questions	SW	SM	S	N	NCP
n.36	12	2	3	1	0

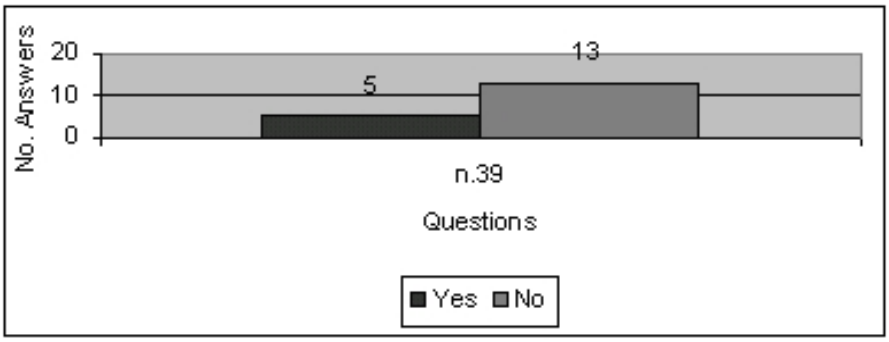


Questions	Y	N
n.37	2	16

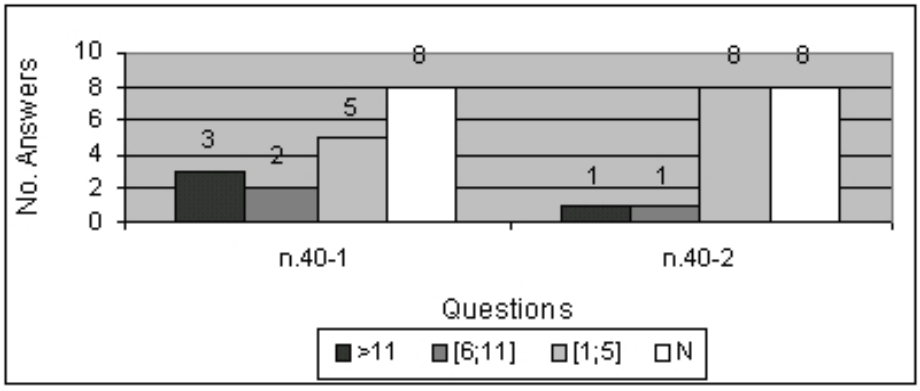


Questions	Y	N
n.38	2	16

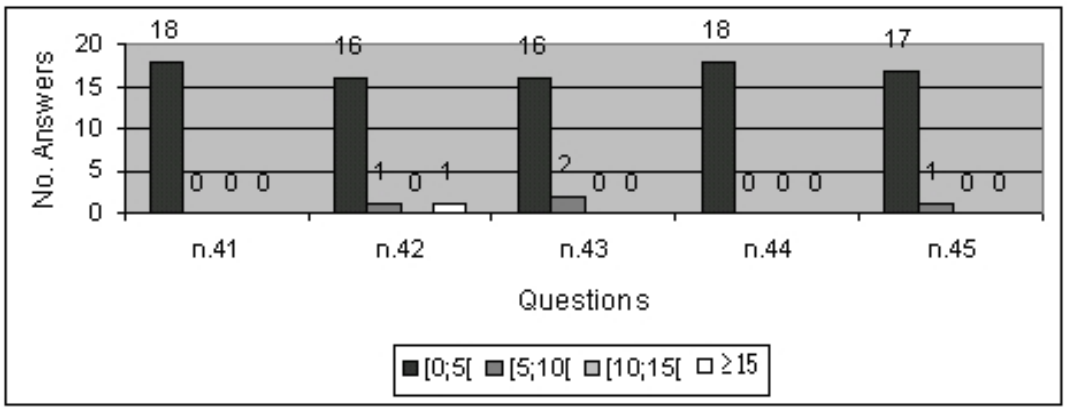
Questions	Y	N
n.39	5	13



Questions	>11	[6;11]	[1;5]	N
n.40-1	3	2	5	8
n.40-2	1	1	8	8



Questions	[0;5[	[5;10[	[10;15[	=15
n.41	18	0	0	0
n.42	16	1	0	1
n.43	16	2	0	0
n.44	18	0	0	0
n.45	17	1	0	0



[1] O Projecto Educativo da ESPAV para 1998-2001 está acessível no site da escola: [2] Available at: [3] Which in Portugal corresponds to the end of secondary school, i.e. te completion of 9th grade.

[4] 1st group - sciences; 2nd - arts; 3rd - economics; 4th - humanities

[5] Programme available at http://eee.esec-pde-antonio-vieira.rcts.pt/multimed.htm