OECD/CERI ICT PROGRAMME

A Case Study of ICT and School Improvement
at
School E

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1. Overview

School E is a public gymnasium (low-secondary school) comprising three grades (A, B and C) and it is situated in a suburb of Athens. School C is a big school since it numbers 227 full time students, 113 boys and 114 girls, split in three grades and 10 classrooms. Student group organisation is based on alphabetical order. The school budget sums about 4,5 million drachmas that come from the national budget. The Head teacher and one assistant Head teacher share the school function with 30 teachers both permanent (26) and temporary (4). The academic start school date is scheduled for the 10th of September and teaching school period finishes on the 22nd of May. The school weekly days are from Monday to Friday, and the fixed working periods- which last about 50 minutes each- are 30 per week. Soon after this date from the 25th of May till the 14th of June the students sit for their final examination. Actually, this is not the unique exam in which the students are assessed. They have already done the 1st and 2nd term formal exam in February which results rather the half of their annual assessment. The students formal assessment procedure follows the Ministry of Education guideline (National curriculum assessment) which prescribes that the students should be assessed: orally in classroom, 1st and 2nd term written exams, and final-total material-exam. There are different types of subject tests that the teachers design on the basis of assigned subject material. The main purpose of assessing students is firstly to perform either in oral or written exams their subject material acquisition in various stages of learning. Secondly, teachers can use formative and summative evaluation of the students performance as feedback in developing tests which will improve their learning in the future.
The school has introduced the use of ICT in two main ways. First within the framework of the Information Technology, aiming to familiarize students with technology and computer applications. Second, within the framework of computer based activities relevant to the curriculum subjects aiming as an aid and practice tool

adding to the traditional instruction/learning process. The headmaster of the school confirms the hypothesis that the school passed from the traditional use of information technology to computer based activities through the procedure of, old technology networking machines in 1986.
All students attend Information Technology session once a week, while students access to the computer lab within the framework of other curriculum subjects differs much as this is related to specific teachers that use ICT in their teaching. So, there are students that enter the lab only with their IT teacher once a week. There are students that enter the lab with their IT teacher once a week and 3-4 times a year more with another teacher. There are students that have been into the lab with more teachers and thus for much more times.
Most of the teachers that use ICT in their teaching enriched their teaching by giving the opportunity to their students to use modern multidynamic tools. There is a very positive climate in the school in relation to the computer use and all the school community tries hard to integrate them into the different curriculum subjects. The presence of technical spesialist in the lab during the lesson ensures unobstructed implementation of the computer-based activities and the ongoing in-service training seems to encourage teachers to get involved with ICT use. However, most of them do not manage to shift their students learning to student centred approaches. It will need more time for the teachers to reflect on these first try outs and move forward to the next step of using the computer to upgrade their own teaching objectives.

2. Overview of the Past

As mentioned before the school introduced the use of computers in the school schedule in two main ways. First within the framework of the Information Technology, aiming to familiarize students with technology and computer applications. Second, within the framework of computer based activities relevant to the curriculum subjects aiming as an aid and practice tool adding to the traditional instruction/learning process.
The headmaster of the school confirms the hypothesis that the school passed from the traditional use of information technology to computer based activities through the procedure of, old technology networking machines in1986.
The Ministry of Education in collaboration with ITY were the first to suggest teachers to adopt the Odessia project together with the precious effort provided by trainers and the information technology positioned person who technically supported the whole process.
The most important thing in this case seems to be also revealed from the Headmaster s interview data who mentioned that the school had a fight before establishing the Odessia project, as many schools claimed participation.
Finally, the teachers mainly supported the effort although they had had some reservations at the beginning.
As for the resistance T3 argues that some teachers had had personal reasons not to participate, while others consider technology a positive thing but to be controlled.
As for the training the headmaster thinks that it was inadequate for all specialized teachers involved in the project except the Greek Language teachers who were frequently trained during the previous year sessions and therefore they were rather ready to start this academic year. Additionally, he highlighted the importance of both, training and availability of CD-ROM material for each subject distinguishing between teachers enthusiasm and instruction material:
we have got the turbo car but we have ran out of fuel
Training played the central role in establishing, applying, and integrating the reform, teachers argue that 40 hours of introductory learning in both computer use and educational instruction were just the minimum offered to start with it. Since then little was done for the teachers to be developed. The only educational and technical support was provided by the special positioned technical person who, as it was observed in the experimental instructions basically supported the teachers in their technical problems than evaluating and receiving feedback from the teachers instruction and students learning process.
Teachers also argued that mainly lack of daily technical support and training on the computer use on pedagogical issues are the reasons that computer use were not diffused more into the school. As already mentioned, teachers argued that more of their colleagues would have taken their students into the computer lab, if they had had someone to support them before and during the time they used the computer lab. In-service training provided was adequate to familiarise them with basic computer use, but not adequate to make them feel competent and confident enough to integrate computers within their teaching.

3. Overview of the Present

3.1 ICT in the classroom

During the visit of the research team at the school E twelve teaching sessions were observed. The observed sessions can be divided in three groups according to the types of the software used and subsequently to the kind of the teaching scenarios which were developed: a) sessions during which interactive educational software was used (two science and two music sessions), b) sessions during which students had to collect and elaborate information from a web site regarding a selected topic (two history sessions, one in technology and one in Greek literature) and c) sessions during which Power Point applications were used providing information and presenting students with tasks (three mathematics sessions and one session in Greek language). Most of the organised computer-based activities were based on specific units of the national curriculum.

a) Use of interactive educational software

Two sessions in physics taught by the same teacher TZ were observed. Students of the 8th and 9th grades participated in these sessions. They were both based on educational software drawn from a web site (http://www.spin.gr)/. The software presented the students of the 9th grade with the simulation of the function of a current generator, while the 8th graders observed an experiment concerning the variation with height of the hydrostatic pressure. In both occasions the students were able to interact with the software. They could vary the value of different parameters (e.g. the rotation velocity, the direction of the rotation or the kind of the liquid) and observe changes in the value of others (e.g. the electric current or the hydrostatic pressure). They could also simultaneously observe graphs presenting the variation of the value of some parameters with others (e.g. Voltage with time). Students worked in groups of two or three persons. Each group was provided with a task-paper. The task-paper contained questions as well as information regarding the topic studied. There were questions asking the students to anticipate the outcome of the experiment such as the variation of the value of a parameter (e.g. the hydrostatic pressure) when the value of another parameter was changed (e.g. the kind of the liquid). Students were also asked to observe the simulation of the experiment, to take measures and evaluate their predictions. They were also asked to make graphs or use graphs presenting the variation of parameters and to explain their observations. The students collaborated successfully, each group working at its own pace, while the teacher intervened in the work of the groups in order to encourage the students or to provide explanations.

The two music sessions we observed were also based on the use of an interactive software (Encore 4). The software is designed to give to the user the ability to compose music, using a library of music symbols and of music instruments and to listen to his/her composition as it is reproduced by the computer. In the two sessions we observed the music teacher (TX) asked the students to follow his instructions step by step. He asked them to write on a staff, appearing on the screen, a small well-known piece of music using music symbols from a library, also appearing on the screen. The students working in groups of two persons followed his instructions. When they had finished the teacher asked them to select a music instrument (a violin) and set the computer to reproduce the composition. By listening to the music the students of each group, could localize and correct possible mistakes in the composition. Finally, the teacher asked the students to make changes to the tempo of the music piece and listen to the music reproduced. The teacher was very instructive and we cannot say that the students really interacted with the software or had the opportunity to create something new or to explore how the different parameters (tempo, instruments) affect the music produced.

b) Collecting and elaborating information from web sites

During our visit in school E we observed four teaching sessions which were based on the use of internet. Teacher TL taught 7th and 8th graders Greek literature and History respectively. In both sessions the teacher TL followed the same procedure. She gave to the students task-papers where each student separately had to reply to certain questions. The teacher asked the students to visit selected sites, to read the material and to complete the task-papers. The students worked in pairs and they collaborated as they were trying to find the information in the web sites. Questions were asking information concerning the ancient Greek drama and the ancient Greek theaters or information concerning the archeological museum of Heracleon (a big city in Crete) and some of the

findings which are exposed there. Responses to all the questions included in the task-paper could be found in the text contained in the sites. Students did not have to further elaborate the information drawn from the site, they used the computer as an electronic book. At the end some students were asked to read the responses to the class. The teacher just controlled the process and encouraged students or helped them when they asked for her help.

Teacher TM who taught history to 8th graders followed a similar procedure. Again, the teacher selected a web site, the students had to visit the site, read the contained material and answer individually to the questions included in a task-paper. The students collaborated in order to find the responses, which could be found directly in the site with one exception. The last question of the task-paper demanded from the students to relate and synthesize the information collected. However, this question was left as homework. Finally, some of the students were asked to read their answers to the class and to give further clarifications when the teacher asked for.

A less controlled use of internet was observed during a session with the technology class. In this session participated eight of the 7th graders (half of the class) of the Athletic Department of school E. Students work in the computer lab was in the framework of a project undertaken by each student individually. Each student had to write a report using all the information available from various sources regarding the sport of his specialization. The internet was one of the sources of information. In the beginning of the session teacher TB provided the students with a list of web sites where information regarding different sports could be found. Students worked individually. They visited the different sites and spend all the time reading the material and keeping notes in a notebook. Students were allowed to collect all they information they thought they would need without being further instructed. The students were not familiar with the computers operation and they often asked the teacher to help them. A parent was also present who provided technical support to the teacher and helped the students as well.

c) Using Power-point applications

In these teaching sessions the computers were used to present the students with sequences of pages, developed with the Power point by the teachers. There were pages containing theoretical information, which were followed by others with exercises and problems that the students were asked to solve and to write their responses in task-papers. The teachers strictly controlled the whole process.

We observed four teaching sessions of this kind. Three of them were sessions in mathematics (two by teacher TA and one by TG) and one in Greek grammar (teacher TP). After a short introduction the teachers asked their students to read carefully the information presented on the screen. The teachers gave additional information and emphasized some crucial points. When all the students had read the information, the teachers asked them to press the enter key in order to see the next page. The students were then presented with a task related to the information they had just read. They had, for example, to solve an equation or to analyze syntactically a sentence. Students were not allowed to collaborate but each one had to write his/her answer in the task-paper. When all the students had completed this phase they were asked to press the enter key once more in order to read further information. The session was finished when the students had completed all the tasks in their task-papers. The materials were enriched with colours, graphics and sounds and succeeded in attracting students interest. However, these teaching interventions did not differ from a traditional teacher centered approach.

3.2 School community s perceptions on the use of ICT

The administrator

The administrator is the key person in the process of ICT integration in the school since he was the one who initiated the idea of the school participation to the project Odysseas. All of the interviewed teachers noted his supportive role in the introduction of innovations in the school culture. His view of ICT focuses on the importance of using modern mediums in the school as a result of the modern technological evolution.

If we see it [ICT use] in relation to the past it is an innovation. But it is also a duty of the new times. You cannot avoid using the mediums that bring the modern times.

(Headmaster interview, School E)

Referring to the objectives of the ICT use he stresses the basic knowledge of informatics and the role internet as an extended source of information.

First of all is the acquisition of a basic knowledge of informatics in the context of the Information Technology lesson. Secondly there is an effort to use the internet in the teaching of all the lessons since the use of internet for example suggests a big deposit of information. This can result to a more spherical approximation of the teaching subject. Of course the teacher and the blackbord are irreplaceable. (Headmaster interview, School E)
Through the computer the knowledge is extended. There is a much bigger the amount of information. (Headmaster interview, School E)
The headmaster teaches mathematics and in his interview mentioned of appropriate material adapted to the curriculum of mathematics. As far as the computer role in the teaching of mathematics he seemed to perceive the role of computer as a good representational medium for the presentation of the lesson in the classroom.
Some things must be designed by us. That s because there are not appropriate CDs. There is difficulty in finding material adapted to the school textbook. You can find a cd on equations in general but it is not close to the student s book of mathematics. In the opposite some others seem to be copies of the student s book. (Headmaster interview, School E)

Teachers

Teacher 1 teaches Science and Technology in the school which does not have to do with informatics. The motivation of her engagement at the computer activities came from the requirements of her lesson in the curriculum. Students need to search for information on topics that are The internet gives the chance to find all those answers by visiting respective sites.
In my lesson each student chooses one technological topic and he has to collect material on a specific subject and do research. For example how a factory works, what are the responsibilities of each person in the production lines etc. As you understand we need the internet to find the necessary information. No one encyclopedia includes such detailed information on how let s say a refrigerator is made. (Teacher 1)
The internet is seen as a source of rich information that substitutes the traditional encyclopedias. She doesn t visit the lab systematically but she wishes to do with all of her classes at least two times in the year. It is noticeable that the perception of ICT use is not related to the collaborative work on the lab and students work alone in each computer.
In the lab everyone works alone. I can do that since I have only the half of a class. I have chosen some sites and cd roms and each child follows my instructions on how to download the necessary material. There are not teams.
(Teacher1)
Teacher 2 is a teacher of mathematics. He considers the school s participation to Odysseas project as the starting point for his engagement to ICT use in the teaching of mathematics. He mainly adopts a whole-class teaching with the computer playing the role of the medium by which presents the teaching material to the children in an attractive way using the Power Point. Each activity includes worksheets designed by T2 and pupils are asked to fill the missing answers after reading the examples as well as the points of the theory displayed on the computer. Moreover each answer is favored by a number of units if it is answered correctly.
It s like a game. When a student sees the keyboard, the screen ... he feels like playing a game and I personally give them points of the theory, an example, and then I ask them ÃÅ¼À»·ÁÎÃ¿Å½ their answers. The first one is usually very easy. So anybody can write something and then continue enthusiastically. Now we are at the beginning. That s why students are asked to work mainly with the worksheet. (Teacher 2)
It is noticeable that much emphasis is paid on the technical part of the presentation on the screen that reminds of a multimedia approach.
I attach sounds, fast movements, colors so as to be attractive to the pupils ... The sound of the gun that follows the answers given by the computer are attached for the pupil s excitement. (Teacher 2)
T3 is a teacher of physics. She started going with her classes in the lab this year. She uses the internet as a source of interesting material for her lessons which is used in the classroom accompanied by prepared by herself.
Last month I downloaded an animation of an experiment based on the law of Laplace. I had also prepared a worksheet. The lesson in one of the classes had bees better than the other. ™ saw what I could do in the future. (Teacher 3)
As she is at initial stages of ICT integration in the classroom she sees the lesson as a challenge to improve her

level of familiarization with ICT applications in general.
Now the things that I ask pupils are simple: press this button, click here etc. The worksheet is written by hand. As for myself I see that I have to learn a lot. I have to devote much time for that. Now I can see my ignorance. (Teacher 3)
Teacher 4 teaches literature in the school. She goes to the lab once a month using mainly the internet for the collection of information of specific sites.
I usually give pupils a url to find information or to write a text in the Word which may be the results of a research, an example taken from the internet or from the books of our library. Pupils have already collected information on the Dafni monastery which is an important monument in the area. (Teacher 3)
In summary, the majority of teachers are at initial stages of ICT integration in their lessons and they see the computer as a medium complementary to the lesson in the classroom that gives the ability (a) to select and manipulate information and (b) to represent the traditional teaching material in an attractive way.

Students

Turning to the way students perceive the ICT use, data revealed that students realise the effort of the school to connect computer use with the teaching of other subjects. The interviewees mentioned the different uses of ICT.
Now with the computer I can write my work for the Science and Technology lesson because it is very easy. I can change easily what I want. Moreover, I have some programs for photos processing. (Student 1)
We use the computers in the lesson of informatics. In the new lab we did only some things with the Word. But nothing more. Copy, paste etc. (Student 2)
We visited a site with the music teacher. We chose some notes to create our own melodies. (Student 3)

As far the perception of what they are doing, data shows that students realize the purpose of the activities in close relation to the traditional lesson in the classroom. This may have been owed to the fact that except the use of internet- the main part of the lessons were articulated in the form of a presentation with power point accompanied by worksheets.
I think the computer use breaks the monotony of the blackboard. Sometimes instead of the blackboard we have the computers. We can enjoy many different sounds. It is interesting. (Student 2)
We did an experimental lesson in mathematics. Our teacher constructed mathematical formulas and shared worksheets to the teams. We solved the exercises easier, with more pleasure. (Student 2)
We get some ÆÍ»»± µÁ³±Ã¯±Â with questions ... we can read the theory on the screen, firstly the theories and then the questions. We write on the worksheets (Student 4)
However, more experienced students expressed their criticism to the way computers were used until now mentioning the insufficiency of this specific use.
Computer could be useful for me if I could take information from the internet. Now we are doing a different thing. We do not save information. We ve just had a specific program in one diskette which includes information ... the theory. After the theory we have to solve exercises. We are only looking at that. (Student 4)

Parents

Turning to the way parents perceive the ICT use, data revealed that all of the interviewees view ICT use of major importance in the modern society. This comes as a result of the changes that have taken place over the years.
Computers must be intorduced to all of the greek schools without any question. Since we don t ask for the necessity to teach writing and reading we souldn t ask for ICT integration within schools nowdays. (Parent 4 interview)
The future of our children would be strongly related to the use of computers.
(Parent 3 interview)

As far as the ICT use in the school all parents seem to consider important just the fact that computers are used within the site. All of them were informed that their kids are taught Information Technology, since the subject is presented in the school schedule. Moreover they are informed that school is at the beginning of ICT integration

to the teaching of other subjects.
The school is at the beginning of the computer introduction except the lesson of informatics. Some of the teachers have already given lessons with computers and they receive training on them. There is a special room for that. I think this is the most promising thing for the future. (Parent 3)
Once a week they [students] are taught informatics and then they go to the lab with teachers of other school subjects. (Parent 1)

Additionally, three of the four interviewees have a computer at home or at their offices and declared that their children spend a lot of time working with them. They realise that their kids do use computer at home to prepare their homework. Talking on how their children use computers at home seemed to view the computer mainly as a tool for accessing and processing information.
My son uses [the computer] a lot especially for the preparation of his work in the Information Technology. They have a topic and try to find information on the internet ... He sees the computer as a medium that gives easy access to the information. (Parent 2)
She uses the computer at home when he needs to create tables, to write her work for Science and Technology. (Parent 1)
Two of the parents (P2 and P4) who are engaged professionally with ICT were aware of the fact that the informatics lesson takes place in the old lab with computers while the others in the new lab of Odysseas. In their interviews both stressed that the use of the old lab is confusing for the students. P2 have also taken an active role in the technical support of the school. He participates in the construction of the school home-page and helps teachers to create their presentations with Power Point.
The computers on which they work in the informatics lesson are very old. The modern operational systems do not have any relation with them. That s confusing for the children. (Parent 2)
On the technical part I can offer my help. Now we are constructing the home-page of the school. We are also trying to find interactive software ... not only to create presentations. (Parent 2)
The old lab of the school is old-fashioned. This is the technology of the early nineties. A passive system. (Parent 4)
As far as the relation of ICT use to educational innovation parents seemed to recognize that ICT use suggests an innovation itself just because the computers are used in the lesson. This was based on the perception of new technology as a vehicle for access to information or as a medium for an effective completion of the homework (easier writing, better representation of the data etc.)

4. Main hypotheses

In what follows we will discuss the main hypotheses of the study in the light of the empirical evidence that have been presented in the preceding sections.

1. ***Technology is a strong catalyst for educational innovation and improvement especially when World Wide Web is involved.***

Teachers used a variety of ICT tools in their practice. The computer use, however, was not in the most cases a catalyst for educational innovation, but a modern multidynamic teaching aid and information resource that enriched teaching. Some of the teachers used a power point application to develop tutorials for their students on specific teaching units. There was a linear sequence and students were mostly observing activities. Some of the teachers used the Internet and gave the opportunity to their students to look for information on the specific teaching units they taught. Teachers also used educational software. However, all except one teacher did not escape the traditional teacher centred teaching model, where the teacher has the central role in learning that focuses on the product and not on the process of learning

1. ***The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995).***

School E introduced the use of ICT in the school participating in the national project Odysseas, since the Headmaster of the school and the most of the teachers at that time were willing to implement pilot computer based lessons. The school fought for its participation since many schools also claimed participation. As in all schools that participate in the project Odysseas, the involvement of the teachers was by no sense obligatory, and

there was no specific school policy related to the aims of the computer-based activities or specific subjects for ICT to be used. It was up to interested teachers to get involved and use ICT in their teaching. It is still the interested teachers who use ICT in their teaching. However, there is a very positive climate in the school in relation to the use of ICT in teaching. The Head of the school is very supportive and encourages all teachers to use computers into their teaching. Teacher training has been organised and takes place regularly each week for all interested teachers. In parallel, a person responsible for provision of technical support has been positioned. He also helps teachers in the lab when teaching. Finally, strong parents involvement and support not only helps teachers with the preparation of their lessons, but also encourages them to use computers in the sense that they acknowledge their effort. It had to be highlighted though that the effort of the school to introduce ICT use in Greek schools is very recent. Teachers have a long way to go with the use of ICT, but they surely have made the first most important steps.

1. ***Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning.***

As already mentioned, most of the teachers that used ICT in their teaching enriched their teaching by giving the opportunity to their students to use modern multidynamic tools. There was a very positive climate in the school in relation to the computer use and all the school community tried hard to integrate them into the different curriculum subjects. The presence of technical support in the lab during the lesson ensured unobstructed implementation of the computer-based activities and the ongoing in-service training encouraged teachers to get involved with ICT use. However, most of them did not manage to shift their students learning to student centred approaches. It will need more time for the teachers to reflect on these first try outs and move forward to the next step of using the computer to upgrade their own teaching objectives. Moreover, it will need more support on the pedagogical issues of using ICT and development of communication networks between teachers to exchange ideas and share activities.

5. Projection to the future

Our judgments about how likely it is that the school s accomplishments will remain are based on different factors.

How well is the innovation integrated into the workings of the site.

The introduction of ICT in the school is very recent. However, a positive climate for the computer use in teaching has been developed within the school community. The Head teacher is very positive for the use of ICT in the school, teachers who use ICT are very enthusiastic about its potential in their teaching, students expressed their interest as well as motivation in using computers in the classroom, and involved parents support the effort wherever they can. In parallel, teachers are provided with long term in-service training on computers use as well as on its use in teaching of different curriculum subjects, and a person responsible to provide technical help has been positioned in the school. It seems that the school has made the most important steps towards the integration of computers into teaching: that is a kick off start. There is no evidence to suggest that this effort will end. By contrast, the favourite climate developed by the early users in combination with the supportive school environment seems that it will lead to further exploration of ICT use in the classrooms.

What are the future plans of the school about the continuation of the ICT use.

The school has just started his adventure on the ICT use in teaching. It has still a long way to go. It seems that more teachers will get involved in time with the project and more uses of ICT will be explored with experience.

Whether the financial and other support to the innovation has been assured.

As declared by the project team, the first schools that participated in the project will continue to get technical but also educational support. In this case, there is no reason to suggest that the school will face such kind of problems.

What do the administration, the staff, the students and parents think about the use of ICT.

As discussed previously, all the members of the school community expressed positive opinions about the ICT use. Moreover, they have started to develop a core team of interested computer users that will lead more teachers to join the effort.

APPENDIX A

Consistent with the methodology described in the Workbook for Organisational Case Studies (OECD/CERI) a short-term explanatory case study has taken place in the school in order to compile a corpus of information that would allow a rich description of the ICT integration within the site. The data collection was completed in a four-day visit of the four researchers who participate in the ICT team of the Center for Educational Research. Classroom observations were conducted in the school as well as interviews with the staff. The purpose of classroom observations was (a) to validate how ICT is used in the lessons and (b) to gather evidence for how lessons are taught. The overall time of observation was 12 sessions of 45 minutes. The scheduling of the observations in school E shown at the Table 1 - was arranged in collaboration with the head master nearly one week before the visit.

Teacher	Subject	Grade	Number of observations	ICT use
T1	Technology	A	1	Internet
T2	Mathematics	A	1	Power Point
T2	Mathematics	B	1	Power Point
T3	Physics	B	1	Educ. Software-Simulation
T3	Physics	C	1	Educ. Software-Simulation
T4	Greek Literature	C	1	Internet
T4	History	A	1	Internet
T5	Greek Language	A	1	Power Point
T6	Music	B	1	Educ. Software
T6	Music	C	1	Eeduc. Software
T7	History	B	1	Internet
T8	Mathematics	C	1	Poewr Point

Table 1: Classroom observation plan

For the observational data collection one video-camera was used - occasionally moving to capture instances of the classroom atmosphere. Concurrently with the video-recordings, observation notes have been taken describing the overall classroom activity and focusing on potentially significant details and episodes in teacher practice, student groupwork and student communication. During our visits to the school 14 interviews were conducted: 1 with the head master, 4 with teachers (one not engaged in the ICT use), 4 with students, 4 with parents and 1 with the technical support specialist. The average time of each interview is shown at the Table 2.

Interviewee	Time (min.)
Head master	60
Teachers	50
Parents	40
Students	30
Technical specialist	45

Table 2: Average interview time

Background data was also collected (i.e. students written presentations of their work) that served as complementary information to the video-recordings and observation notes, which formed the main corpus of our observational data. Verbatim transcriptions of all interviews were made.

APPENDIX B

Table 1. Familiarisation of teachers with computer applications				
How comfortable are you with using a computer to do each of the following?	**Very comfortable**	**Comfortable**	**Somewhat comfortable**	**Not at all comfortable**
1. write a paper	2	8	1	0
1. search for information on the World Wide Web (WWW)	1	1	4	5
1. create and maintain web pages	0	0	3	8
1. use a data base	1	0	7	3
1. develop a data base	0	1	2	0
1. send and receive an e-mail	1	3	2	5
1. write a program	0	4	1	6
1. draw a picture or a diagram	0	5	3	3
1. present information (e.g. use Power Point or equivalent)	1	4	3	3

Table 2. Importance of computer-related skills for teaching

How important is each of the following computer-related skills for your teaching?	Very important	Important	So-so	Not important at all
1. write a paper with a word processor	4	7	0	0
1. search for information on the WWW	3	6	1	1
1. create web pages	2	3	4	4
1. use a data base	3	7	0	1
1. develop a data base	1	7	1	2
1. send and receive an e-mail	2	4	1	4
1. write a program	1	6	2	2
1. draw a picture or a diagram	2	6	1	2
1. present information (e.g. use Power Point or equivalent)	5	4	2	0

Table 3. Frequency of use of computer applications by the students

During the past school year, how often did your students on average do the following for the work you assigned?	Several times each week	Several times each month	A few times a year	Never	No answer
1. use the World Wide Web	0	0	3	7	1
1. create web pages	0	0	0	10	1
1. send and receive an e-mail	0	0	2	8	1
1. use a word processing program	0	1	5	4	1
1. use a computer to play games	2	0	0	8	1
1. use a spreadsheet	0	2	1	8	1
1. use a graphics program	0	1	3	6	1
1. join in an on-line forum or chat room	0	0	0	10	1
1. use a presentation program (e.g. Power Point	0	1	1	8	1
1. use an instructional program (including simulations)	0	0	0	10	1
1. other computer uses (specify)	0	0	0	0	11

Table 4. Teachers ability to use computers				
	Good	**Fair**	**Poor**	**No answer**
30. How would you rate your ability to use a computer	**5**	**5**	**0**	**1**

Table 5a. Experiences and policies concerning ICT use

Answer questions 31-38 based on experiences or policies from the last school year	**Yes**	**No**
31. Was student computer use ever evaluated for grading?	1	10
33. Did you create or modify a Web site with any of the classes that you taught?	1	10
37. Did you participate as a student or instructor in a virtual course through the Internet/WWW?	1	10
38. Did you involve your students in collaborative learning over the Internet/WWW with students from other classes?	1	10

Table 5b. Experiences and policies concerning ICT use (continued)

Answer questions 31-38 based on experiences or policies from the last school year	No restrictions	Some restrictions	Designated sites only	No answer
32. If you assigned WWW searching, how much freedom did you allow students in locating sites to visit?	4	1	1	5

Table 5c. Experiences and policies concerning ICT use (continued)					
Answer questions 31-38 based on experiences or policies from the last school year	**All**	**Most**	**Some**	**Very little**	**No answer**
34. What portion of the computer use in your classes was directly related to the course content?	2	2	3	3	1
35. What portion of the computer use that you assigned was done by students individually?	1	2	3	3	3

Table 5d. Experiences and policies concerning ICT use (continued)

Answer questions 31-38 based on experiences or policies from the last school year	Almost every day	Several times a week	Several times a month	A few times a year	Never	No computer
36. If you have a computer at home, how often did you use it for preparing for teaching ?	0	2	4	2	1	2

Table 6a. Computer use for communication

	Yes	No
39. Are you currently using technology to collaborate with other teachers?	0	11

Table 6b. Computer use for communication (continued)

	More than 12	6-11	1-5	None

40. How many e-mail messages do you send each week on average?	0	0	1	10

Table 7. Advanced uses of computer

How many of the following have you ever done?	Yes	No	No answer
41. make changes to a computer s hardware	1	10	0
42. updated an application program (word processor, graphics program, etc.)	0	10	1
43. recovered a damaged file	0	10	1
44. created a web site	1	9	0
45. developed a data base	2	9	0