

OECD/CERI ICT PROGRAMME

A Case Study of ICT and School Improvement at Secondary School, Grein, Austria



October 30th, 2000

Peter Baumgartner, Univ.Prof. Dr.

Hermann Denz, A.Prof. Dr.

Irmgard Oberhauser, Mag.

Kurt Hoffmann, Mag. Ing.

University of Innsbruck
Austria

Table of Contents

Overview of the present

The pilot study was carried out at the Secondary School of Grein. Grein is a small town in Upper Austria situated on the Danubia River. It has about 3,400 inhabitants, and roughly half of the working population in Grein commute to jobs elsewhere. The secondary school of Grein, called HIT Grein (**H**auptschule für **I**nformations**T**echnologie, e.g. secondary school for information technologies) has approximately 230 students aged 10-14 who are taught by 34 teachers in 10 classes. Secondary schools in Austria have four grades. HIT Grein has a modern sports field for athletics and a library with one desktop computer with internet access. In addition, there are two computer labs with 16 desktop computers per lab. The PC s are connected to the Web by modems, and all PC s are integrated into a LAN-network. At the moment there is only one ICT-class, so two labs are sufficient. However, the labs will be bursting at the seams with the beginning of the next school year, when the second ICT-class will start.

One year ago, the staff of this secondary school set up a special class for children who want to gain knowledge about ICT (e.g. hardware, software and programming). A further goal is to

transmit abilities and skills for using ICT effectively. A small teacher team has created an extraordinary curriculum with a special schedule for each of the four years. The local school board approved this self-initiated school program and provided the additional funding needed for the staff.

There are several reasons for this school approach. On the one hand it should produce higher academic results, and on the other hand the school should establish a new academic profile which should help to save this location. Due to this specialization, student enrollment is expected to increase in the future. Creating a new academic profile is a noticeable trend in Austria in several types of schools. Students benefit from this school approach in different ways.

Overview of the past

The main problems of this site were the decreasing number of students and the decreasing level of student performance. It is alarming that many pupils are not able to write one sentence correctly by the end of the school (statement of a teacher). The teachers at this school share a common approach to solving these problems. ICT is the magic word. The use of ICT was introduced step by step.

First, a small group of teachers used the ICT for their teaching preparation, thereby gaining special knowledge about ICT. But the knowledge gained was not sufficient for teaching students in class, so an extensive program for staff development was created and implemented. Every teacher was required to attend either in-house or outside courses in ICT to gain the knowledge necessary to use and teach ICT. Half of the teaching staff resisted this policy until a team of teachers informed their colleagues about the advantages and the necessity of these changes. Today the majority of teachers accept this school approach.

Secondly the whole range of ICT (technical equipment) had to be financed and installed. Funds for hardware and software from several companies and the municipality allowed the school to set up two computer labs with modern equipment. Two teachers and an external IT-company implemented the entire ICT. They also administer and support the network.

Projections for the future

What would happen if all ICT were removed for the next school year? This question was answered by the majority of the teachers with one word: inconceivable .

The school administration defined two goals for the near future. One goal is to establish an information tower containing three or four PC s with free internet access for the pupils in the school entrance, so the students can check their e-mails and use the Internet without being monitored. The second goal is defined: One PC with Internet access in every class to avoid capacity problems in the labs. Every teacher should have the possibility to use the PC and the Internet directly in the classroom. Last but not least, it is very important to attract and to keep IT-specialists and ICT-trained teachers in order to maintain and improve the present situation. All these investments are dependent on the financial situation and the engagement of the school administration.

The expected increase in the number of students will force the staff to establish an entrance examination. This procedure will make it possible to select those students who have the best abilities and knowledge. A team which consisting of some staff members and a psychologist will develop this entrance examination.

What are the main indicators of success in such an ICT school approach?

- Readiness of the proper authorities to change legal conditions to allow the implementation of a self-initiated academic program with an intensive focus on ICT
- Provision of financial and human resources for the whole process
- Self-initiative and engagement of a competent teacher team
- A school program containing goals, instructions, extraordinary curriculum and schedules
- Provision of space for special educational needs
- Openness to change among the whole staff

Conclusion about key hypotheses

Hypothesis 1

Technology is a strong catalyst for educational reform, especially when the World Wide Web is involved. The rival hypothesis is that where true reform is found, technology serves only as an additional resource and not as a catalyst, and that the forces that drove the reform also drove the application of technology to specific educational problems.

The analysis of the data collected indicates that hypothesis 1 can be verified with some restrictions. That means in the case of Grein, the implementation of ICT was not a planned

social change but the start of a social change. If the teachers decided to create another main emphasis like sports or music, this would probably be the catalyst for the reform. Therefore in our case ICT is the magic word and a strong catalyst for school reform in the secondary school of Grein. There were of course additional resources besides the ICT which served the innovation, but the whole infrastructure of ICT is and will be the main indicator of this school approach. The teachers already know that one problem will occur at the beginning of the next school year: the capacity problems in the labs. Without sufficient and modern ICT-resources, the curriculum developed will not be transformed and the education goals for ICT will not be reached. A further factor which has forced the staff to react is the decreasing number of students. In order to attract more students, the staff decided to put the main emphasis on ICT. The last and very important factor is a competent and engaged teaching team. The majority of the teachers indicated that a team of four or five led and organized the whole innovation, provided and continues to provide support, and will develop further improvements. Without their engagement, an organizational change would not have been possible.

The use of ICT was identified as one solution for the specific need for change in Grein. As the solution for educational reform, ICT was the catalyst, that allowed the plan to be put into action immediately.

Hypothesis 2

The diffusion of the reform (and therefore of ICT) followed the traditional diffusion pattern for reforms and innovations as outlined by Rogers (1995). The rival hypothesis is that technology functions differently from traditional innovations and reforms and that different diffusion patterns therefore occur.

The diffusion of the organizational change followed the traditional diffusion pattern. ICT was the content of the changing process, but at the start it was not the driving force of the change. In the first step, there was a small group of interested people who learned and used several ICT-skills, e.g. word processing, design web page, etc. With the technical expertise they acquired, these teachers were able to teach special ICT-subjects in the school.

The next step was on the one hand to create an extensive concept containing goals, instructions, extraordinary curriculum and timetables and on the other hand to convince the majority of the necessity and advantages of this school approach. Convincing the teaching staff was the most difficult part of the organizational change because in our case the average age of the teaching staff is very high. Some teachers will retire in the next five years and are therefore not willing to learn more about the new technologies.

A special diffusion pattern could be the so-called *education highway* in eastern Austria. The education highway is a web-based education network where schools and other educational institutions can post their own web-pages and search for information about schooling and education. In our case, the director and his team searched the education highway for sites about such school approaches done in the past. They found two secondary schools in Vienna and

contacted them. An exchange of ideas took place between some of the teachers from Grein and Vienna; as a result they got an impression of an functioning ICT-curriculum. The information helped them to develop their own ICT-based curriculum for their specific needs.

Hypothesis 3

Successful implementation of ICT depends mostly upon the technological infrastructure and student ICT competence rather than upon staff competence in the integration of ICT into instruction. The rival hypothesis is that teachers mediate such applications when they are successful, and that their academic value relates positively to teacher competence.

In fact the rival hypothesis shows this situation regarding the use of ICT. The more familiar and comfortable teachers are with using ICT, the more they will use it for their teaching preparation and for their actual teaching. Without the necessary technical knowledge of the teaching staff, the mediation of applications can not be successful.

The main fear of many teachers was that the students might have more technical expertise than themselves. A further change must take place a change in their own views. In this case teamwork is the magic word. Students and teachers have to constitute a team, then the process of learning can take place based on partnership.

Hypothesis 4

Gaps in performance between high and low income students will be enlarged rather than diminished where all students have equal access to ICT. The rival hypothesis is that equal access to ICT will lead to high poverty students closing the gap with low poverty students.

The principal, teachers and parents all concurred that learning with ICT has benefited all the students who have participated. In the case of equal access to ICT, the performance of the students depends on their personal interest and engagement. The condition of equal access to ICT is satisfied on the one hand during the lessons. But on the other hand, equal access is not guaranteed at home, where homework or several exercises have to be done. Engaged and interested students find ways to use computers outside the school, e.g. meeting classmates who have a computer at home, but the competition conditions are not the same.

In Austria, having a computer at home is not a question of income level; it is more a question of the attitude and the technical expertise of the parents. One statement of a teacher underlines this result: Basically, today changes are taking place throughout the whole population, but the use of computers is different. I believe people are saving money elsewhere. There are computers at every level of society.

That s the view of the teachers in Grein, but other empirical studies in Austria disprove this

statement. Having or not having a PC is a question of social stratification. Several studies in Austria show that low income families have significantly fewer PC s at home than families with higher incomes.

Hypothesis 5

Successful implementation of ICT will lead to the same or higher academic standards in spite of the low quality of many ICT materials. Academic standards are a function of teacher and school expectations and not of the standards of textbooks, ICT materials, and the like. The alternative hypothesis is that ICT use will lead to a lowering of academic standards as students spend more time on marginally beneficial searches and in browsing poor quality Web and courseware content.

In fact, academic standards are a function of teacher and school expectations. The teacher decides which teaching material will be used during the lesson. Some teachers said that while much of the teaching material on the web and the software market is good, there is also poor quality material. The task of the teacher is to choose the material that will be beneficial. If the teacher selects good ICT teaching materials, then ICT will not lead to a lowering of academic standards. On the other hand, if he or she does not pre-select special Web sites and allows the students to browse the Web without any restrictions, many students will be overtaxed because they will not be able to understand the information they find.

Characteristics of the school

The following is a detailed description of the school site, beginning with the central idea of the Secondary School in Grein.

Name of school site	HIT Grein
Address	A-4360 Grein, Großgraben 2
Phone / Fax	+43-7268/704614, +43-7268704615
Founded	1920
Administration	Principal: Mr. Dittmar Handel
Number of classes	10 (8 HS + 2 PTS)
Number of students	241
Number of teachers	30
Kind of school	HS = Hauptschule (secondary school for students between the ages of 10 and 14) and PTS = polytechnical school (final compulsory 9 th year for students who will go on to an apprenticeship)
Peculiarities of school autonomy:	

School experiment	HIT = secondary school for information technology (offers an examination in ECDL = European Computer Driving Licence during 4 years of school time)
Unusual features	Applied word processing in the 8 th year (1 lesson a week)
	Applied spread sheet in the 8 th year (1 lesson a week)
	Typing in the 6 th year (1 lesson a week)
Social-integrative classes (co-teaching of normal and handicapped students)	In the 5 th , 6 th , 7 th years
Expert divisions of Polytechnical school	<ol style="list-style-type: none"> 1. Technical fields (woodwork, construction, metal) 2. Commercial field 3. Human-creative field
Peculiarities of the school site:	
Library	PC with internet-connection
2 computer labs, 16 PC s per lab; 4 extra PC s	WINNT-network + 16 WIN98 workstation; WIN2000TS-network + 16 WIN95 workstation; 20 Pentium and 16 486DX, 3 network-printer 1 digital camera, 1 scanner, 1 beamer
Sport and playing fields	soccer, beach volleyball, athletics
Web	http://hitgrein.eduhi.at/

Success as a result of good work

Some of the highlights and awards of the past years clearly show the work of the teachers and students in Grein.

- A qualitative study of the University of Vienna Project work on Austrian and South Tyrolean School Sites identified the secondary school in Grein as one of the ten model schools.
- The internet project GRIPS = Greiner Internet Plattform für Schüler (e.g. Greins internet platform for pupils) won the Cyberschool contest award for the best project carried out by a secondary school in Upper Austria in the school year 1997/98.
- The contribution of the Digital Campfire - HOLODECK won first place in Austria and was exhibited at both the Guggenheim Museum in New York and the National Exhibition of Styria.
- Students of the secondary school in Grein developed and programmed a homepage for a local information system about Grein. This project won one of the main prizes in the Cyberschool 1999 contest and went on to compete in the PRIX ARS ELECTRONICA U19 .

Evaluation of change

Diffusion patterns

The principal and a small team of teachers decided to introduce a school experiment. This group of experts defined goals and created an self-initiated academic program with its own curriculum. The school experiment was shown to the proper authorities and their teacher colleagues. The authorities finally gave permission to implement the concept, but only after a great deal of campaigning and discussion. This was one of the most difficult hurdles.

The ICT implementation at this site began with the step-by-step installation of the technical infrastructure. First of all, the IT specialists and an external PC company installed the hardware (lines, network, PC s, printer, scanner,...) and the necessary software (Win 95, Win 98, Win-Nt, Office and several special application programs).

Professional development activities had to be introduced after the installation of the technical infrastructure. ECDL (European Computer Driving License) is the buzzword in professional development in Grein. Every teacher has to participate in ICT trainings to gain the necessary knowledge and abilities to train students in ICT subjects. The training cycles end with an examination. Teachers who pass the exam receive a certification which is recognized in Europe. Many teachers make use of the ECDL.

In the next step, a special curriculum was created and installed. Computers were increasingly integrated into lessons. Students had to learn to type very early because that is the prerequisite for meaningful computer use. The subject *Typing* was therefore integrated in the 6th grade. Additionally two new subjects were implemented in the 8th grade: *Applied Word Processing* and *Applied Spreadsheet Analysis*. In *Applied Word Processing*, teachers and students often use the Internet to search for specific topics. The principal and his team tried to introduce ICT-subjects which the public (e.g. pupils, parents, other schools, businesses, ...) accepted and needed. This was obviously a wise choice: 100 % of the students enrolled in an elective course, e.g. computer science, which shows their great interest and high level of motivation.

Money is always an issue. The technical equipment is expensive, and the life of the hardware is very short. Money is urgently and constantly needed. The principal tries to co-operate with local companies in order to both get additional financial resources and provide students with the opportunity to work on a real project and get to know potential employer. A further source of income is sponsoring: last year, for example, a company provided the funds for a digital camera.

Staff development and involvement

Continuing education and training for teachers in Austria is organized by a special institution called PI = Pädagogisches Institut (i.e. Pedagogical Institute). At present, the problem of the PI is that its training program contains a wide range of subjects, from cooking to ICT. The number

of special ICT trainings has increased each year, but it still does not satisfy the demand. As a result, there are long waiting periods for courses - an unsatisfactory situation. The content of these trainings are matched to the needs of teachers for their educational work. The staff development currently taking place is not obligatory, free of charge, and without any recognition.

The IT specialist at Grein is also a member of the PI training staff and has done several PI trainings in the school, which many teachers attended. The great demand for ICT trainings has created an extraordinary situation in Grein: ICT teachers from the school have trained and coached their colleagues voluntarily in their free time without pay. Members of the small work groups meet regularly to learn from one another and exchange experiences. In addition to the knowledge gained in ICT, other results of this self-initiated training program have been very positive: an increased interchange of ideas, teamwork, broadened horizons, and more information. This kind of staff development is a remarkable example of engagement and self-initiative in Austria. Nevertheless, trained IT specialists are urgently needed in this school.

Role of leadership

The principal and his team were responsible for implementing this school experiment and oversaw the entire ICT installation and staff development. These key persons also set the tone and determine the direction for the future.

ICT reform connections

ICT is the wave of the future, answered one teacher during the evaluation. Responsible computing and teamwork is the basis for many of the new jobs in the IT-branch. Students should have the opportunity to get these basic qualifications in the school. ICT also functions as a catalyst for the reform to keep students from the area in Grein who might otherwise leave to attend other schools elsewhere. Lower ability students, who have no chance of being accepted by another school, are forced to stay in Grein, while those with higher abilities can choose the type of school they want to attend.

Their learning would bring about a decrease in performance level. Now, however, the ICT school experiment has changed this situation, and increasing enrollment has made it necessary to introduce an entrance test.

Outcomes

ICT Infrastructure

The secondary school of Grein aims to provide an environment where teachers and students use ICT in their teaching and learning processes. The following ICT infrastructure is situated in the school:

1. Hardware

2 computer labs with 16 PC s per lab. All PC s are Web integrated and multimedia ready. The library, the conference room, and the main office each have a PC. Additionally a scanner, a beamer and a digital camera are available.

2. Internet

Internet access is managed by an ISDN-modem, and an internet connection via satellite is being tested.

3. Support

Two teachers called Kustoden provide support, but the Grein staff is also helping itself. Information about hardware features and software is provided by the external company which is responsible for the delivery and installation of new ICT equipment. If possible, teachers repair defective hardware themselves. Otherwise, the above-mentioned company arranges for repairs, which will be paid for by the community. Both custodian teachers invest a lot of time to keep the system running. They see an urgent need to enlarge the IT-team by a third qualified person because both of them are completely overtaxed.

4. E-mail

At the moment, students do not have school e-mail accounts. They will get their own accounts when the information tower in the entrance hall is installed some time in the future. One official school e-mail account was set up for the main office, and some teachers have private e-mail accounts.

5. System backup

The backup of the system and the configuration is made by a streamer tape, but this is only done occasionally, but not regularly. Data created by teachers and students is not automatically saved. It is the responsibility of teachers and students to save the data they produce themselves.

6. Use of ICT

ICT is used in projects, spreadsheet analysis, word processing, preparing and carrying out presentations, programming, creating and maintaining Web pages, and drawing pictures or diagrams. Teachers sometimes integrate CD-ROM s which contain special learning software in their teaching.

7. Computer magazines

The school does not subscribe to any dedicated computer magazines. Some teachers donate old issues of their private magazines to the library.

8. Multimedia library

The multimedia library is equipped with a PC which has internet access and can use special software e.g. encyclopedia, Physics, Geography, The Human Body, English, Mathematics, German.

9. Unusual feature

Slow PC s are connected to a powerful server, so together they function like a client-server system. The slow PC s only task is to function as an external monitor. All application programs are installed on the server.

10. Provider

The education highway powered by the authorities is the main provider for schools in Upper Austria. Laws prohibit the use of private providers by schools.

Effectiveness

On the one hand, the decreasing numbers of students has led to a new positioning of the school philosophy; on the other hand, the economy s increasing demand for ICT skills has led to a change in the subjects taught.

The following points highlight some indicators of the success of ICT school innovation.

- Well-educated, engaged and interested staff members are absolutely necessary to integrate ICT successfully in the school. Without the engagement of ICT experts, the process of change is not possible. Professional development in using ICT has to be organized systematically. Possibilities for further education must be guaranteed.
- Generating interest and motivation: Teachers attitude and their conviction that they are on the right path is essential.
- Setting goals is important. A mechanism for checking the attainment of the goals defined has to be implemented.
- Providing the necessary hard- and software for using ICT in school is absolutely necessary. Teachers will not be able to integrate ICT in their teaching if the hard- and software equipment is not available, supported and user-friendly.

What are the barriers to fuller staff involvement?

- negative attitude of some teachers to ICT
- current situation of further education (waiting period of six months to one year). A lack of ICT-knowledge is the negative result.
- lack of capacity in the labs
- a lack of professional self-assurance

The role of the teacher changes when he or she uses ICT. The teaching style becomes more dynamic. During a traditional lesson, the teacher functions as an instructor. All aspects of the teaching and learning interaction are under the control of the instructor. However, the role of a teacher in ICT assisted lessons changes from that of an instructor to that of a coach. The coach

transfers some control over the learning process to the learners, thereby increasing the individual autonomy of the students. On the one hand, this teaching style responds to contemporary realities and the changing environment. On the other hand coaching and using ICT during the lessons is very strenuous for teachers because students' individual problems require individual attention. An additional result of coaching is a change in the way both students and teachers work with knowledge. The teacher knows everything and the students know nothing is an old adage that loses its validity. Students find a lot of information in the internet and have to select the most important facts, but they are often unable to structure and understand the knowledge gained. The new task and the challenge of teaching is to structure the information and discuss it with the pupils.

What are the most positive and the most negative aspects and impacts of using ICT in Grein?

Positive aspects

- ICT gives students the opportunity to develop valuable skills (team work, self-organization, being and working independently)
- ICT is a strong motor for the motivation of students. As one English teacher put it: First of all I train new vocabulary verbally in cooperation with the students in the classroom. Afterwards we go to the lab, and the students can use a multimedia CD-ROM to learn and deepen the new vocabulary in written form. When say we are going to the lab, the whole class shrieks with delight.
- Start-up grant for entrance into a high school or a profession
- ICT supports students who are interested in this field. They often have computers at home and are actively involved in ICT. Almost 60 % of all students at Grein use a computer at home.

Negative aspects

- Students spend a lot of time using ICT. Kids often spend their free time in front of the computer. One critic told us, I find their social development very questionable. Computers are taking over control of our children and our profession. There is no time left to be a child.
- The implementation of ICT in schooling has divided the teaching staff into two groups: to those who are fascinated by and engaged in using ICT, and those who were opposed to the new technology. This split has led to questionable deterioration of the working atmosphere. The digital divide within a profession?
- ICT reduces the whole personality of students to one factor: who is computer literate and who isn't. The personal interests and other abilities of the students are often not taken into account. The digital divide within the pupils?
- Face to face situations during the lessons are becoming increasingly rare. Interpersonal relations and communication are suffering.

Academic rigor

Academic rigor depends on the following items:

- Readiness and time for further education: It is necessary for every teacher to have his own PC at home to work individually. The PC should be used for preparing lessons, administrating, and communicating with several groups of people. The prerequisite for teachers to use ICT in classroom instruction is that they feel very comfortable working with ICT.
- ICT specifics have to be taken into consideration by creating an academic schedule.

How can the situation concerning academic rigor in Grein be characterized? The teachers often prepare tests and teaching materials (e.g. worksheets, presentations) on the PC. Some teachers use special learning software (CD-ROM s) for their teaching. Sometimes teachers and students work together on a project using ICT. The more teachers use ICT during their lessons, the more students profit from it. Sometimes the internet functions as a complement to school books because it offers the latest information. The Internet, however, can not replace a good school book because it is very unstructured, and students often find too much information in the web which they do not understand. ICT access is guaranteed during the lessons or after school hours if a teacher gives the students special tasks. Teamwork only occurs during project work, not during the use of learning software. The students are monitored while searching for information in the web in an effort to curb abuse (chatting, sending SMS s, viewing unsuitable content,...). Paid contracts from local companies are very popular because they give the students practice and greatly increase their motivation.

Equity

Grein had the following experience with equity:

- The Web motivates students to search for new information about several topics, so students are also more likely to find information about foreign cultures. The Web provides a new form of access for multicultural learning.
- Teamwork occurs among teachers and students who are interested in ICT. Three teachers and three school classes, for example, worked together on the project Riddles for the Web and the local newspaper .
- During school hours, all students have equal access to ICT, so there are no differences between high and low ability students. On the other hand, low-income students have equal access at school but not during their free time.

Projections

Sustainability

What has to be done in Grein to preserve or improve the results of using ICT? The recommendations can be divided into five categories.

1. Technical equipment

- Regular replacement of the old technical equipment.
- Expansion of the existing equipment: one or two computers with internet access in each classroom, multimedia-tower in the entrance hall, installation of a third computer lab.
- A media center which contains several kinds of CD ROM s for special subjects.
- Quick and reliable external support for hardware problems.

2. Organization

- Enlarging the school district to include the area where students live. At the same time, the school should try to avoid losing high ability students to other types of schools.
- Having one full-time IT specialist who manages the whole ICT system would be very helpful.
- Organizing access to the computer labs better in order to give every teacher the opportunity to use ICT. Without an expansion of one or two PC s per class, this is not possible.
- Rethinking the organization of the lessons in the future is vital because of the enormous capacity problems to be solved when there are four HIT classes.

3. Staff

- Well-educated staff members are essential. Many of Grein s teachers have passed the ECDL. Further education has to be guaranteed for everyone.
- It is absolutely necessary to hire new, well-educated ICT teachers. The integration of the new staff members should be systematic, organized, and geared to establishing a strong teaching team.
- The working atmosphere in Grein should be improved because the motivation of some teachers was destroyed by the introduction of ICT.
- The IT specialists who manage the support for staff and students should be better paid because they invest so much time in keeping the system working.
- The new technologies are one possible way to save teachers jobs.

4. Environment

- Growing number of homes with computer equipment.
- More parental interest in ICT to support the students at home. Collaborative learning between students and parents can occur.
- If the parents have knowledge about ICT, they should take the necessary precautions against forbidden internet use, e.g. talk about abuses of the Web, encourage students to practice responsible computing,...

5. Education

- Constant evaluation of the current needs in ICT skills for high schools in order to ensure that graduates of a secondary school have the skills they need.
- Teachers should encourage their students to practice responsible computing, thus avoiding abuse. One ICT course should be The Social Dimension of the Web .
- It is vital to teach basic ICT skills in addition to reading, writing and arithmetic. New special ICT subjects were created, e.g. measure, control and regulate .

Scalability

What efforts and resources are required for full implementation and what benefits can result from it? This question must be answered indirectly, because the interviews didn't contain the necessary data. The main points are described below.

- The principal and the staff members must define a common goal which they will directly pursue.
- The authorities and the communities of the schools have to support the efforts of the staff members not only by providing financial resources but also by creating the basic conditions necessary to act.
- Further trainings for staff members must be organized and supported in order to give teachers input on innovations and the opportunity to discuss pedagogical topics.
- All subject teachers should use ICT to the same degree their lessons; otherwise, the students of teachers who don't use ICT in the lessons will be a disadvantage compared to the students of teachers who use ICT. The individual philosophy of a teacher determines whether he/she is suited to implementing ICT into his/her teaching.

Methodical reflection

Based on feedback from our pre-pilot studies, we propose the following changes. The term "reform" was often expressed differently by the interviewees, for example, as the expansion of the curriculum-offer or changes. The term "reform" should be further clarified.

1. Teacher Interview

Sometimes the teachers were not able to answer any questions because they didn't understand the meaning of the questions or they didn't have the necessary background knowledge. The following questions proved difficult to answer.

- Perspective on reform: Are high and low ability students impacted equally?
- Value: What role does it play in the academic program?
- Value: How does it relate to the reform? (Very abstract - we would remove this question.)
- Maintenance: What support is in place to keep it working? (A lot of teachers didn't have the background knowledge to answer this question.)
- History: Who embraced it first/last? (This question should be further clarified for example classification in groups by ages, gender, subjects,...)

2. Parent/Guardian Interview

Parents who also use ICT were better able to answer the questions. The language of the questions was unfamiliar to some parents. Clear differences were recognizable in the level of educational. The parents were to some degree overtaxed by some questions, for example:

- Child's interests: What is the most interesting or exciting thing your child has done at this school?
- Perspectives on ICT: How much use does your child make of ICT at school?
- Perspectives on ICT: Are any students being left out because of ICT use in the school?

3. Administrator Interview

In the secondary schools in Austria, there is no school administrator. The principal of the secondary school performs the tasks of an administrator. Therefore, we conducted part of the administrator interview with the principal.

Translation

Sometimes different meanings resulted from the translation of the questions. For this reason, we have changed some pre-determined questions on Austrian realities, e.g.

-> Nomination Form for a School Site

- Transiency rate of students (the ratio of the number of non-full term students to full term

students)

-> **Parent/Guardian Interview**

- What are your child's extra-curricular interests?

-> **Student Interview**

- What extra-curricular activities do you do?
- What extra-curricular activities do your closest friends do?

Experience and support

- *Planning and organizing for a site visit*

After site selection, the research team announced the extent of the research to the principal by e-mail (total number of interviews per category). That was very helpful, because the principal could arrange certain appointments with parents and teachers in advance.

- *Site visit*

At the beginning, the principal introduced the research team to the staff. Afterwards, we took a tour of the school and scheduled interviews and observations. A critical point was the selection of the people to be interviewed. On the one hand, it was easy to find teachers who were closed involved in and strongly identified with the reform. On the other hand it was difficult to identify teachers who were opposed to the reform. The research team was very impressed by a teacher who was opposed to the reform and he volunteered as an interviewee. Quotation: I would like to talk about the other side of the coin, to discuss those points that none of the teachers speaks about openly, such as frustration, overstrain, social isolation, fear, and discrimination,... This interview was conducted as an open conversation, and the content was very exciting.

The support of the teachers, like that of the principal, was fantastic. Everyone was very helpful, co-operative and friendly.

Appendix A

Methodology

Description of the volume and type of data collected

Activity	Annotation	Amount
Verbal Interviews (approximately 45-60 minutes each)		
Nomination Form for a School Site	Principal	1
Administrator Interview	Principal	1
Parent/Guardian Interview	2 mothers, 2 fathers	4
Technology Specialist Interview		2
Student Interview	1 group of 6 students (first year) 1 group of 5 students (fourth year)	2
Teacher Interview	4 teachers who were actively involved in and strongly identified with the reform. 4 teachers who were opposed to the reform.	8
Questionnaire		
ICT Use Survey of Teachers	Teacher	23
Observing in Classrooms		
Computer science	fourth year	2 hours
English	second year (use an instructional program)	1 hour
Gymnastics athletics competition	all classes	2 hours
Technical Project	fourth year (Poly)	3 hours
Word processing - Internet	fourth year	1 hour
Collecting additional materials		
Web-site presentation	http://hitgrein.eduhi.at/	
Web-site presentation of a school project	http://www.grein-donau.at/greinol/hauptgr.htm	
Student-generated materials	riddle (die Knofelecke)	
Lesson plan from the IT class		
Reports on the experimental school form		
Plans for school improvement		
School report	from a fourth year	

Appendix B

ICT Use Survey for Teachers

15 teachers filled out this questionnaire (n = 23).
The results are represented in percentage (100 %).

- How comfortable are you with using a computer to do each of the following? (Choices are: very comfortable, comfortable, somewhat comfortable, not at all comfortable)

		very com- fortable	com- fortable	somewhat com- fortable	not at all com- fortable
1.	write a paper	78.3	21.7	-	-
2.	search for information on the World Wide Web	27.3	31.8	27.3	13.6
3.	create and maintain web pages	4.4	4.4	17.4	73.9
4.	develop and use a data base	17.4	8.7	30.4	43.5
5.	send or receive e-mail	18.2	27.3	45.5	9.1
6.	programming (e.g. writing a program in Visual BASIC or Java)	8.7	-	91.3	-
7.	draw a picture or diagram	26.1	21.7	21.7	30.4

" How often do your students on average do the following for the work you assign? (Choices are: almost every day, a few times each week, between once a week and once a month, less than once a month, never)

		almost every day	a few times each week	between once a week and once a month	less than once a month	never
8.	use a computer for any purpose	27.3	27.3	36.4	9.1	-

9.	use the World Wide Web	26.1	34.8	21.7	17.4	-
10.	create web pages	-	-	4.6	-	95.5
11.	send or receive e-mail	4.4	8.7	17.4	21.7	47.8
12.	use a word processing program	26.1	39.1	21.7	8.7	4.4
13.	use a computer to play games	-	4.4	13.0	26.1	56.5
14.	use a spreadsheet	4.4	21.7	13.0	-	60.9
15.	use a graphics program	-	4.6	27.3	27.3	40.9
16.	join in an on-line forum or chat room	-	-	-	4.4	95.7
17.	use a graphing calculator	4.4	4.4	8.7	8.7	73.9
18.	use a digital camera	4.6	4.6	9.1	18.2	63.6
19.	use an instructional program (including simulations)	4.4	8.7	52.1	17.4	17.4

20. How would you rate your ability to use a computer? (Choices are: excellent, good, fair, poor)

9.1	excellent
18.2	good
45.5	fair
27.8	poor

21. Is student computer use ever evaluated for grading? (yes-no)

35.0	yes
65.0	no

22. If you assign World Wide Web searching, how much freedom do you allow students in locating sites to visit? (no restrictions, some restrictions, designated sites only)

16.7	no restrictions
44.4	some restrictions
38.9	designated sites only

23. Do any of the classes you teach have a web page? (yes-no)

15.8	yes
84.2	no

24. What portion of the computer use in your classes is directly related to the course content (as opposed to rewards or incentives, for example)? (all, most, some, very little)

27.3	all
9.1	most
36.4	some
27.3	very little

25. What portion of the computer use that you assign is done by students individually? (all, most, some, very little)

4.8	all
47.6	most
33.3	some
14.3	very little

26. How often do you use a computer at home for preparing for teaching? (almost every day, several times a week, etc.)

27.3	almost every day
50.0	several times a week
22.7	etc.

27. Have you ever participated as a student or instructor in a virtual course through the Internet/World Wide Web? (yes-no)

27.3	yes
72.7	no

28. Have you ever involved your students in collaborative learning over the Internet/World Wide Web with students from other classes? (yes-no)

4.4	yes
95.6	no

29. Do you participate in any on-line professional chat rooms, forums, or the like? (yes-no)

4.4	yes
95.6	no

30. How many e-mail messages do you send and receive each day? (more than 12, 6-11, 1-5, none).

-	more than 12
4.4	6-11
34.8	1-5
60.9	none

" Have you ever done any of the following? (Choices are: yes, no)

		yes	no
31.	made changes to a computer s memory chips, hard disk, or processor	17.4	82.6
32.	installed an update to an application program (word processor, graphics program, etc.)	43.5	56.5
33.	installed a computer on a network	17.4	82.6
34.	created or managed a web site	8.7	91.3
35.	developed a data base with more than 25 records	30.4	69.6
36.	used a digital camera	39.1	60.9

Abstract

The secondary school of Grein decided for several reasons to install a school approach in ICT: because ICT-education is a modern trend, because they wanted to stop the decrease in the number of students, and because they wanted to increase the level of students performance.

The attractiveness of this ICT main emphasis is already recognizable in the first year. The enrolments for the ICT-class show an above-average increase. Whether the level of students performance in general could be increased will be answered in three years, when the first ICT class graduates. Many difficulties are connected with the installation of an ICT school approach in Austria. For example: The teachers have to be trained in several ICT-subjects, but the demand for ICT-training far exceeds the availability.