Socrates' Mailbox

The Upper Secondary School

Norway 1996-1998

I Introduction

The Socrates' Mailbox-project was started in the autumn of 1996. The initial intention was that each of the six countries would observe how ICT was used, focusing in particular on the use of e-mail as a means of communication in a lower secondary school and an upper secondary school. The Mailbox project has carried out observations in 16 classrooms and produced 16 case studies.

Norway is represented in the Mailbox-project by the National Centre for Educational Resources. France, the United Kingdom, Belgium, Italy and Switzerland are represented by individual consultants, institutions and universities. The European Commission is responsible for financing a large part of the Mailbox project, from autumn 1996 to autumn 1998.

In the spring of 1997, we carried out observations at a Norwegian primary school, a lower secondary school and an upper secondary school. It was important that the schools were geographically accessible. Most importantly, however, they were interesting because they represented schools that led the way in respect of ICT in education. We contacted a very active teacher, later referred to as **I.,** who works at the upper secondary school, and our contact with her and the school administration was positive.

Since we visited the upper secondary school in the spring of 1997, the Mailbox project has held four project meetings, produced draft reports at a national level, an internal report for the European Commission and articles in English and French. Certain aspects of the project were presented at a plenary session during a large European conference on ICT in Education, "Open Classroom II", held in Crete in September 1997.

Everyone is struggling with ICT. There is no standard answer as to how ICT can be integrated in schools. Some individuals choose to focus on equipment, others on plans. Some people attach importance to the broad-based training of all pupils, others have no plans for training. There is some uncertainty among pupils, but there is most uncertainty among teachers.

The primary aim of the Mailbox project is to look at the communication aspect of ICT. How do teachers and pupils use e-mail, the Internet, and even IRC, in the education system? The Norwegian Mailbox-schools have not been using e-mail during the periods we have been observing them, but they have used the Internet to search for information, particularly in connection with project assignments. An extra bonus was IRC, which was not part of the project until pupils in the lower secondary school in Norway began to use it to "chat" after school.

This report is divided into five sections. Section II contains a short overview of the school, as experienced by the observer in the spring of 1997, and a brief introduction to the school's strategy as regards information and communication technology (ICT). Section III takes the form of a chronological description of the observations we made in the classroom in connection with the use of ICT as an educational aid. Section IV is based on the interviews of various individuals at the school towards the end of the observation period. Section V contains the conclusion, in which the Mailbox observer and the Norwegian project supervisor from the National Centre for Educational Resources provide comments based on the observations and interviews.

II A brief introduction to the Upper Secondary School

The school**,** which was established as a vocational school thirty years ago, combines elements of the old commercial college culture with general non-vocational studies. In conjunction with the introduction of Reform '94 – the upper secondary school reform – the school received a good deal of attention for its efforts. Among other things, the principal at that time was invited to visit the Ministry of Education, Research and Church Affairs to speak about her educational model.

Four years ago, the upper secondary school was relocated in new premises just outside a small town in the County of Akershus. The school premises comprise part of an industrial estate, and the school is surrounded by a number of small companies. During our visits, the school was in the midst of a tough battle to keep three of its classes, including two classes in general, non-vocational studies. Both the pupils and the teachers were very much involved in bringing pressure to bear on the county politicians so that they would reverse their decision to move the classes to another upper secondary school in the county. When I, the observer, arrived at the school, the notice board outside the teachers' study was plastered with recent newspaper articles describing this case. Everyone was encouraged to demonstrate.

The subjects offered at the school in 1996/97 were general studies, business studies, health and social studies, hotel and catering, technical construction and specially adapted training courses in separate classes. With regard to mandatory language training, courses were offered in German, French and Spanish in addition to English. The number of pupils applying to study science subjects was increasing.[1] In 1995, there were a total of 41 teachers and 280 pupils at the school.

The school premises were relatively new and the rooms were bright and pleasant. The school consisted of three buildings which were situated in the form of a triangle, with doors leading out onto a grass area in the middle section, which most people used as a thoroughfare. The ground floor of the main building housed a canteen and a library, the first floor contained the teachers' studies, staff rooms and a computer room, while the second floor had two classrooms and two computer rooms. The school administration was located in one building. The hotel and catering section had a canteen and a kitchen in the third building.

One of the computer rooms doubled as a classroom for technical drawing. The school had around 100 PC's which the pupils were able to use. The two computer rooms, which in principle were open to all pupils at the school, housed just over 30 computers. On 24 February 1997, 15 computers were connected to the Internet via ISDN. Prior to this one computer in the computer room on the ground floor was connected to the Internet via a modem that **I.** (the teacher whom we observed) had a hold of.

The school's ICT efforts

Two people were responsible for the school's ICT systems. One of them was in charge of the administration's ICT equipment. The systems administrator, whom we interviewed, held a combined post, 40% of which he spent ensuring that the computer hardware and software was functioning and could be used by pupils and teachers. In addition, he also arranged a number of courses in the use of word processing programs and presentation software for the school staff.

ICT activity at the school was characterised by the lack of a strategic plan regarding the use of the computer rooms. Nor was there any plan for the introduction of the Internet and training of pupils and teachers in how to use the Internet. Since there were no plans for the distribution and use of ICT equipment, **I.** and several other teachers were able to use the computing facilities for a long while during the spring without having to compete with the other teachers.

[1] School brochure 1996–97.

I did not observe the use of e-mail. The pupils had not yet received their e-mail addresses when I was at the school.

ICT gave teachers other than **I.** new opportunities. Changes occurred in the pupils' ICT skills after the "new" computer room was established.

III The observation period

I. (the teacher whom I followed throughout the period) had hoped that the school would have 15 computers connected to the Internet via ISDN by the time the Mailbox observation began in the middle of February 1997. That was not to be the case, however. The company that was supposed to install and ensure that the computers were hooked up to the Internet had not done its job when I arrived. During the first observation period, which lasted from 12–14 February, only one computer in the ground floor computer room could be connected to the Internet and used with other communication tools. This was done with the aid of a modem which **I.** was responsible for looking after.

During the winter break, the problems had been solved and the 15 computers in the first-floor computer room had been connected to the Internet via ISDN. The two observation periods therefore differed considerably. During the first period, I chiefly observed boys in a third-year physics class downloading information which they would use in their curriculum-based interdisciplinary project. During the second period, I observed classes and groups at the second and third-year levels – boys and girls – using the Internet as an integral part of both English and History classes.

The observer's role was defined and agreed on as being that of a passive observer. The intention was that I would sit in a corner and follow events. I did that, I took notes, made video recordings and took photographs with a digital camera. I also discovered that I had to walk around and see what the pupils were doing on the screen. I was not invisible, but the pupils were not particularly concerned that I was there. As soon as I had been introduced and the teacher had informed the pupils why I was there, it seemed as though the pupils felt that it was OK and fun that I was interested in what they were doing. During the three days I was an observer, I spent as much time as possible in the room with the computer connected to the Internet.

I. was very interested in my role. If she had time, when she was not giving the pupils advice, she would often come over to me to explain what was happening and to discuss ICT issues. This was very interesting but it made it more difficult for me to be a neutral/passive observer.

It soon became clear to me how unnatural the role of passive observer was if I was to be able to understand how the pupils used and experienced the Internet as a tool in their school activities. Whenever it was natural to do so, I therefore began to ask the pupils a number of questions related to my observations.

Observation 12–14 and 24–28 February

Content and working methods

The second-year project[2] was inter-disciplinary. The pupils had selected a base subject but were required to relate the content of that subject to several other subjects. Most of the students had been on an excursion the week before the observation period. Those pupils who

[2] National Centre for Educational Resources: Metodisk veiledning i prosjektarbeid, 1994 (Methodical Guide to Project Work): "The new curricula stipulate that project assignments shall have a key place in the educational system. In the course of the school year, all pupils shall carry out one or more projects. At least one of the projects shall include common general subjects and specialist core subjects." "The collection, adaptation and presentation of information shall be rooted in the subject, though initiatives in which the pupils themselves demonstrate commitment and responsibility represent a major and important condition for the implementation of all phases of the project" (p. 1)."The most distinctive feature of project assignments is that they provide pupils with extended opportunities to act and learn. This is not to say that pupils may do whatever they wish, and that the role of the teacher as an expert and educationalist is reduced" (p. 2). "The characteristics of project assignments: The work process requires that information be collected, edited and evaluated, and that the process allows different working methods and forms of expression". This will result in a product, i.e. experiences and results that can be communicated or shown to others. This product will be collectively evaluated by the teacher and the pupils" (p. 3).

so wished**,** were able to use the excursion as a basis for their project work. Some of them had worked on ideas and obtained information which they now continued to work on. Others had waited until they returned. They used the Internet differently depending on whether they wanted to build on what they had already found, or whether this was the first time they were searching for information on a particular subject.

The pupils were able to choose their own groups. They were allowed to decide whether they would work at school or at home during this three-day period. No lessons were held during the project period, but the teachers were present in order to offer necessary information and advice.

One computer, which was grouped with the 15 or so other computers in the ground-floor computer room, was connected to the Internet (see observation 12 February). It was located closest to the centre aisle in the first row by the teacher's desk. The other computers were used for word processing. The computers had 4 MB of RAM installed. The computer linked to the Internet was a 486 SX. On the board was a large hand-written poster displaying the rules for using the computer room, e.g. *Eating and drinking in the computer room are strictly forbidden. Computer games are not allowed.*

For word processing purposes, the pupils were also able to use any of the fifteen computers in the computer room one floor up (see appendix 1). These computers had 8 MB of RAM installed but were not connected to any communication tools.

The pupils and teachers in the third year

These pupils were the first set of pupils affected by the introduction of Reform '94, and were accustomed to project work. They knew that it involved a lot of effort. They had not used e-mail to any significant degree earlier because they had not had the technical capabilities to do so. **I.** had allowed some of the pupils to use her e-mail address a few times and they had tried sending and receiving mail.

One boy, **Y.,** was excused from working in a group. He had been interested in ICT for a long time, had some equipment at home and was regarded as an "expert" in the use of ICT by **I.** and his fellow pupils.

I. was responsible for giving advice to the pupils who had chosen to use the Internet to obtain information for their projects. She spent most of the project period by the computer. Other teachers commuted between the classrooms, the library, the canteen and the computer rooms, giving advice to pupils who required assistance.

Observation of the inter-disciplinary project

The ground floor computer room, where I spent virtually the whole day, gradually filled up with pupils as the morning progressed. **I.** said that she had made a list on which groups who wanted to could sign up to use the Internet. She told me that she wasn't sure how long each of the groups would be able to use the Internet computer, half an hour, or until they had found what they wanted. The computer took a long time to download information.

On the whole, there were two project groups that used the Internet during the three-day period. One group wrote abut "The History and Scope of the Laser", while the other group wrote on the following subject: "Is it possible to colonise, for example, Mars, and is it ethically correct?"[3] The base subject for both groups' projects was physics, and their main tutor was a female physics teacher.

[3] From the groups' questionnaire given to the tutors 27 January.

The "Laser group": I have chosen to call the two groups the "Laser group" and the "Mars group". The first group of people I observed using the Internet were three boys from the "Laser group".

After they had spent half an hour looking for information, I asked them whether they would mind if I taped their conversation. The audio recording lasts 57 minutes and illustrates the pupils frustration over the fact that the computer was so sluggish and that they had to wait such a long time when downloading pages.

Two of the boys could access the Internet at home. While they were waiting for the information, they had plenty of time to talk about their leisure-time activities. The pupils had searched for the words "LASER+NORGE" (Laser+Norway). They found one page.

> "We can use this," says the boy who was surfing the Internet. He is one of the boys who has access to the Internet at home. On his left is the other boy who has experience using the Internet at home. He is drinking soda. They are discussing how they are going to save this information as a text file. "We'll have to wait until it's finished downloading," says the boy who has no Internet experience. "It's finished," says the boy sitting at the keyboard. "How can you tell?" "You can tell when the red stop button is greyed out," replies the boy who is writing. The question of saving information is put to **Y.,** the expert pupil. He explains matters to them and also suggests that they print the information on a laser printer in the computer room on the floor above.
>
> **I.** comes over to the group and asks them whether they "have found anything". "Yes, one page, but it would have been nice if we could find something in Norwegian," replies one of the pupils. "What have you been searching for?" she asks. "LASER+USE". "There's an awful lot out there on the Internet. The problem is often selecting the right stuff," says **I.** The pupils perform a new search, this time by writing "LASER+NTNU".[4] One of the pupils is not too optimistic about what they might find. They would like to find something in Norwegian. "Maybe we should write NTNU first, and then LASER," suggests one of them. They wait for a long time.
>
> "Have you sold any more of those essays?" one of them asks. "I haven't been to Oslo yet, can't get there until Friday," he replies. They notice that **I.** is on her way over again. "Have you tried any of the other search engines? Or you could ask **Y.,** he often has smart ideas," she says. **I.** leaves them, and the pupils begin to talk about playing in a band. They start talking about films, and they log onto a web site on films. "Which film is that?" says one of them, and his friend tells him. "This is taking an awful long time," they say. The conversation then turns to learning to drive. **I.** comes over.
>
> "The boys have started searching!" **I**. said with satisfaction. "Yes, we have". "Key words, yes, try to limit the search as much as possible because then it'll be easier to find what you want. However, you have key words there so you should have a chance of finding something..." One of the pupils explains to **I.** that they are going to save whatever they find on a diskette and then print it out at another location. "Yes, we have a lot of diskettes...we should really have been in the large computer room but it's not yet ready," says **I.** "What is Kvasir[5] then?" says the boy without Internet access at home. "A search engine," says one of the other boys.
>
> *I (the observer) ask the group whether they used e-mail in connection with the project:* They tell me that their physics teacher contacted someone who works on lasers at the Norwegian College of Science and Technology. Through this contact, they were able to get in touch with an institute in Aachen which they visited on their study tour the previous week.

---

[4] (The Norwegian College of Science and Technology, NTNU).

[5] Kvasir: Catalogue of Norwegian and Nordic resources organised by subject. Operated by: Schibsted Nett AS. Size as of 19 August 1997: 7653 records. (http://www.jbi.hioslo.no/referanse/hovedopp.htm)

I. asks them whether they have found anything more on Kvasir. **Y.,** who is sitting directly behind the group, says that they should close one or more of the windows on the screen otherwise it will slow the machine down. **I.** has diskettes for the group. The pupils discuss amongst themselves whether they should download information on "lasers and CDs", "CDs also have something to do with laser techniques," says one of them. **I.** asks them if they have a good way of presenting the problem so that they..., but she stops in mid-sentence and suggests that they can try to use another search engine, e.g. "LASERAPPLIKASJONER" (laser applications) on Alta Vista.[6] "Yes, there are quite a lot of usable suggestions here...," says **I.,** and is just as enthusiastic as her pupils. "Are you going to copy this, too?" says the boy who has Internet access at home. **I.** suggests that they also perform a search using Yahoo![7] or one of the other search engines, and that they search for a topic such as "TECHNOLOGY" or perhaps "ENTERTAINMENT". **Y.** suggests that they should also search on Yahoo! **I.** says that she is going to try to find the systems administrator so that they can fix the sluggish computer. This is the second time that morning that she has gone to see whether the systems administrator is available. The expert pupil was clearly unhappy about the fact that the systems administrator, who holds a "full-time post(!)" has been unable to fix the computer. **I.** defends the systems administrator, saying that he has teaching responsibilities as well.

One of the pupils suggests that they sit down and find out what they should concentrate on in the project report. They divide the assignments among themselves. Later they will sit at home and work independently. One of the boys says that he would prefer to work with information in Norwegian. They exchange telephone numbers so that they can call one another and keep each other updated on the progress they are making. They agree that they get less done at school than they would at home.

They continue to search the Internet for information and then save it on a diskette. "Wasn't it Alta Vista where we found such a lot of information?" says one of the boys. **Y.** tells them how to write Yahoo! One of the pupils says that they found a lot of information in an encyclopaedia in the school library. **I.** returns.

"Did you find any good links here?" she asks them to look at some links to newspapers. She believes that the best links will probably appear on the screen in any case. "Our presentation of the problem in the project doesn't have to be formulated as a question, does it?" asks one pupil. **I.** replies that it doesn't necessarily have to be the case, and says that it is also possible to limit the actual approach to the problem to: 'Do we need lasers today, in what instances are lasers useful?' There are two areas here too, one of them is for background information and it's a good idea to search for 'LASER+HISTORY'," she says. She asks them if they have tried this, and they reply that it brought up 800 000 links. "What you can also do is to search for some of the people whose name appears in connection with lasers, that could also be a good tip," says **I.** The pupils discuss how they will continue their search. **I.** has left the room again to find the systems administrator.

The pupils talk about music and the band where one of them plays. **Y.** is sitting together with them. They talk about money, work and other interests. "What were those guys' names? " (*the inventors of the laser, sic*.), says the boy sitting at the keyboard. They try different spellings. One of the pupils leaves the room to copy something for the group.

The group talk about the man who invented the laser. A search for his name produces 55 hits. "He was born in 1915," says one of the pupils. Another pupil says that they will browse to a link since they will most likely get lots of information that way. **I.** stands

---

[6] Alta Vista: Very good robot-based search engine and the largest database of web sites. Size as of 19 August 1997: 22 mill. web sites, 13 000 news groups. Coverage: WWW, Usenet news groups. Updated: Daily. (http://www.jbi.hioslo.no/referanse/hovedopp.htm)

[7] Yahoo! Hierarchical catalogue organised by subject. The best site for browsing. User-friendly and with good explanations. Operated by: Yahoo! Corp. Developed by David Filo and Jerry Yang. Size as of 19 August 1997: Over 185 000 web pages, growing by around 700-1000 pages per day. Updated: Daily. (http://www.jbi.hioslo.no/referanse/hovedopp.htm)

beside them, watching. She is discussing with **Y.** what the systems administrator said. He had not been willing to do anything about the situation. **Y.** feels she should bring in a newer computer from the other computer room.

I. turns to the group again and says that she is pleased that they have begun to find something of interest. One pupil goes to the library to find information in the encyclopaedia, while another pupil returns with copies. One pupils shouts out that it is important for him that he finds something in Norwegian.

Y., who is very annoyed about the sluggish computer, tells the group that they have spent an hour and a half on the Internet, but that half of that time has been spent waiting.

Another group is waiting to get on to the Internet, while a third group is registering on the waiting list. "It says here that that guy isn't dead," says the pupil who found a reference to the inventor of the laser in an encyclopaedia. **Y.** has gone out himself to check whether "they" *(the school)* could install a new computer. He is fed up with the fact that the systems administrator can't be "bothered" to do anything with the computer. The "Laser group" discover that it is the next group's turn. "What about our presentation of the problem and all that?" says one of them. "We haven't really got an angle," says the other pupil.

E., the "Laser" and "Mars" group's physics teacher, comes across to me and asks me what I'm doing. She tells me that she feels that the Internet is relevant in school. In her opinion, the problem is finding time to discover what's on the Internet and finding time to use it. In the physics laboratory, they have one PC, which is not connected to the Internet. She feels that without access to the Internet, her pupils would have problems finding information on lasers. "The school library didn't have any relevant information," she says. Furthermore, she feels that using the Internet requires a mature attitude on the part of the pupils. In reply to the question of whether it would be difficult to evaluate the projects of pupils who have used the Internet a lot, she says that it would not be difficult, because "you always know the effort that lies behind a piece of work".

The "Mars" group

The "Mars group" had already found quite a lot of information on the Internet[8]. One week earlier, when **E.,** their physics teacher, had been absent, they had been given permission to use the double period to go to the computer room and search for information on the Internet. They had also located some information on the Internet at home.

I asked them whether they minded if I recorded their conversations while they were looking for information. They had no problem with this. The audio recording lasted 22 minutes.

Two of the four boys in the "Mars" group, **T.** and **B.,** were trying to find more information about Mars on the Internet. They were slightly hesitant because **I.** was trying to find someone who could help them to get the computer to work more quickly.

"Been sitting here for a quarter of an hour and haven't found a damn thing!" says **B.** "It wasn't so bad last time," says **T.** "That was tolerable."

I ask them if what they have found seems serious: "Last time we found NASA's home page and that was serious information," says **T.** *Have you received any instruction in how to use the Internet?, I ask.* "No, but we haven't asked, either," they tell me.

"Possible life on Mars. Yes, here's a Norwegian page," says **B.** They have found a Danish page containing the words: "Traces of life on Mars". They discuss among themselves how serious this information is. "If it's from the University of Oslo, then it's serious," says **Y.,** who is standing nearby. "It doesn't *have* to be serious" says **T.** "This article was written by

[8] This was a few weeks before NASA sent Pathfinder/Sojurner to March to send information via the Internet.

an astrology student, but he doesn't have any professional basis for writing it. It doesn't say any more than I could have written myself," says **T.**

Mailbox comment: *It is surprising that the school has not instructed the pupils in how to use the Internet. This means that success of the Internet depends on the pupils' capabilities and previous knowledge. However, these pupils were very critical of the source material.*

(**I.** explained to me later that so far instruction on how to use the Internet is only given to a limited number of classes at the school depending on the interest and competence of their teacher).

I. has been in one of second-year classes, in order to fetch **ES.,** who is a second-year pupil. He is one of the most knowledgeable pupils at school as far as computing is concerned. Among other things, **ES.** was involved in designing and producing the school's, still unofficial, home page. Quickly and with great efficiency, he deletes part of the computer's cached memory, removing elements which neither the school nor the pupils require for their projects. The computer is now noticeably faster.

In the canteen during lunch I spoke with **C.** and **R.,** two girls who had not yet used the Internet at school, although one of them had used the Internet at home. **C.,** who had Internet access at home, was in her second year of computer studies. **R.** had never used ICT before.

Their project assignment was based on the following question: "Did Norway's decision to join NATO represent a breach of the Norwegian policy of neutrality? How did it change Norwegian foreign policy? And what was the reason for joining?" The subjects covered by this multidisciplinary project were social economics, computing and social studies. **C.** had visited NATO Headquarters during a field trip to Brussels. **R.** had spent time collecting information at home.

I asked them why they used the Internet to search for information for their project? They had discussed using the Internet as one of many sources of information. "You never know what you might find. Almost all the information you can find elsewhere is now available on the Internet," says **C.** When she searched for information on "NATO", she found twenty pages containing different links to new pages. "There's an incredible amount of information on the Internet," she says. *What were their thoughts on the reliability of source materials on the Internet?* "You have to be critical, regardless of whether you're writing about NATO or anything else. We have to approach the question exactly as stated," they say. *Where did they get the rest of their information from?* They found most of their information in the library.

Initially, **C.** searched using the words "NATO+NORGE" (NATO+Norway). Among other things, she found all of Bjørn Tore Godal's[9] speeches.

"When you have three days to complete a project, then there's no point in us both being on the Internet at the same time. You have to share the workload. Three days is not very long, but then the project won't be as comprehensive as we would have liked," said **R. C.** said that "they were told about this project a long time ago, so they should have finished collecting information a long time ago." They have shared the workload so that **R.** has spent a lot of time using a word processor, while C. has done much of the searching on the Internet.

In the second floor computer lab I met a group of girls who had not used the Internet for their project assignment. I spoke to three girls who were working on the following problem: "Aristotle and Newton lived in different millennia, yet they researched the same things. How did they explain the same phenomena? Describe which of their opinions were similar and which were different?"

[9] Norway's foreign minister.

U. had access to the Internet at home. The second girl had used the Internet in one of **I.**'s history lessons, while the third girl had never used the Internet.

I asked them what were their thoughts on using the Internet? **U.** said that "it can be difficult to find things unless you have the correct address. When you finally get a reply, you may have to browse through several thousand hits before you find anything, and that can often take a very long time. In that case, it will often be easier to look in an encyclopaedia in order to find something on, say, Newton than it is to use the Internet. If you use an article from the Internet, the facts are often mixed in with a lot of "nonsense", whereas one finds more facts in an encyclopaedia." The girl who had tried the Internet at school felt that it can be difficult to find one's way around the Internet. She often thinks it is easier to use an encyclopaedia.

Then I talked to a group of boys who had used the Internet in their project work. I went across to the three boys who were chiefly using a word processing program. I had seen them trying the Internet the day before. The title of their project was: "Expectations and reality," relating to a school excursion they had made to Morocco. Their basis for their project was a combination of the following subjects: tourism, history, religion and a little French.

I asked them if they had found anything on the Internet. "Yes, but there's so much to choose from on the Internet, so it's difficult to know what to use and what not to use," said one of the boys. *Had you used the Internet before yesterday?* "I used it a little, but not very much. I surfed a bit." They told me that they had found something which they were going to use in their project. They had not used much information from the library. They were basing their project on their own attitudes, they told me. "But we need a little extra from the Internet..." *On what basis did you have expectations to Morocco?* They had started to write some out of their head, then searched the Internet to find additional information.

Mailbox comment: *The girls carefully considered the purpose of their assignment. They were concerned with being efficient and effective. They selected information that others had already processed. Their selections were made on a rational basis. The boys chose the opposite course to that of the girls. They were experimental, trying things out as they went. These two groups represent two different ways of collecting information.*

The "Mars" group sat in the room and worked on their project. They were using a word processing program. I went across to the group to ask them about their experiences with the Internet. **T.,** was the first person with whom I spoke.

Have you used the Internet much before? "No, not much". *Was the information that you found yesterday of any use?* "What we did yesterday wasn't particularly useful because we didn't need the information." "We had found what we wanted earlier in the form of a link to NASA," says another member of the group. *When and where did you use the Internet?* "In a couple of physics lessons, when the teacher was off sick. **T.** found a picture from Mars yesterday. He knew where to find it because he had found a link to the pages on one of the pages we had found earlier."

I turned to the rest of the group. *What do you think about using the Internet to collect information?* "Most of what we have found comes from the Internet. It is practical and easier to use than an encyclopaedia. We would have to have chosen another assignment if we hadn't had access to the Internet. Or we would have had to have done a lot more work in order to obtain the information, e.g. by writing letters to NASA. *Did you copy the information directly from the Internet, or did you reformulate it in your own words?* We copied some of it, but we have also read through it and made changes afterwards. A lot of what we find is so advanced that we have to rewrite it when we translate it into Norwegian. *Are you careful about using quotes?* We make a note of the sources as we go. *Has your*

teacher spoken to you about using source material on the Internet? No, our teachers haven't said anything at all about using sources. *Did you think it through yourselves?* Including quotes is normal, it gives your work a more serious character.

Mailbox comment: *The basis for their assignment is information available from the Internet. The pupils conclude that the assignment would have been more difficult without the Internet. They are able to get hold of more than just text, they can also get download pictures. This illustrates how new technology can provide them with relevant information without the need for the teacher's presence and without the use of traditional, printed materials. The Internet can have a liberating effect in relation to teachers and educational aids. The Internet can increase a pupil's opportunities and boost his motivation to learn.*

The pupils had to translate and edit the information themselves. They were involved in adapting information for their readers.

It would appear that the pupils themselves had to set a framework for their activities, and that this is a method that works well with pupils who are rational and motivated.

In the computer room on the first floor I found a project group consisting of one girl and three boys. None of the pupils had Internet access at home. They were writing about human rights in Marocco. The teacher had downloaded information from the Internet and given it to them to read.

I asked them why they hadn't searched for the information themselves? The girl told me that she had not had much training in using the Internet yet. It also takes a long time. Her special subject was English, and they could actually have used the Internet but their syllabus is already large enough, so that they had chosen not to include it, she said. *What did you think of the information you found on the Internet?* "It was superficial, it didn't go into any great detail about the subjects,", she said. They also collected information from the library and from Amnesty International. In the library they found several reports from Amnesty, and, among other things, a travel guide which gave them a good overview of the area. *How do you treat or use sources?* It's difficult to find out who had written things you come across on the Internet, but she told me she had managed to find out in the end.

Mailbox comment: *The teacher selects information on the Internet for his/her pupils. In this way, the teacher expands on the content he gives his pupils. This goes in the line of a traditional way to teach.*

Meeting with the pupils in I.'s second-year English class

The last two periods on Friday, 14 February 1997 were also the last two lessons before the pupils broke up for a week's half-term holiday. **I.** had English with 10 second-year pupils. They worked on one of the two compulsory English projects. The English course ran over five periods a week. Three teaching periods were spent on a variety of themes, while two teaching periods were spent on project work. The pupils had completed a project two weeks earlier, and had started to plan a new one. They were allowed to choose groups themselves.

The pupils in this class have worked on projects ever since they began at the upper secondary school. They have worked with Internet and e-mail because Before Christmas they worked on a project in which they used computers and the Internet. **BA., E.,** and **J.,** are pupils in this English class. They represent an important resource for **I.** in her task of integrating ICT into her teaching.

I. was not very pleased that the computer room only had one computer connected to the Internet. Occasionally, she therefore let **J., BA.,** and **ES.,** hook up to the Internet on computers in the teachers' study when the computer room was occupied by other classes.

These three computers were located in a corner, separated from the teachers' desks by wall panels. **I.** has often used these pupils as resource pupils when she has encountered ICT problems of a technical nature.

The boys were going to write a project on "Pink Floyd". The theme of their project was "Art". They were supposed to spend six months on their project, and their main source of information was to be the Internet. They would also be interpreting lyrics. I was informed that two of them already knew a lot about "Pink Floyd's" music.

On this particular Friday, the pupils were not motivated to work owing to the fact that they would soon be starting a week's holiday. I followed **I.** and the three boys down to the teachers' study room and talked to them there.

J. sat at a computer and was searching on the Internet. **ES.,** the boy who had helped the third-year pupils and **I.** to get the computer to run faster, was working on another computer. We talked a little about a variety of subjects concerning the use of electronic communication.

What does one need to know in order to create a home page? "The will to sit down and the gumption to search for something you can use," **J.** replied. "Anyone can make a home page," he continued, and told us that his 12-year-old sister had created her own home page herself. "I just gave her a little help to start the program." He showed me his sister's home page. "It's important that you know how to use ICT beforehand," he said.

Are there important things to think about when you are creating a home page? "The most important thing is that you have some idea about what it should look like and what you want to include in it" said **J. ES.** felt that design was important, "but text is also important", he added. **BA.** had not created his own home page.

What sort of people create their own home pages? "What normally happens is that people who like using the Internet decide they want to make their own home page," said **J.** "It's usually young people, or students. And professional companies, too." *Both girls and boys?* "Clearly, it's mostly boys, but there are also a large number of girls," said **J.**

Have you ever thought about why more boys than girls make home pages? Boys are generally more interested in computing than girls, says **J.** Girls look at computing as "something for losers". What about the fact that ICT can be communication, content and a personal style, wouldn't that appeal to girls? Girls who first start using a computer create home pages. **J.** has read that at various universities in the United States only a couple of per cent fewer girls than boys have created their own home pages. This is because they are required to use computers as part of their education. "People who don't use computers can't be bothered to create their own home pages," says **J.**

Does school play an important role in getting people to use computers? "Computers are something you have to know how to use in any case. It's important that as many people as possible receive information on how to use ordinary software packages such as word processing and spreadsheet programs. We should start with ICT earlier at infants school. Perhaps you get the Internet when you begin in ninth grade (aged 15–16), and by that time most people are of the opinion that computing is not interesting. When the pupils begin at upper secondary school, they are told that their teachers refuse to accept hand-written essays because they can't read their pupils' handwriting. Pupils who are familiar with computers have an immediate advantage. There are some boys who can use ICT, hardly any girls, and everyone is totally paralysed. We should start computing earlier," says **J.**

BA. had access to the Internet at home and had been using the Internet for 3–4 years. He first became interested in computers when he applied for a computer from the authorities on account of his handicap, but that took a long time. Then he bought a computer himself. To begin with he played a lot of games. After a while he found out that he could connect the computer to the Internet, and he took out a subscription.

BA. uses the Internet for to search for information, he says. Recently he has begun to spend more time "chatting" on IRC[10]. He likes to talk about all sorts of things, particularly about football. *School things?* "If there's a subject I need information on, then I use the Internet. The problem is that it's difficult to sift out relevant information because there is so much," he says.

Can you give me an example of a time when you used the Internet for school work without being encouraged to do so? "A while ago, our English class was studying the US elections. I tried to find some tables and results, but there was too much information to sift through. The whole class used the Internet at school, but I also used it at home."

ES. got his first Commodore 64 before he started school. He was very interested and thought that everything to do with computers and computing was very exciting. He had also looked at computers in shops and really wanted one. His family know hardly anything about computers, he told me. At his lower secondary school, he had hardly used computers, only word processing. At upper secondary school, he had used ICT to a small extent. He would like to study Computer Science at the University of Oslo. He enjoys creating things on computers, music and graphics are fun, he said. "At school, we should have learnt basic skills. It's essential knowledge one requires in occupational life later."

M. and two other girls are in the same project group. I met her right at the end of the day, she was alone in the classroom. Her group was doing a project on the Industrial Revolution and the position of women. Their project was at the planning stage. The main theme of the project was equality, and they were going to compare England and Norway, then and now. Before the lesson was over, I had a very interesting talk with her.

Have you planned how you will collect information? **"**Yes. We did a project earlier on art and culture. That time we collected information in a variety of ways. We used the library, the Internet and people we knew. We are planning to do the same again," says **M.**

Did the Internet live up to your expectations? "It was quite new, I hadn't used it earlier so I was very excited about it. I had planned to use the library quite a lot, but what I found on the Internet about Oscar Wilde was almost better." None of the girls in her group had access to the Internet at home.

If you could decide where the school PCs should be placed. In a computer room or somewhere else? Where would you put them? "Having a computer room is OK, but one solution could be to have the Internet computer in a place of its own. It can get a little "hectic" if you have one computer connected to the Internet and there are a lot of people standing in a queue waiting for their turn." *But if there were a lot of computers at school. Where should they be located? In the classroom, in the library or in a study room?* "Yes, perhaps in a study room where we would only work on projects." "It would be OK if we had a large room with some Internet computers and books. And you would have to set aside a number of periods a week to allow the pupils to work on projects when they wanted." "That would be nice," said **I.** She had just came in to see how we were doing.

Observation 24–28 February

This was the first day after the half-term winter break, and the school had connected all the computers in the first-floor computer room to the Internet via ISDN. The computers were placed in a horseshoe, with the pupils sitting around the outside. In the middle of the horseshoe was a colour printer (see appendix 1).

I. told me that she found out, by calling the systems administrator at home, that the room had not been finished until late the night before. As a result of this, I witnessed the very first Internet lesson in the scool's ISDN room.

[10] IRC Internet Relay Chat. Communication via the Internet in real time.

English – Second-year course

Content

The class will be working on "British politics" during this lesson.

Excerpt from the National and Local curricula for English second year course at upper secondary school (see appendix 2).

Working methods

Use the Internet to complete the exercises (see appendix 3).

Observation

The lesson started, not all the pupils knew that they were supposed to be in the computer room that day. **I.** began the lesson by telling the seven pupils – three pupils were absent – that the school now had Internet access in one of the computer rooms. The exercise that **I.** gave the class was to log onto the Internet, and then search for and download information on British politics and the forthcoming elections in the UK. We moved to the "new" computer room.

I. asked the pupils to sit in twos, one boy and one girl. According to **I., ES.** was one of the persons in the school who knew most about computers and the Internet. He was sitting between two girls, helping them with their computers. Two boys were sitting together, a long way away from the other five pupils.

After the teacher had finished her introduction, some of the pupils asked her for the password to log onto the computer.

I. wrote "Tony Blair" and "John Major" on the blackboard. These were the search words the pupils would use on the Internet. Today's lesson was designed to give the pupils a chance to become accustomed to the new room and to discover how to use the Internet.

I. told the pupils that the system administrator would come in to give them some pointers on using the Internet, and he arrived early in the lesson. **J.** put some paper in the printer. **I.** made active use of two of the boys, **J.** and **ES.,** as resource people. They answered questions about passwords and other technical aspects.

All the pupils appeared to have logged onto the Internet and had begun to find information. The bottleneck seemed to be a lack of printer capacity. All the pupils wanted to print out everything they found. **I.** walked around the classroom, offering encouragement and suggesting search phrases. "Communist party, good! There's a lot of information here! Good, great!" said **I.** to two pupils sitting at a computer.

ES.'s name could be heard all the time, his fellow pupils needed help to carry on, and no one waited for **I.** to come and help them, most of them wanted help from **ES.**

I. went out to ask the systems administrator to help get the printer working properly again. The trainee teacher came in during the middle of the teaching period to announce his arrival to **I.** The systems administrator arrived shortly to fix the printer.

As the pupils finished their assignment, they began to "chat" on IRC. **I.** told me in passing that the subject they were researching was especially well-suited to collecting information on the Internet, because their text books would not contain any information on the forthcoming election in the UK.

I. asked the system administrator how they could avoid problems with the printer. She felt that the school should have invested in an extra printer now that there were more computers. **I.** told the pupils that it was a good idea to only print what they were going to use, and that it wasn't a good idea to print too much at once. "If you do, then there's a good chance that the printer will stop again."

One of the pupils found a map of Scotland that showed where the different political parties had a majority. **I.** asked the pupil to analyse the map and find out why the different political

parties had majorities in different parts of the country, and then to prepare an oral summary for presentation in class.

The pupils sitting at three of the PC's were logged onto IRC. **I.** said nothing about this. The pupils at two other PC's were hard at work looking for information on British politics. **ES.** and a girl whom we interviewed later, **D.,** were sitting together. He was sitting right in front of the screen, while she was sitting a little to one side. He surfed the Internet, wrote, used the mouse – she looked on. He sometimes "disappeared" into the screen and **D.** became very passive.

I. came across to me and told me that there was an enormous difference between the time before the winter holiday when they had one computer and a modem and now when they have 15 computers connected to the Internet via a fixed line – enough for everybody. She also felt that it was good that the pupils were using IRC because it gave them a chance of a "breather". "Searching the Internet is a very intense business," she said.

I. had planned to review the lesson, but would have to wait until next time.

History: Third-year course (3HI, 3AØ-C)

Excerpt from the National Curriculum for History (Third-year course) (see appendix 4).

Observation:

The pupils were assembled in their usual classroom. **I.** greeted them and told them that today they would be in the computer room with 15 computers connected to the Internet. They would be doing assignments which they would solve by searching the Internet (see appendix 5). The assignments were taken directly from the day's class assignment. We went to the computer room.

The group consisted of seven boys and eight girls, and each pupil sat alone at a computer, with the exception of two pupil who wanted to sit together. Among the pupils in this class was **Y.,** who was the ICT resource pupil when the third-year class carried out its inter-disciplinary project.

The pupils were very eager. For example, one girl was looking at **Y.'s** homepage. **Y.** was "chatting" on IRC. One of the pupils who had been in the "Laser" group asked **I.** what "Shortcut to..." meant. She didn't hear him ask her, and after a short while he received a reply from **C.,** the girl whom we interviewed about NATO and who had experience of using the Internet at home. The pupils were making use of one another.

After a while, most of the pupils were connected to IRC. One girl asked more or less out loud: "Why is this lesson so much fun?"

There were problems with the printer. **I.** asked **Y.** for advice, but he didn't know what was wrong.

One pupil found information from the Israeli Foreign Office on the Internet.

According to **I.,** this class had not previously been enthusiastic about the Internet. "It looks as if they are all actively involved now, although I must say that IRC is popular," she said.

History (Second-year course): I. began the lesson in the ordinary classroom. I was waiting in the "new" computer room on the first floor. Two pupils, one of whom was **ES.,** were already in the computer room. They knew that the history lesson was going to be held there, and had told **I.** that they would be in the computer room during the break.

I. introduced me to the pupils, and told them that I was "here to observe their attitudes to using the Internet, and to understand whether they used it for anything useful". I had met many of the pupils earlier.

The pupils worked together, some of them alone in front of one computer, while others worked in pairs. They asked each other for help and showed each other what was happening on their own screens. **I.** walked around the room, first to a girl, then to another girl, then back to the first, then to another girl, before she went back to the first girl twice more. She gave one girl a thorough explanation about search strategies. Another girl was searching for information about the Black Death: "THE BLACK DEATH". Another girl asked **I.** what she was actually supposed to be doing?

Three girls were going to give a talk on "The Black Death". After working for 20 minutes, they didn't think they had found anything they wanted to use. They wondered whether they shouldn't use books instead. Two other girls, who were writing an introduction to the "Black Death", felt they had found a lot of information on the Internet.

Two girls were writing an e-mail message to someone they knew. One girl told me that this was the second time in her life she had written an e-mail message. I asked her if she thought **I.** would mind that she was writing an e-mail message to a friend instead of searching for information. She told me that she thought **I.** "would think it was good that they were learning to use e-mail".

Two boys came into the computer room towards the end of the lesson. They knew the pupils in this class well and told **I.** and the rest of the class that they were "just curious about the new room". They were supposed to be attending another class in a different classroom. **I.** had introduced me to one of the pupils during a break, and had told me that he was "the only person in the school who had placed anything on the Internet that he had made himself". The two pupils walked around the room, helping the pupils who were sitting there. It seemed quite natural. **I.** asked one of them if he could take a look at the printer that had stopped working.

In the break between the sixth and seventh period, there was no one who wanted to take a break. The two boys from the other class were still in the computer room.

I walked across to two girls who were each sitting at their own computer. **I.** came across and praised the girls for their expertise because they were, in her opinion, very skilled at searching the Internet effectively. They wrote notes directly from the screen, without making printouts. They made notes of addresses which they could return to later, and if they found only a little bit of information that was interesting, they would copy it straight down in their notebook. The two girls had used the Internet before, but they had no access to the Internet at home. One of the girls felt there were a lot of things on the Internet that were unnecessary, such as advertisements. The other girl would have liked to have spent "a couple of days on the Internet because it was so exciting," she said.

Three other boys came in from another class to see what was going on in the "new" computer room. The boy from the other class, whom **I.** had asked to take a look at the printer, had found out that it was probably a "cable error". **I.** left the room to fetch the systems administrator, "or someone else" who could fix the problem. The systems administrator did not come, but **I.** returned with a male science teacher to help her instead.

History (Third-year course) (3AØ–B): We were in the computer room. Space was limited. One of the pupils arrived late. He was unable to find a free computer until two girls suggested that they sit together so that he could use one of theirs.

The exercises they were given were to be solved using the Internet (see appendix 6).

History (Second-year course): This was the same class that had spent time the day before searching for information on subjects which they would later use to create presentations. One of the subjects they had searched for was stave churches.

I. began by reviewing the pupils' homework on the use of sources. The pupils had already logged onto the Internet.

It was cramped in the computer room, which was filled with 23 pupils. Some of the pupils were sitting in pairs. When **I.** asked them questions about the "Unification of Norway," only a few of them answered. A couple of girls, who had arrived late, were sitting on the floor looking at today's assignment. Most of the other pupils were either looking at their own, or their neighbour's, computer. **I.** gave up trying to go through the class's homework assignment, and let the pupils continue using the Internet.

She explained to me that she had to consider the time it would take to start the lesson in the regular classroom to be able to go through the homework compared to start the lesson in the computer lab to save time. She had thought it would be possible to review the pupils' homework assignment while they were sitting at their computers, but she could see that it was difficult to combine these two activities.

I stood behind a boy who was looking for information about "stave churches" on the Internet. He was performing a search using the Yahoo! search engine. He told me that he had only used the Internet once before. He found several pictures of stave churches.

A while later, when there was 15 minutes of the lesson remaining, I observed a girl and a boy who were no longer searching for information for their presentation. They were "surfing" the Internet instead. He had had access to the Internet at home for a couple of months. They said they had found out that there was no point searching for information/material on the computers at school because the printer didn't work, and because there wasn't enough time to take notes from the screen. "I'd rather do it at home," said the boy.

ES. was sitting at another computer on the other side of the room. He was also searching for information on stave churches. While he was waiting for the computer to download pages on stave churches, he had logged onto IRC and was "chatting". He appeared to be engrossed in what he was doing.

English (Second-year course):

The pupils, and myself, were given a sheet of paper with an exercise outlining the objective of the lesson.

Objective
"Each pupil will log onto IRC and "chat" on the subject of "British politics" with people in English-speaking countries.

Observation

We were in the computer room. Two boys, who were sitting together some way away from the others, had logged onto IRC. They would occasionally shout to **ES.,** who was sitting together with a girl. It looked as if **ES.** and some of the other boys were chatting on IRC amongst themselves. One of them shouted about "kicking" others off the channel.

It was difficult for the pupils to find anyone with whom they could talk about British politics. One girl, who was not accustomed to using ICT because the school she had attended the year before had not taught its pupils to use it, was very proud that she had found someone in the USA with whom she had chatted for a little while during the lesson. Her written English was good because she had spent part of her life in the United States.

Towards the end of the lesson, **I.** wanted to draw the pupils' attention to the subject of Netiquette. "Don't talk about religion, be careful, be nice, don't use dirty words." None of the pupils had any comments about what she said. Either they were already aware of the rules and

took them for granted, or they were so keen to use IRC that they didn't hear what was being said.

12 February**,** I had an interesting conversation with a teacher, **A.,** and a couple of other people on the topic of "Gender and ICT". I think it is worthwhile including excerpts from this conversation (see appendix 7).

23 April, I returned to the school to hear two of the third-year groups present the results of their project assignment to one of the third-year classes. In its presentation, the "Mars" group, that had been awarded the best possible grade for its project, said that the advantages of using the Internet were the availability of information, and the fact that the Internet was easy to use.

The disadvantage of using the Internet was that the computer at school was so slow, which meant that it took a long time to download information. The fact that all the information they found was in English was a problem, because they had to translate everything the whole time. There was also a lot of information, and by searching for "MARS" they found a lot of useless information, e.g. people who were born in the month of March (Norwegian "mars" also means "March" in English) etc. They also found a lot of information written by the same person, and ended up using a lot of his opinions in their assignment.

IV The interviews

The project supervisor and the observer interviewed **I.,** the principal, the systems administrator and the librarian separately. The teachers **E.** and **S.** were interviewed together, as were the pupils **D., G., H.** and **BA.**. Here is a presentation of the participants' views on a number of topics which interest them. We used an interview guide, but also followed up our inquiries by asking further questions in those areas that the interviewees found most interesting.

The interviewees and their roles

When we selected an upper secondary school, we chose this particular school because **I.** was a teacher there. She has been a pioneer and a motive force in Norwegian schools in the testing of Information and Communication Technology (ICT) in the classroom. In 1988, she introduced Minitel in a French class at the school were she was working. She did so because she felt she needed to create opportunities for communication in her French lessons.

I. has a Master's degree in French and a Bachelor's degree in English, History and French. She also attended a pedagogical on-line seminar hosted at the University of Oslo. Her previous work experience includes six years at a vocational school where she came into contact with a very interesting way of working, she told us. She was used to thinking in terms of theory. However, with pupils who didn't even want to "hold a pencil," she had to find new ways of working. In her English lessons, she allowed pupils from the "machines and mechanics" course to present topics related to machinery and the names of equipment. After the introduction of the central educational reform for upper secondary education, Reform '94, **I.** began to teach academically-oriented, non-vocational courses at upper secondary level.

I. feels that pupils should be given a good deal of freedom with responsibility in their school work. She often use pupils from her class as a resource when using ICT. She teaches English, French, history and social studies. I observed her teaching English and history.

I. has been allocated a number of teaching periods and a good deal of educational resources in connection with her work on project assignments. She has previously been a head of year and a senior subject teacher. In order to create the space for her work, she has availed herself of those opportunities these positions have presented to her. She has taken an active part in the development of educational strategies, and feels that the way in which she integrates the Internet into her lessons is innovative and developmental. As such, it is futile to place old conventions within the educational system in the way of opportunities to develop new teaching methods. She has experienced repressive forces at the school, and has had to look outside the school for new impulses. I would characterise **I.** as a creative, fearless and committed teacher. By fearless, I mean that she is not afraid of being unpopular among her colleagues, as long as she feels that what she is doing is best for her pupils.

The **pupils**, **D., G.,** and **BA.,** were in their second year of the three-year course in general, non-vocational subjects, and **I.** was their English teacher. All three pupils had a PC at home before they started at the upper secondary school. The boy, **BA.,** had access to the Internet at home. He "chatted" quite a lot on IRC and played computer games each week, he told us in the interview. He wasn't quite sure what he wanted to study, but he thought it would be something to do with computers. Together with **ES.** and **J., BA.** was one of the pupils whom **I.** frequently used as a resource whenever they had problems relating to the use of ICT.

The girls, **D., H.,** and **G.** wanted to study to become a nurse/midwife, policewoman and teacher, respectively. They had computers at home, but rarely used them. **H.** sometimes used her computer to play computer games. The computer equipment in the girls' homes was not as good as **BA.'s,** but he needs a computer at home because he sits in a wheelchair and has cerebral palsy.

The **principal** was new to the school. Her background was in handicrafts and esthetical subjects. She was used to using software in connection with, for example, weaving. The

principal regarded ICT as important, she herself used the Internet occasionally, though not e-mail. The principal had been away from school for a while prior to the time when I conducted my observations. She told us that she had therefore been unable to discuss ICT as much as she would have liked. In the period before I came to the school, a lot of time had been spent on saving three classes from being transferred to other schools.

The **systems administrator** had no job description for that particular part of his work, which accounted for 40% of his total hours at the school. "The post of systems administrator is under continuous development, it's not static, and with ICT something's always changing," he told us in the interview. "Once it was enough if you were a computer expert, but that's not possible any more, even if you know how to programme." He spent the rest of his time at school as a technical drawing teacher.

He had not received any post-school training in the use of ICT, but had registered for courses on three occasions and his expenses had been met by the school. Whenever he encounters problems he is unable to solve on his own, he gets assistance from the companies that sold the school the computer hardware and software. If he feels that the school should invest in equipment, he will ask one of the school's superintendents. He told us that the school administration often asked him what ICT equipment costs. Sometimes he is granted funds straight away, at other times he buys it regardless of their decision, if he feels it is necessary.

Originally a constructional engineer and carpenter, he began using computers in another job ten years ago. Personal interest drove him to find out what went on in a PC. He has six months of formal training in computing. Beyond that he was self-taught. He holds the post of systems administrator, and within that post he is free to do exactly what he wants, he told us in the interview. "It's a bit stressful," he said. "First and foremost, it's a matter of following developments because things change so quickly and demand is growing."

Teachers E. and **S.** were science teachers, and their subjects were physics and mathematics, and mathematics, physics and general science, respectively. **E.** had fairly recently graduated from university with a masters in physics. **S.** had been at the school for 5–6 years, and had previously worked in the manufacturing industry. They had both used the Internet and ICT for teaching purposes. **E.** was the teacher for the pupils who used the Internet to search for information on "Mars" and "Lasers" during third-year project week.

S. had taught himself to use ICT. For the last year, the county council had offered its teachers a relatively inexpensive Internet connection and **S.** had availed himself of this special offer. He had mostly used the Internet for private matters. **E.** told us that she had already spent some time on the Internet, but that time was a scarce resource and that she would not use it any more than she felt was appropriate. **S.** felt that one didn't need to increase the amount of time one spent on ICT because the technology was becoming easier to use.

The **librarian** came to the school in 1994, when the upper secondary school reform had been implemented and the library was new. At that time she had just graduated as a librarian, having retrained as a mature student from a position in the health sector. She has taken one Internet course that was held under the auspices of the Director of Education (County Educational Chief). She has not made any field trips to look at Internet solutions, but she knows a good deal about how other libraries have implemented the Internet, she told us in the interview. She had not reckoned on being alone in the library, and had hoped she would receive some in-house ICT training. She has sons at home who have taught her something about ICT, but she feels a need to enhance her ICT skills. One condition for her being able to search for information, she thinks, is that she feels confident about the level of expertise in the upper secondary school – which she feels she is. She is sceptical about the Internet, which she feels is very "messy".

Topic no. 1: The role of pupil and teacher as regards responsibility for one's own learning

During the observation period and interviews, it emerged that **I.,** on her own responsibility, and without clearing this with her colleagues, the principal or the systems administrator, had allowed her own pupils, who were pupils whom she knew and trusted, to remain in the computer room during breaks in order to use the Internet. She knew that they were "experts" on the Internet and she therefore allowed them to be there even though she was not in the room herself.

I. made it clear that she regarded her pupils as individuals, not as a class or a group, and that they had to be treated so that they felt that they could assume responsibility for their own learning, as indicated in the school reform. She felt that she was their equal when it came to ICT. She also stressed that the fun thing about being a teacher was that she considered her pupils to be ordinary people with whom she could discuss matters outside of lessons. She felt that a lot of "fun" things happened and that "it was interesting dealing with people". She told us that she liked pioneering work, or things no one else had done before, or things that were fairly new at least. She was interested in school development. It was impossible to use the Internet at set times behind closed doors.

I. told us how she had worked when she trained one class of pupils to use the Internet. To increase her efficiency, she had selected several skilled pupils to assist her since none of the teachers could have helped her in the same way. The pupils (**J.** and **SE.**) were assigned their own user identities on the Internet and were "treated as resources for the other pupils".

Mailbox comment: *The use of new technology requires a different degree of freedom and a redefinition of roles, rules and conventions related to planning, implementation and assessment of the teaching. At this school one has the feeling that the development and progress of ICT is conditional on the enthusiast who is extremely active and does new things. Is this positive for the development of the school, or is it a problem that her activity has not been institutionalised? She is very concerned that pupils who demonstrate capabilities should be given opportunities. As long as there are no rules at the school, she maximises the situation and allows the pupils whom she trusts to use ICT without a teacher present. She puts the pupils' learning above her relationship with her colleagues. She defends what she does by saying that she is involved with educational development in relation to the technology. For her, being conventional is meaningless.*

*What drives **I.** is her enthusiasm. She is optimistic by nature and wishes to follow developments in the world. It would appear that she likes to live an exciting existence, and she is action-oriented despite the fact that she has* very little *training in ICT.*

The school is unable to meet the demand for the Internet. Is this as important as she makes out, and our observations would suggest? Or is this a form of self-affirmation?

Frustration is a common problem among pupils who use ICT at school, according to the **second-year pupils** we interviewed (**H., G., BA.** and **D.**). They want assistance quickly whenever they were stuck. They would call out to one of the boys in the class if they made an error in their search, and told us about the time when they were supposed to find schoolchildren on IRC with whom they could chat to about the British elections. It is important that they can spend some time in the computer room. "That's why we need to spend at least a double period in the room each time," they said.

The pupils were of the opinion that it made an enormous difference whether the teachers were positive and keen to use the Internet. the boy, **BA**., felt that it was unfair that pupils who know how to use the Internet are able to find information, while the other pupils do not have this opportunity because the teachers are unable to teach them how to use the Internet.

The school should offer more basic training on how to get started and how to start programs, said one of the girls. They should give us some addresses so that we have something basic to begin with, said the other girl. The boy felt that the school should offer a separate course that

provided a basic introduction to using ICT. “Another thing would be if the search engines were saved as ‘Favourites’ on all the computers, then at least you could get as far as starting a search. The pupils haven’t really been given any training as far as the communication aspect of ICT is concerned,” he said.

“It’s stupid that a teacher has to be in the room the whole time, and that the teachers have to lock the room between lessons,” the boy continued. “They say that there has to be a teacher in the computer room whenever pupils are using the computers because the systems administrator is afraid of computer viruses, but if we were allowed to sit there, nothing bad would happen. When you keep getting thrown out all the time, you almost want to do something ‘naughty’, and one teacher can’t follow what’s happening on 15 computers at the same time in any case” One of the girls thought it would be nice if they could do their homework during breaks, and that they should be allowed to work freely on the computers. “The systems administrator says that it is the teachers’ responsibility to allow the pupils into the computer rooms, and that he must throw them out,” the boy continued. He felt that the systems administrator took his duties a little too seriously. “The pupils should be able to learn to use the Internet a little on their own by finding information that interests them. If they were allowed to use the computer room during breaks, it would be quieter, and if one pupil could help his/her fellow pupils, the pupils would learn more,” he thought.

“The library should be bigger,” the boy continued. They would like to be able to use the library whenever they want. They touched upon the subject of assuming responsibility for one’s own learning. The library is locked when the librarian isn’t there. After 2.00 p.m., no new pupils are allowed into the library, although those who are already in there can stay. It has to be quiet there. The canteen closes at 1.00 p.m., so the pupils cannot go there either. They told us that they needed a common room. The pupils disagreed as to whether they would be able to assume full responsibility for their own learning.

One of the girls felt thought that there were so many pupils who needed help that they weren’t getting enough help from **I.** That’s why they used **ES.** and **J.** as ICT resource pupils. “We call out for them more than we do for **I.**,” she told us. The pupils felt that **I.** was a skilled Internet user, but that it was good that there were fellow pupils who are even better who can help them when they need it. **BA.** said that he asked for help from the person or persons whom he felt knew most, and he didn’t feel “stupid” compared with the two resource pupils. However, the pupils thought that it must be a bit boring for **ES.** and **J.** having to help people the whole time. And, they added, they thought it must be an enormous “help” for the teachers having resource pupils like them around.

The pupils explained that they worked differently with the new technology. To a greater extent, ICT enables them to pursue things they find interesting. However, they do need somewhere to start. It was important that they had guidelines for their work. They also thought that the teachers learned something new by using the new technology. The pupils told us that they saw that the teachers and pupils were at the same level as far as ICT skills were concerned.

One of the girls expressed a certain scepticism to new technology, which she felt had permeated the whole society. “It’s just as if those who have a command of computing soon won’t have to work themselves,” she says. “It’s so asocial.” The boy believed the Internet could ruin so much. He had read about “hackers” who had cracked codes and brought down companies. “The Internet is not only positive, you can use it for a lot of negative things if you want,” he said.

The principal considered the initiative to use pupils as ICT resources to be very positive. Nevertheless, she questioned how much one should use them. They had so many other things at hand which would be measured in terms of grades, she said. “The pupils should therefore bear in mind what they are spending their time on. However, the fact that the pupils are teaching others is a tremendous learning process.” From schools where she has previously

worked, her experience of using last year's pupils as computer assistants is very good. These individuals had studied computing in depth and worked as tutors together with one teacher at the school. It was very successful, she said.

In England, she was impressed at how several schools made use of what she would call "technical personnel". In Norway, the teachers need to transcend the technical barriers, which may in turn help explain why the general, non-vocational subjects are lagging behind vocational subjects as regards the use ICT. She also felt that the post of systems administrator at the school "is one area that certainly needs a proper job description," since it was a very important job.

"The fact that strong, enthusiastic powers are forcing the school's ICT policy may represent a danger. It's not always necessary to march in time, but you needn't make too much progress before you encounter a boomerang effect." She argued that she needed a "normalisation strategy" with regard to the situation where several of the teachers are extremely enthusiastic ICT users, while others have no interest in using it as a tool. "The tension among the staff has intensified recently." But we haven't missed the boat yet, and she believed that once they had raised the ICT skills of most of the staff up to a certain level, they would be able to begin integrating ICT into different subjects and courses. This was the principal's wish.

The principal found it very interesting that the pupils wanted to have more basic training in ICT use than they were currently being offered. This surprised her, because she thought that the teachers had learnt this themselves on their courses, and that they were aware of this.

The systems administrator told us that at a staff meeting recently he had called for the training and certification of teachers. He wanted to arrange a simple user-course in practical ICT skills. "The teachers should be able to log onto the net and have some idea about what's going on." This was so that he would avoid too much hassle. He did not discount the possibility that the internal training of teachers in the future would occur in parallel.

He was aware that the ground rules regarding the use of the computer room had become a topic of discussion. He had seen it coming. "Everything must be downloaded and printed, something is bound to go wrong." He felt that a teacher should always be present when there were pupils in the computer room. Yet, since they had so many fine resources and pupils who wanted to use ICT, it seemed stupid to lock the pupils out. He had therefore suggested that the school should allocate available resources to those teachers who wanted to sit with pupils in the computer room during recesses and lunch breaks. Until such time, he would lock the pupils out.

It was difficult for both pupils and teachers to follow the rules he had laid down for using the computer rooms. He told us how both groups ignored the alarm that sounded if it detected a diskette that was infected by a virus, that they didn't always restart the computer, but continued using the computer as it was instead, which meant that he had to clear up after them. "During the first part of the third-year project week (Vk.2), the pupils traipsed in and out of the computer room, bringing with them a lot of viruses and a lot of games and a lot of things that didn't work," he said. It had been necessary to say that things couldn't continue like that, and the second week of the project had been a little better. He actually felt that if the pupils wanted to work in the computer room, then they should be allowed to do so.

There was a poster in each room which said that *games are not allowed*, and that *any infringement of these rules will lead to expulsion*. The systems administrator felt that this was a paradox. A PC network is constructed so that one may do whatever one wishes. In a school situation, this is a little difficult. The Internet is designed to allow everyone access to whatever they want, and this is quite the opposite in a school situation. "The fact that you have access to information from the whole world, but are not allowed to download violence, breasts, bombs and drugs is a little self-contradictory," the systems administrator said. Teachers need to speak of morals and ethics beforehand, he felt. Imagine the following

scenario in the media, where a school whose pupils' use of the Internet is relatively free and open may find itself the subject of the following headline: "Child pornography from Internet rife at this upper secondary school." If the pupils can accept a situation with a teacher present, then he thinks that that's good enough. "That's just the way it is," he said.

The systems administrator felt that the attitudes of the teachers at the school were characterised by ignorance. "Most of them have very little idea about what they can actually do with ICT." They haven't discussed this at joint meetings or staff meetings, and it would surprise him if there were any differences between the different groups of subjects as far as usage and attitudes to the Internet were concerned.

He didn't know himself how he would plan his teaching on Internet use. The pupils' skills differ enormously because they have different ICT experience from home, and because their parents' attitudes to ICT are different.

The school has already encountered instances where pupils know more than their teachers. This has a positive effect on the pupils at least, says the systems administrator. Naturally, it represents a challenge for the teachers. "Even teachers whose specialist subject is computing will find they have pupils who are not motivated to work because what they are being taught is too banal for them. And a lot of the vandalism on the school's computers is done by pupils with good computing skills." He himself tries to prevent vandalism, but when the pupils manage to remove the barriers he has set up, he has to invent new things. "I think it's an expression of boredom. It can also be due to a lot of tension or a destructive urge."

"One could reverse this by giving these pupils responsibility for servicing and maintaining the school's computers instead." He regarded the installation of games as vandalism. It was not allowed. He has also tried to make it a general rule that no pupil may use his or her own diskettes. He handed out diskettes to the teachers, who in turn would hand out and collect the diskettes as required. Another possible solution was to remove the disk station.

The systems administrator had proposed that the pupils be given the use of one room containing multimedia equipment, which they would be responsible for themselves. "The danger with this is that the computers would perhaps only be available to those pupils who were most skilled at using ICT already. And that those pupils who could develop an interest in computing through playing games would not be given a chance to use the equipment."

He believed that technophobia on the part of some teachers prevented them from using technology. For example, many teachers avoid using videos at school. Some of them have a "fear of keyboards", although he has seen gradual changes. "We have had some staunch opponents of computers at the school, but the media and their own children have left their mark on the attitudes of some of the teachers. Now they've accepted that the Internet is perhaps something for them, too. But there are many teachers who dare not let anyone know that they don't know very much about computers."

He says it is tiring having to deal with very enthusiastic teachers. There are 2–3 teachers at the school who are genuinely interested in ICT. They ask questions on subjects about which he knows very little, and he does his best to advise them, he says. It is a very good investment, however, because they can then help the others with simpler problems.

The systems administrator felt that the pupils were at the mercy of the skills possessed by their respective teachers, or friends in their class, who are typically boys. The result is an inner circle within the class.

Some of the pupils have a need for a separate ICT resource solely for them, while he is essentially there for the teachers. The economics and information course is designed to meet that need, but it is true that the school has not given the pupils any basic ICT training. This

matter has not been discussed by the teachers, since planning lags behind developments in ICT. However, it will probably force a need, he said.

Mailbox comment: *It still surprises me that when things happen they happen in a very ad hoc way in the school. One of the unfortunate effects of this is a great degree of variation from individual to individual as far as ICT experiences are concerned.*

The librarian had not been included in the Internet discussions at the school, she told us. "This was due to personal chemistry". She cooperated very well with the computer people, but they "don't know libraries so they are struggling, and they think that Mikromarc is stupid." She thinks that purely as a matter of principle it would be natural for her to participate in the Internet discussions at school. She has not been asked to take part, and she doesn't think they dare ask her, she said. She would like to cooperate more with the teachers than she does at present.

The teachers, S. and **E.** felt that it was too early to say too much about the effect ICT would have on their pupils' learning. "It's totally new, and we have yet to organise and use the room." What's happening at the moment is that the pupils are flocking in, said **S.** "The pupils were extremely motivated, and it was surprising to see some of the first-year girls who were very motivated towards using the Internet," he said. "Also pupils who are less gifted are generally more motivated as far as the Internet is concerned," said **E.** "A pupil can quickly become skilled at using the Internet, and can suddenly become the class guru," she said, referring in particular to one third-year pupil who acted as a resource pupil throughout the project week.

S. envisaged a scenario in which pupils could act as paid ICT tutors. "There is almost a spirit of among teachers and pupils at this school that we pull together, so I'm not sure whether one can speak of a 'balance of power'," he said. He also believed that several conflicts could erupt among the staff in the future. "Some people will be afraid of the technology, and some people will not be able to get used to new ways of working. It can be somewhat frustrating to see that the pupils are good at doing something which you yourself are unable to do." He believed that those teachers who were fundamentally negative to new technology, would distance themselves even more from using ICT if the enthusiastic teachers constantly claimed that using ICT meant the difference between "life and death". This would lead to polarisation. Courses intended to shape attitudes were therefore just as important as technical courses, said **S.**

Topic no. 2: Internet and professional relevance/integrated into subject teaching

I. was concerned about the fact that "ICT is not an unambiguous term. ICT is a teaching aid, it makes a number of things easier and enables us to do a good deal of things which we were previously unable to do." She gave us an example from the time when she was one of the first language teachers in Norway to introduce Minitel in her French lessons. "Some of the pupils who were previously unmotivated were willing to look up things in grammar books and dictionaries two weeks after they had begun to study French. They did this to find out how they could communicate with pupils in France. And when they received replies from the French boys, they were very interested that she, the teacher, could help them to translate the content of the letters. They were willing to learn new things so that they could communicate with others." **I.** thought that e-mail could have the same effect. "The fact that they know that they are writing to another "genuine" person is more motivating than writing something that the teacher is going to correct," **I.** felt.

Mailbox comment: *Using e-mail creates authentic situations – particularly in language teaching. The fact that the pupils began to produce texts two weeks after they started learning*

a language is quite unique. We learn by doing things. Here the teacher stands for a constructivist view of teaching.

I. felt that the objective of using the Internet is to follow the curriculum so that the pupils get good grades in their examinations, and secondly that they may have some personal benefit from it. **I.** stressed that variation is the best thing in teaching. "It's difficult treading the fine line between giving the pupils time to use the Internet and time to get through the syllabus, because as a teacher you want to give your pupils freedom at the same time as you want them to do well in their examinations."

I. gave us an example of one pupil (*the resource pupil who helped everyone with their ICT problems during project week)* who functioned poorly without a computer. It was important that he had a computer. Some pupils concentrate better in front of a computer even if they sometimes do things you wish they wouldn't. "If each pupil has one thing that they master, then that's good for them".

I. felt it was important that the whole class was assembled when they were working on the Internet. They could work on different and differentiated assignments, thus enabling all the pupils to work on what they needed. She would first have to familiarise herself with the information on the Internet. This could, for example, take the form of updating information which was often outdated in the textbook.

"The curriculum is very extensive and stresses that pupils shall discover things for themselves, so a textbook will not contain sufficient information." She explained her thinking behind her approach to the subject "British politics" in her English class. Elections were due to be held in the United Kingdom, and the pupils were required to learn about social and political conditions. There was nothing in the textbook on this subject, so she had to use the Internet. At first she tried to get her pupils to buy international newspapers, but they didn't do so. Therefore she began to search the Internet for information together with her pupils. They found a database which was both informative and relevant, said **I.** As such, the Internet also covers the international aspect of the curriculum.

Mailbox comment: *It is natural to ask whether the information the pupils find is of good quality.* ***I.*** *also told us that her class had not discussed the quality of their source material, the right to use what they find, and the right to download and use it. It is surprising that they have not given consideration to sources and critical attitudes to source material. The Ministry of Education is concerned with the ethical issues relating to Internet use and copyrighted material, e.g. downloading software from the Internet. Why hadn't the school librarian felt the need to cast light on these issues on the basis of a systemic perspective?*
(Later **I**. told me that she has gradually become more concerned with the problems related to evaluation of source material and ethical questions. Both these concerns are now and integrated part of her Internet teaching).

The pupils whom we interviewed had different opinions about how relevant ICT was for their learning. One girl felt that ICT was important, but she had never liked it. The girl who wanted to be a teacher thought that it was important to know something about the Internet. "It's a little bit difficult to find what you're looking for, but it's fun learning how it works." The girl who wanted to be a nurse thought that Internet addresses were difficult.

All of the pupils had tried e-mail. The girls explained that if they had had Internet access at home, they would use it for school work and e-mail. They thought they would probably grow tired of IRC after a while.

The girls said that they had never thought that anything they downloaded from the Internet could be untrue. "Not what they have downloaded during school hours at least," said one of them. They said that none of the teachers had talked to them about being critical of source

material on the Internet. However, they knew that it was easy to manipulate and be manipulated on the Internet.

Beginning next autumn the new physics curriculum will pave the way for greater use of the Internet, and textbooks will include Internet references, said **the teachers E. S.** felt that the present curricula were too extensive to allow pupils to select topics for themselves.

When the new physics curricula become effective in the autumn, **E.** will tell the deputy head that she requires five periods a week in the Internet room, she said. **S.** told us that he hasn't properly reviewed how he can use ICT to do things in a goal-oriented manner, but that he was thinking of using computer simulation in physics in addition to the Internet.

At a meeting of subject teachers, **E.** and **S.** had raised the matter of buying a computer and an overhead projector so that they could demonstrate simulations for their pupils. "Internet and ICT will be important, especially in achieving objectives in physics experiments. One can plot in variables, which is otherwise impossible to do. The pupils can discover that it is not that easy to measure things and learn research methods." **S.** felt that one can demonstrate processes and experiments over the space of a short time, but at the same time he was afraid that his pupils would forget the simple things. He didn't want his pupils to spend more than 20–30% of the time they have allocated for experiments, on the computer. "Things can be simplified using computers, but they can't replace the rest of the work," said **S.**

E. told us that in connection with the third-year project week they had not discussed the importance of being critical to source material. "The gifted pupils have understood a lot of this themselves." One problem that was common to most pupils was that they had not been drilled sufficiently in the importance of defining the problem properly when working on a project. **S.** interjected that we shouldn't believe that the Internet is a "universal remedy" that can help with everything, it's only an aid for facilitating communication and access to information.

In the natural sciences, where one may discuss, for example, environmental problems, you have a communicational aspect, said **S.,** in response to our question. One example might be that it says in a textbook that "a certain percentage of electricity in Denmark comes from wind power". You can send an e-mail to a pupil in Denmark and ask "where does your electric power come from?". "That'll make it easier to remember," said **S.**, "but it takes two hours to do this instead of just reading one sentence in a textbook. You have to bear that in mind, too."

Our observations revealed that in **I.'s** classes the pupils were allowed to "chat" on the IRC between searches. She felt that IRC was a motivating force. "IRC is a good tool for spontaneous communication." The curriculum emphasises the importance of linguistic and communicative skills. **I.** felt that spontaneous communication could be made goal-oriented by sticking to one theme and at the same time managing to write something very quickly. **I.** knew that when her pupils were chatting on IRC, they were not always doing what they were supposed to be doing. This meant that as a teacher one had lost control. "However, you can't say to a pupil that he or she shall only chat about one thing and nothing else," says **I.**

Mailbox comment*: *I. *demonstrates here that she has defined "chat" as a means of developing spontaneous communication in a free and unstructured dialogue. At the same time she wants to use it for more goal-oriented learning where it will be possible to carry on a dialogue about specific topics. In reality, both aspects occur in parallel. If the "chat" takes the form of oral communication, it seldom occurs within a managed framework and with a "chat leader". Is "chatting" a written or oral form of communication with a genuine place in goal-oriented learning?*

IRC places great demands on the participants, but at the same time it offers a range of opportunities to learn many different skills and provides access to a rich diversity of

communication, the opportunity to explore one's own texts and feelings. ***I.*** *and several others at the school have neither tested to any degree nor given much consideration to this. It would also be interesting to discuss whether searching for information on the Internet is surfing or searching? Does surfing become searching?*

The pupils can test out new roles. This gives them an opportunity to be someone else for a short while. The pupils are young adults and they find getting to know the opposite sex to be very exciting. What is the pupils opinion of communicating with IRC? Is it true that the boys chat, and it is true that they use false identities to investigate, to bully others, gossip about others, kick each other out of digital channels or flirt with the opposite sex?

The pupils whom we interviewed told us that they used IRC a lot. The girl who wants to be a teacher told us that she had just learned how to hide the IRC window when her teacher approaches her computer. They also told us that they used IRC to "chat" with other pupils in the classroom and the neighbouring classroom, but also with people in other parts of the country and around the world.

They had begun to use some of the commonly used abbreviations: "U" (you) and "R" (are) and "BRB" (be right back). The boy and one of the girls told us that they had never used a false identity on IRC. The two others said that they could sometimes investigate their limitations by concealing their identity.

One of the girls had tried to log onto a German IRC channel. She wasn't that good at German, so she didn't understand much of what was being said, she told us. The boy felt that he had begun to write more quickly on account of IRC. If he was on an English channel, he quickly learnt new English words. One of the girls felt that she was not fully concentrating on the lesson because of IRC, while the boy felt that it was good to "chat" as it took a long time to download information from the Internet when using a slow modem. However, there "was often a little too much 'chatting'". One of the girls felt that "chatting" was one way of relaxing. The girl who wanted to be a nurse felt that it was better to talk on the telephone – she wanted "to hear the voice of the person she is talking to." Another girl said that she couldn't find anyone to talk to about British politics during her English class.

Mailbox comment: *Here we can perhaps see the limitations of IRC. You never know with whom you will be chatting, and there are constraints relating to the serious, professional issues of IRC.*

Topic no. 3: The school's ICT strategy. Is there one?

I. was not very happy with the way in which the school had followed up its ICT efforts. The responsibility of the ICT tutor has not been sufficiently taken defined. The school allocates resources to a systems administrator, but many of the people who have had this job have had no idea about the Internet. "Many teachers who would like to use the Internet have no one to ask and no funds with which to research on their own," said **I.** She had experienced repressive forces at the school. She had to look outside the school for impulses and had found room for pedagogical development. However, no one at the school was visibly responsible for following up the educational side of ICT, and that means that there has been no ICT policy.

The present principal was very positive and had supported **I.** one hundred per cent. In **I.'s** opinion, the problem lay in the very strong sense of equality at the school. "If one person has access to computer technology, then the others shall have the same, regardless of whether they know how to use it or not." **I.** felt that the school should take things one step at a time. She would like the school to have more computer rooms, because it shouldn't be the case that some teachers end up without access to ICT, as often happens with the girls/women. She referred to the fact that only the boys used the Internet at school during the third-year project week (Vk. 2.) **I.** told us that she had held many external courses for female teachers. Several women had expressed the opinion that the Internet was OK and safe, but that they were

unable to access their schools' computers because the computers were used for other subjects (natural sciences) rather than their subjects (languages). **I.** felt that the teachers had a greater need for a pedagogical course on how to integrate the Internet into their teaching than they had for a technical course on how to access the Internet.

Mailbox comment: *To begin with **I.** wanted to monopolise the ICT equipment because ICT was a limited resource at the school. Her ambivalence as regards other peoples' access to the ICT equipment was linked with her own situation and the fact that she would have lost out on opportunities for development if the school's limited ICT resources were shared among many people.*

*The school is relatively new, not yet properly established, and lacks a number of routines. Since many people have also had to fight for the school's existence, there has been little time to discuss ICT properly. **I.** has gained recognition for what she does because she has worked with ICT for such a long time, she is able to do what she wants. She tried to use the principle of exemplification by demonstrating with the aid of an example a good model for how one can integrate ICT in teaching. She gave others the opportunity to share her experience. A good dissemination strategy, but did others see it this way?*

The gifted pupils probably know more about computing but it's not certain that they are better at communicating, and that they have better method skills, says **I.** When they communicate in English, the girls are traditionally very good at English and the quality of their language content is usually good. Content is important. If your content and method skills are not good, being able to use the technology doesn't help much.

If the Internet continues to be popular among the pupils, it may mean that the teachers who don't use it in their classes will suffer, said **I.** She cited one example where pupils from another class came into the computer room in the middle of her lesson because they wanted to use the Internet instead. **I.** felt that the need for the communication aspect of the Internet is particularly relevant in the teaching of languages, and perhaps even more than in certain other subjects.

Mailbox comment: *It's not surprising that the pupils were curious about events in the computer room immediately after it had been opened with several Internet computers. Pupils will continue to choose subjects which they find interesting, regardless of the Internet, and it is incorrect to say that it will not be interesting to use the Internet in mathematics and economics teaching. On the contrary, the Internet contains an enormous amount of information on economics and mathematics. This example is rather an indication of the pupils inquisitiveness about all that is new, and it tells us nothing about which attitudes pupils will have to this technology in the future.*

(Later **I.** commented on this and said that the use of the Internet will vary according to subject. Communication is heavily emphasised in language teaching, while other aspects of the Internet, such as search for information, may be more relevant in other subjects).

I. has come in for some criticism. As long as there was one computer connected to the Internet via a modem, the term "monopoly" was mentioned. That particular computer was so slow, and **ES.** and **J.** intended to design the school's home page. **I.** therefore took these two pupils into the teachers' study, where they also had a computer connected to the Internet via a modem. The problem was that there were other teachers in there marking assignments. She had obtained permission from the administration beforehand. Nevertheless, this behaviour was criticised.

There is no fundamental opposition to the Internet at school, said **I.** However, some of the teachers wanted everyone to move at the same pace. Borrowing one resource pupil from

another lesson was something she no longer did, out of consideration to her colleagues. The pupils have never criticised her for doing this. This was criticism from the system.

I. felt that she had a curriculum that enabled her to utilise the opportunities presented by ICT. Nor could she put her foot down and claim that the curriculum states that one shall use the Internet. Unless it is explicitly stipulated in the curriculum ICT shall be used, subjects which do not traditionally use ICT who will lose out. ICT and the natural sciences may win this battle because they already have a monopoly on ICT. In the curriculum for second-year English (Vk.1), it is possible to find recognition for Internet use because the pupils have to do two major projects during the space of one year, but that is not good enough. Teachers don't read the *Plan of Action for IT in Education*,[11] says **I.**

Mailbox comment: *The teachers don't have the curriculum they need because ICT has no legitimacy in the curriculum.* **I.** *has developed her own strategy for gaining access to ICT resources. This strategy gives her more access and greater opportunities for development than many of the other teachers at the school. As such, the strategy meets her needs, but perhaps reduces the chances for others to share in the school's ICT resources. The school administration will face a difficult decision when it comes to balancing the needs of enthusiastic and goal-oriented teachers against the general needs of the school. It is not surprising that her strategy both boosts her opportunities and triggers criticism from her colleagues.*

"The boys are most interested in computing," the girls, **H., G**. and **D**. said. **BA**. the boys, pointed out that the teacher who was most interested in computing was a woman. The girl who wanted to be a nurse said she liked to hear voices or have eye-contact with people when she communicated, she preferred to write notes to using IRC. They felt that the school had not been looking to recruit girls to act as resource pupils, they have chosen pupils who already possessed skills, they explained.

The girls told us that they had visited a friend's home page, but that they didn't know how to create their own home page. While one of the girls was talking, it became apparent that she had confused home pages with e-mail addresses. The boy explained the difference to her.

E., the teacher, was interested in the issue of girls and physics, and girls and the Internet. "You can't force the Internet on girls, but they can suddenly discover that they can save a lot of time by using it, and it's important to demonstrate this to the girls," she said. Last year, for example, the girls who were studying physics met on alternate weeks to attempt to master certain topics where the boys often excelled. **E.** told us that this autumn she wanted to get the girls to learn to use ICT and the Internet.

"In the autumn the most gifted pupils were very keen to make a start at using the Internet," **the principal** told us. "We were worried when we saw that this group only consisted of boys." Many teachers were concerned about the issue of gender and ICT, she said. "Perhaps we should segregate the groups by gender in order to help the girls?" She felt that in some contexts this could be one solution, at least to begin with, "if it doesn't end up as the final solution." "In the 1990s, we have begun to talk more about segregated classes. However, it's also a case of having role models." She wanted the pupils to have more role models among their teachers.

The danger is that those who can will succeed, and those who have will succeed more, says the principal. "The main challenge facing the school will be to do something about this." "Last autumn the school discovered that one pupil had cheated by downloading a project from

[11] http://odin.dep.no/kuf/pub/it-plan/

the Internet. In some subjects, it's pedagogically challenging to formulate project assignments so that the pupils are able to gather information but not answer the assignment directly by using the Internet." "The teachers would prefer it if developments stopped here, they see no solution." "As far as gender and ICT are concerned, this school is way behind the times, and terrifyingly so," said the principal. This is important in relation to the health and social welfare course. We will have to bear this in mind now that the school is expanding its ICT use. In occupational life, health personnel use ICT as an instrument, and she was surprised that the school was not involved in this arena when she started as principal. She thinks that the environment has been too small up till now, but the health and social welfare course needs to do something about this matter, and that's her responsibility. The principal fees that pupils studying health and social welfare subjects should offer ICT as a regular elective so that pupils who come from other schools can quickly attain the level of the other pupils. "Having computers in the workshop would be could for these girls. Then they would be able to hide themselves away until they felt sufficiently secure about using ICT. Research has shown that the girls need a fairly good command of it if they are to use it."

Implementing obligatory project assignments without having access to the Internet would require an enormous library, said **I.** You need to plan things so much earlier.

I. said that she found that when people talk about the Internet, they don't talk about communication, they talk about educational software and utilities.

Mailbox comment: *What she is saying is that using a utility is not the most important thing. Searching databases, the Internet, and using IRC and e-mail are essential. She is a language teacher and it is therefore natural for her that one of her professional objectives is communication and the production of texts.*

S. felt that the school should arrange courses in the conscious use of computers. He felt that too much time can be wasted by not using ICT in a conscious and goal-oriented manner. Teachers should communicate this to their pupils. **E.** felt that it was a pity that some young people sit indoors too much, playing computer games. "Teachers should make a conscious effort to help the pupils to understand that there are other things they could be doing," she said.

The principal saw the need for a strategy that would ensure that all the teachers would be able to benefit from developments. Beginning last autumn, the school drew up a strategy involving an introductory course with the intention that everyone would take part, she told us. It was hoped that more teachers would become involved. They are now busy making further plans. She is planning to select certain environments that can represent a driving force, and concentrating on these. She had hoped that they would have made a better start last autumn, but they had not been awarded central government funding for their initiative aimed at building a knowledge base on girls and ICT. "It was a pity because it had attracted several teachers who had never used ICT before."

The principal also told us that she was horrified that some of the teachers who had recently graduated lacked skills in a number of areas, including ICT. Last year they had employed many new teachers in the general, non-vocational subjects, and they had absolutely no ICT skills, she said. "She strongly encouraged all new employees to follow the courses and computer training, because teachers must be able write their own reports. Several of the new teachers were pleased that they had taken the training courses, they had actually missed not having them earlier." The teachers who had former work experience had more ICT experience.

S. told us that **the teachers** had begun to discuss whether or not the computer room should be used for teaching. He said that they may leave the room open so that the pupils could sign up to use it for certain periods of time. **S.** felt that the pupils could spend time in the computer room when they had free periods. **S.** also thought that someone would have to be in charge of the room.

S. also felt that it would be a good idea if three of the computers in the library could be connected to the Internet. **E.** told us that she often thought about finding something interesting on the Internet, and if there is something she is unsure of she thinks she might find the answer on the Internet. “This library doesn’t have the range of non-fiction that you can find on the Internet, and by using e-mail one can easily send questions on professional matters to, say, former colleagues asking for assistance.”

In **the principal**’s opinion, the library was somewhat isolated in terms of ICT. “It was not an area of focus under Reform ’94”. The systems administrator at school was looking into how they could make the library a more accessible place for the pupils, she said. They have discussed whether they could have an Internet connection there. For pupils who require assistance in connection with their writing, and spellcheckers etc., they are developing a strategy which would mean that they would install a computer in each classroom, she told us. “In this way, pupils can use ICT whenever it suits them. They won’t have to go to a computer room to work.” The school’s current policy has been to use computer rooms, and she was not used to that way of thinking in her previous place of employment.

The principal has a vision of an ICT workshop of sorts. She has only discussed this with the heads of departments so far. It is her belief that here the pupils could generally make do with less advanced equipment and computers, not as advanced as the equipment they plan to use with the general subject groups.

This year there has been recurrent displeasure at the school about the fact that the computer room is all too often occupied. It is too difficult to get in there, she says. During the time when teachers set project assignments, the room is open for pupils working on projects. However, the problem is that it is difficult to make the room available. The principal said that the school had not yet discussed these issues because there were other matters concerning the future of the school which had to be worked out first.

In the long term, **the systems administrator** would like to hook up the two other computer rooms to the Internet, he said. That would mean that all the rooms with computers would be linked to an external network. Perhaps even by next year, he said. “Our needs are increasing every day, and the distribution of computers will be unfair if we don’t increase our computing capacity.” The staff were not interested in discussing the computer rooms they currently have. Since then he has not seen the need to discuss the rooms with the teaching staff. His initial view was that it would have been better to have one computer connected to the Internet in each classroom rather than having fifteen Internet PC’s in one classroom. “In a teaching situation where you are teaching people to use the Internet it’s OK to have the computers in one classroom. In the long-term, however, once this become second nature, you could use the resources more effectively if you have one computer in each classroom.” He compared the Internet with having an encyclopaedia at the back of each classroom. Nevertheless, he chose to put all the PCs and network them in one computer room. One of his reasons for doing so was that it was easier to keep the PCs virus-free. It’s still possible to put one computer in each classroom, he said. He sees the advantage of having all the machines in one network. They don’t necessarily need to be connected to the Internet, but it would be all right if they were. In educational terms, he believes that there should be one computer in each classroom. “In the package distributed by Telenor – the national telephone company – each pupil already has his own e-mail address,” he said. He had not yet distributed them because he was not sure what was the easiest way of doing this. “It should be done relatively soon. And the pupils will be able to use their mailboxes”.

The systems administrator realised early that the most obvious solution was to place a computer with Internet access in the library, because that was the most natural place for it. “The reason why the library isn’t connected to the Internet is probably because the librarian doesn’t want all the noise and bother that goes with it, and the fact that it will disturb the peace in a library.”

The librarian was afraid that library, being a small room, might become “overcrowded”. If she allowed them to install multimedia, then there would immediately be “ten boys around the computer,” she feared. She had made it clear that things like that should not be in the library. She couldn’t understand why they had to have Internet in the library when they had two classrooms connected to the Internet.

The pupils primarily needed a quiet place to concentrate, she said. She wanted a library with rows of workrooms and where the pupils could wander back and forth on carpeted floors and work quietly. She had written to ask the principal whether they could enlarge the library somewhat, but she had not received any response as yet. For the time being she would like to use the canteen as an overflow. “Because most of the rooms are out of bounds to the pupils, and everyone in the second year now wants to be in the library.” She is frustrated about the fact that nothing has happened as regards her idea about the canteen. She attended a meeting with the student council and the school leaders, but things take a long time, she said. She understood the pupils' reactions, and she thinks the teachers do, too. She closes the library at 2.00 p.m. so that the people who are there can find the peace of mind to work and so that she can go home because she opens the library at 7.30 a.m.

V The school's ICT efforts seen in relation to the objectives and intentions of the Plan of Action for IT in Norwegian Schools

Two primary strategies are laid down in the National Plan of Action for IT in education[12]: 1) Pupils and teachers shall learn IT in order to integrate it into all subjects and contexts wherever this is natural. 2) Pupils and teachers shall use IT in connection with subjects and learning in the school in order to learn.

Our observations at the upper secondary school have revealed **a** growing use of ICT at the school. Both teachers and pupils have used ICT to a greater extent after the computing facilities were improved with the addition of a new room and more computers with Internet access.

The strategy evident at the school is that a few teachers have integrated ICT into their teaching based on the principle "to learn through use" and, to a lesser extent, "to learn to use". For example, **I.** integrated the Internet into her history classes without teaching each pupil basic Internet skills first. We did not observe that the school had a strategy for ensuring that the teachers could use the new tools, which in turn meant that only a few teachers in addition to **I.** had integrated ICT in their teaching.

The school's ICT strategy – in so far as there was one – was primarily to deal with the pupils individually when problems arose. This meant that it was purely coincidental who used and succeeded in using ICT in their own work. This depended on whether one learned one's skills outside school, benefited from other pupils' skills, showed initiative and was independent, or had an enthusiastic teacher.

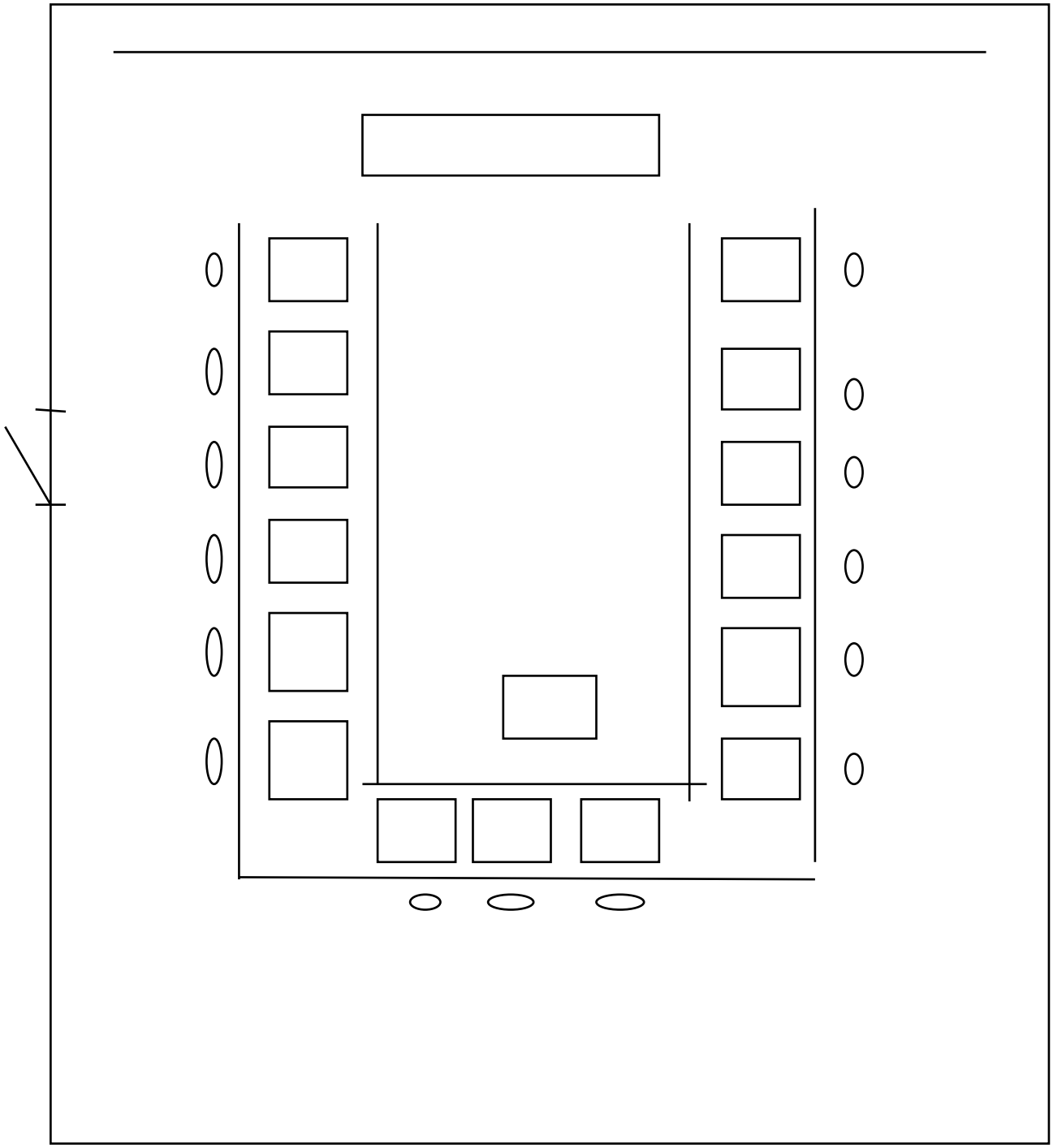
Would one strategy be to assess the pupils' previous skills, so that pupils and teachers who lacked ICT skills could be given a basic grounding in ICT, thereby including everyone? Could the school have a strategy for drawing on the resources of those pupils who already possess ICT skills so as to benefit those pupils lacking in ICT skills? Could the school give its pupils greater access to the computing facilities, by providing open solutions for pupils and teachers to use ICT at other times than it is available today? Would it be a good idea if the school was better able to avail itself of the librarian's expertise in respect of collecting information and using source materials? Would it be a good idea to open the library for pupils who want to learn to use and use to learn ICT outside of their ordinary classes? Would it be a good strategy to devise support schemes for those individuals who are unable to learn ICT on their own – not just by using volunteers, but stipulating that such skills are required of teachers and pupils?

The subject teachers have a knowledge of the content and organisation of learning. They are not essentially technologists. The subject teachers should therefore primarily play a role in these areas. It seems unreasonable that each individual subject teacher shall, without coordination, assume responsibility for the pupils' learning of elementary ICT skills. As regards access to new technology, such an assessment requires that the school has a satisfactory infrastructure and operational reliability in this area. The systems administrator must ensure that this is taken care of when planning the operation of the computer equipment. However, this also requires that every pupil and teacher who will be using the infrastructure and equipment has a foundation of common ICT skills. This requires that the school offers everyone such training. It is only then that the pupils and teachers can assume responsibility for, and service, the equipment.

[12] The Ministry of Education, Research and Church Affairs: *IT in Norwegian Education*. Plan for 1996–99.

Appendix 1

The “new” computer room at the upper secondary school.
15 computers connected to the Internet via ISDN.



Appendix 2

English curriculum – Second year

Objective:

Curriculum for upper secondary school level.[13] English. Area subjects in the branch of subjects general and economic/administrative subjects.

Pupils shall be capable of studying in depth and presenting at least two subject areas from the English-speaking world.

Pupils shall:

Objective 3b

- be able to collect and evaluate information obtained from fiction and non-fiction and other sources of information.

I. believes this means that the pupils should use the Internet to find information on, for example, the subject of "British politics", which the pupils will be working on during this period.

Local curriculum for English – Second year

Six-monthly plan for English – Second year

Excerpt from subjects and objectives during the period when I was there to observe the use of IT in **I.'s** classes:

"Subject:. Objectives (Objectives of the curriculum): The texts shall include international contact".

[13] http://skolenettet.nls.no/prgdb/owa/lp.lp_sok_disp

Appendix 3

Assignments English (Second year course)

BRITISH POLITICS

"Parliamentary elections"

24 February 1997

Objective:

Develop search strategies for finding information on the Internet.

Find and use relevant information about British politics in the Internet.

Working method:

Work in groups of two, one girls and one boy for-----minutes. Then work alone for ----- minutes. Sum up your findings in the course of -----minutes.

Internet Activities:

Answer at least 2 of the following tasks:

1. Find at least 3 interesting sites about British politics.
2. Choose one political party and find 3-4 important aspects/points of view that you find typical of this party.
3. Choose one political candidate and find out 1 or 2 topical issues.
4. Choose a topical issue of the election and present it in a few sentences.
5. Try to find an update on the situation of the candidates of the election.

Oral presentation of your work on Wednesday 26 Feb. Duration: approximately 5 minutes

Appendix 4

Curriculum: History – Second year

Curriculum for upper secondary education.[14] History to 1850. History from 1850. General core subjects.

Objectives:

Pupil shall have a knowledge of key concepts and methods relating to the subject of history.

Pupils shall:

3b) be familiar with methods used to collect, study in depth and analyse historical material, and be able to use this in their own work.

[14] ibid.

Appendix 5

History assignments – Third year (3AØ-C)

"INTERNET ASSIGNMENTS
Objective: Develop search strategies for the Internet.
Obtain information as a supplement to chapter 19 – A new world order?

Search for information on the Internet based on one or more of the following assignments.

1. Terrorism
2. Détente and disarmament
3. The struggle against apartheid. Key words: The Union of South Africa, the Nationalist Party, Apartheid, ANC, Nelson Mandela, Winnie Mandela.
4. Afghanistan. Key words: Gorbachev, Yeltsin, Kabul, Babrak Karmal.
5. Eastern Europe. Key words: Ceausescu, Lech Walesa, Walensa.
6. The growth of nationalism. Key words: Helmut Kohl, The fall of the Berlin Wall.
7. The four tigers. The Kleptocracies, Taiwan.
8. The global environment. Key words: The ozone layer, Salinas, Father Antonio Polo.
9. The UN Environmental Programme.
10. Use the Internet to try to solve the exercises on page 356 of the text book."

Appendix 6

History assignments – Third year (3AØ-B)

"INTERNET EXERCISES
Objective: Develop search strategies for the Internet.
Obtain information to supplement chapter 19 – A new world order?

Search for information on the Internet based on one or more of the following assignments. Print out a MAXIMUM of 1–2 PAGES so as not to lock up the printer. Save what you want by adding the pages to the list of "favourites".

1. Terrorism. Amnesty International. IRA
2. Détente and disarmament.
3. The struggle against apartheid. Key words: The Union of South Africa, the Nationalist party, Apartheid, ANC, Nelson Mandela, Winnie Mandela. Soweto.
4. Afghanistan. Key words: Gorbachev, Yeltsin, Kabul, Babrak Karmal.
5. Eastern Europe. Key words: Ceausescu, Lech Walesa, Walensa.
6. The growth of nationalism. Key words: Helmut Kohl, the fall of the Berlin Wall.
7. De four tigers. The Kleptocracies. Taiwan.
8. The global environment. Key words: The ozone layer, Salinas, Father Antonio Polo.
9. The UN Environmental Programme. The ozone layer.
10. The Helsinki Agreement on Human Rights.
11. SALT
12. CSCE (The Conference on Security and Cooperation in Europe)
13. Exxon Valdez."

You will not have enough time to search for information on each topic. Choose what you feel is most useful in relation to your subject.

Appendix 7

Staff-room conversation with the teachers on the subject of "gender and ICT"

"...Perhaps we should consider using a method similar to that employed in process-oriented writing," said **A.** The biggest problem, in his opinion, is that ICT involves a kind of mastering factor. Either you can do it, or you can't. "Traditionally, boys have looked on this as a great challenge, almost like a battle with the screen: I will solve this problem and succeed..." He believes that the girls are dependent on there being some sense of cooperation around ICT. Giving them feedback along the way is important. "Process-oriented writing is precisely such that one gets feedback. If we could devise a kind of step-by-step method for ICT, where one could provide feedback about what is happening, I think we could stir up a good deal more interest than if we only deal with absolutes, i.e. you can either do it or you can't. This applies to all subjects, not only ICT. How can I divide this problem into several stages, can I take it one step at a time? "I'm thinking out loud now," he says. He sees that the girls are becoming frustrated in a way. "There's an ocean of technology and terms." **E.** comments that the girls feel the boys are so far ahead of them, they'll be unable to make up the head-start that many boys already have.

What is the strategy then? Will girls choose not to use ICT, because they can't be bothered to catch up, do they choose to be good at other things? **I.** replies that she thinks it's a bit of both. "I'm quite certain that some people do choose not to use ICT, like the group that had so much information from other sources that they had chosen not to search the Internet. Of course, if they had chosen to search the Internet, then they would have been given help as they went along. They know that, but ...," she says. **E.** says that boys see the opportunities in ICT because they have been using it for a long time, while the girls have not opened their eyes to the possibilities presented by the Internet. **A.** believes girls are result-oriented and more practical. The boys like technical challenges. You can see this whenever there are any technical problems. The boys will solve them, while the girls will get angry if things don't work, then that isn't good enough. Whereas boys ask their neighbour, they often have a network of contacts so they have someone to whom they can turn, girls don't always have this opportunity. That's why we have quite a job when they are in our classes and we have to make sure there is gender-equality in respect of ICT. To a certain extent, the same thing also applies to the teachers. **I.** thinks it is a good idea to use resource pupils.

ICT is not a goal objective, it's an instrument. You would think then that girls would like computers because they are a practical tool, and because of the communications side of things. That girls like to write and communicate and that e-mail is a tool for that purpose. What do you think about that? **I.** had spoken with a second-year pupil who was an experienced ICT user, and he had told her he had the impression that there were just as many girls as there were boys on the Internet now, at least on the communications side. "Especially as regards e-mail, where you can sit down and write and think about what you're doing, and create content and produce long reports. Many people are on the telephone for hours, this is a new variant," says **I. A.** feels that it takes a while for girls to take chances, "unfortunately", he adds. "There's still a certain difference between girls and boys, as far as taking chances are concerned. Perhaps it's to do with whether one is used to not taking initiatives or taking charge. Many girls feel their way forward before they dare stand up properly. It's a safety factor which has to be there. It's sad that it's like that, but it's a little like that. The problem is that these boys just start speaking when it comes to ICT, they seize the instrument before the girls do and say "this is mine". And maybe boys are used to "one-to-one" communication, that one is used to sitting in front of a computer and communicating with it, that they regard that as being communication enough," says **A.** "While that isn't communication," **I.** interjects. Girls are more dependent on close relations, and it's good that girls are like that, but they are dependent on communication being that way, be it e-mail or whatever, that it's real, that it is

almost tangible," says **A.** "Girls need content, they need to feel it's real, whereas for boys it's more experimental," says **I.** "And more theoretical in a way," says **A.**

Could it be that the boys regard ICT more as a toy, while the girls are too grown-up for that? "Yes, it's not a toy for the girls, that it's not. The girls are there to solve an assignment, and that's no game for them," says **I.** She had not seen much of that, but nor had she seen much game-playing by the boys when she left them on their own on the Internet. "It has something to do with the fact that 'boys will be boys', and 'once a boy, always a boy'," says **A.** "It's probably more difficult for boys to give up control of being a boy in a way," he says. "But many of the boys are not good at communicating," says **I.** On many occasions, when she has had real "racers" in her class, good resource pupils, the moment they have to sit down and compose an e-mail that others will understand, then they have big problems, not all of them naturally. The first time she discovered this was many years ago, she had assembled these resource pupils and it was almost impossible to get them to write. "If one becomes too experimental and technically-oriented, then at worst one will be unable to communicate," says **I**. "It is essential to design clear assignments for the pupils and follow up those levels where development occurs. Then one can see what one needs of technical expertise," says **A.** If experimenting and working like that becomes a goal in itself, he believes that it is the girls who will give in. It's often the case that it's the boys who have set the standard for how ICT is to be used.

I have also seen boys in the third year who are negative to the Internet. Boys who say that it is rubbish, and some of them haven't even tried the Internet, but are afraid to say so. I can see their body language communicating that they don't want me to see how they work at a computer. There are major differences between the boys here, too. "Yes, it's just like driving a car, there are clear parallels," says **A.** "Most boys will feel pressure to learn to drive car and to at least be able to 'fiddle' with it. Even if you don't know anything at all, you have to know a little, if you know what I mean? The crisis is if you don't know anything. Of course, there are differences, but it is expected of all boys that they can 'fiddle' a little. Girls are expected to be able to sit down, solve problems and do other things. There are differences there," says **A.**

What are your comments to the statement "in the computer room boys are the hosts and girls are the guests? **I.** and **A.** don't like these kinds of images. Nor would he say that "the boys are at the helm, and the girls are onboard ship". "As far as schools are concerned, it has a lot to do with the type of attitudes adopted by the male teachers. If the male teachers monopolise the equipment, it will be like that. That's why we have such a job on our hands, and the key to getting it right here at school is to make sure that the female teachers don't end up in the same category as the girls who don't dare," says **I.** A. agrees with her. When she holds courses, she receives a lot of enquiries from women, and there are no end of questions. Men have also asked her questions, which is nice, but the women dare to ask more questions because they don't see it as a defeat if they ask her for help. **A.** cites himself as an example. He says that he is not extremely technically-minded, and when he can be honest about this in the classroom, when, for example, he says that he can't operate a video, the first reaction among people who don't know him is bewilderment, that's impossible, he can't say that. But, he feels that it eases the pressure somewhat on the expectations that rest on the shoulders of the boys in his class. You have to be aware of how you can exploit gender to smooth out the differences that are already in place on account of influences from home etc. One needs to create a kind of understanding of how one should attack this problem. It's very exciting and important. But it's also dangerous and difficult to work with," he says. On those occasions when he has worked with gender inequality, there is often a good deal of tension in the classroom. "Things can easily become black and white and quite intense. Maybe you don't recognise the problem. But perhaps it's necessary for teachers to step in and make a conscious effort to change matters. If not by saying it, at least by doing it, paving the way for things to happen, e.g. by giving the girls access to ICT without them letting them understand that they are being given special treatment," says **A.** "One should step in and see precisely what it is about data that can create positive reactions in girls, because there are things that evoke positive reactions. And then to exploit that, and then add trimmings without them understanding what it is one is

doing," he says. "You can't have an active relationship to ICT without sitting at the computer and practising, and the boys know that only too well," **A.** concludes.