



WAYS TO USE ICT IN SCHOOLS TO OPTIMIZE THE IMPACT ON TEACHING AND LEARNING

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Abstract: The European eLearning Forum for Education 2 (ELFE2) is a project initiated by the ETUCE (European Trade Union Committee on Education) and builds on the conclusion of its predecessor ELFE1. ELFE2 aims, as ELFE1, to contribute to a better understanding of the strengths and weaknesses of using ICT in education. It identifies ways used to optimize the benefits of ICT in education. To explore how ICT can be used to support teaching and learning two schools each in Denmark, England, Latvia, Poland, and Slovenia were selected based on information that indicated that they were regarded nationally as schools with an advanced ICT practice. The idea behind this selection is that by studying schools with what is experienced as an advance practice it will be possible to get some hints about problems and challenges other schools will be faced with. ELFE2 indicates that a number of ways are used in the schools to optimize the positive impact of ICT. Most of these ways are perceived by teachers and students as positive, but there are also factors that make the picture more complex. Some factors seem to be an obstacle for the introduction of ICT in the schools.

Key words: e-learning, ICT, teaching, learning

1. Introduction

The European eLearning¹ Forum for Education 2 (ELFE2) is a project initiated by the ETUCE (European Trade Union Committee on Education). The project builds on the conclusion of its predecessor ELFE1. In ELFE1 it was noted that education and schools in the 21st century faced many challenges of education in information society [1]. In this context the aim of ELFE1 was to allow ETUCE and the wider society to get a better understanding of the strengths and the weaknesses of using ICT in primary and secondary education. An important part of ELFE1 was the visits to in total 15 schools, three schools in each of the five participating countries (Denmark, Germany, Norway, Portugal and United Kingdom). An important focus in the school visits was the *pedagogical and organisational aspects of intensive use of ICT in the school*

The conclusion drawn in ELFE1 was that ICT had made a difference in several ways in the schools including how the students were taught and how they learned. Most of these changes could be described in positive terms. The factors influencing the use of ICT in schools were defined as the external policies. The emphasis lay on the support given outside the school and the role of head teachers. It was also found that there was a change in what students are taught and what they learn, but no hard evidence was collected on improved learning [2].

As ELFE1 was considered a successful project a follow-up of the project was organised. Basically, the idea was to organise a similar project as ELFE1 in another group of countries. Based on the experiences from ELFE1 the emphasise in ELFE2 was partly shifted from a focus on innovations to a focus on identifying ways used to favour a use of ICT that in turn promotes added learning value.

¹ In the context of ELFE1, e-learning was used as the use of ICT (modern information and communication technologies) to enhance teaching and learning so as to make it more student-centred and meeting the challenges of the 21st century. In ELFE2 the concept e-learning has been used in the same way.

ELFE2 aims, as ELFE1, at contributing to a better understanding of the strengths and weaknesses of using ICT in education. The project deals particularly with identifying methodologies used to favour a use of ICT that in turn fosters added learning value.

2. Research methods

In order to explore how ICT can be used to support teaching and learning two schools were selected in each of the five European countries (Denmark, England, Latvia, Poland, and Slovenia).

The ELFE2 study applied a qualitative research approach, a case study [3]. In this study the ten schools visited will generally be treated as one case.

Triangulation in the extended sense [4], is applied to provide various stakeholders perspectives in the process of data collection. Thus research instruments (questionnaires, individual interviews and focus group interviews) subjects of the research in educational institutions of three levels (the head teacher, teachers, students, technical staff) and a team of investigators (experts and trade union representatives) are diversified to ensure the validity and reliability of the data. According to Cohen, Manion, Morrison [5] triangular techniques have special relevance when a holistic view of complex phenomenon in education is sought which is the reason of the use of triangulation in ELFE1 and ELFE2 research.

To make a link to the ELFE1 it was decided that it would be important to use the same instruments as in ELFE1. In ELFE1, the process of determining the information needs followed the approach developed in the IEA SITES-M2 [6]. The SITES-M2 study was a study of innovative pedagogical practices supported by ICT, and as such similar in goal and scope to ELFE1. Some minor changes were made in the instruments.

The budget of the project limited the number of possible school visits to two in each involved country. The Steering Committee of the ELFE2 project decided that in each country two schools should be visited.

Two criteria were used to select the schools:

- 1) The schools had to be secondary schools, both lower secondary and upper secondary schools. The concept secondary schools included schools with a general academic profile, but excluded vocational schools.
- 2) For practical reasons, the steering committee should be able to visit the schools together with the teacher education institution within the number of days allocated in the budget for the visit to each country.

In addition to the two general criteria four additional criteria were used:

- 1) The schools should be 'normal' as opposed to schools that receive extra budgets and support as part of a specific project. However, schools participating in national stimulation projects were considered eligible, too. They could be seen as feasibility projects to test the implementation in the whole system. This included either a school type, and/or schools in a specific region.
- 2) The use of ICT in the schools should be aimed at pedagogical methods (e.g. student centred pedagogy) and/or addressing new curricular goals (e.g. goals related to developing lifelong learning skills).
- 3) ICT should be used intensively in teaching and learning processes in the school as a whole.
- 4) Given the expected differences in development stages with respect to integration of ICT in teaching and learning between European countries, the criteria mentioned above were to be locally defined. The schools should be regarded as advanced in respect of ICT use in their countries.

These criteria were basically the same criteria used to select schools in the ELFE1 project [1]

The project budget provided for three days of visit to each of the countries². The school visits took place from April to November 2008.

The idea behind this selection was that by studying schools experiences with an advanced practice it would be possible to get some hints about developments, problems and challenges other schools will face in the future should they set up an ICT profile at their school.

In each of the visited schools data was collected from various people and in various ways. Head teachers, teachers and students were interviewed and questionnaires were filled in by head teachers and ICT co-ordinators.

In addition to this, relevant documents from the schools were, where possible, collected.

3. Findings

To relate the findings to the aims of ELFE2, mentioned in section 2 and 3, this section will start with identifying different ways in which ICT is used to promote an added learning value. This will be followed by an attempt to identify factors that are supporting or hindering the use of these methodologies.

The data collected in ELFE2 indicates that there is a number of ways in which ICT can be used to optimize the positive impact of ICT on teaching and learning. How ICT is used depends on a number of factors such as for example the financial resources available to the school, teaching traditions and organisational structures. One of the crucial factors is the ICT infrastructure available for instruction.

3.1.1. Interactive boards

Some schools have had the opportunity to get more advanced equipment for computer aided presentations and use Interactive boards, i.e. Smart Boards in some classrooms. The subject content is either commercially produced or prepared by the teachers.

3.1.2. Facilitate experiments

Modern computer equipment is used in several of the schools to facilitate experiments in natural sciences. In some cases the use of ICT is a way to improve the experiments and to make the processes more visible and in other cases the experiments would not even be possible to do without computers. There are in some cases standard programmes which the schools can use, but there are also examples of teachers who developed their own programmes to support experiments they want to do together with their students. As experiments are mainly a part of science subjects this was a methodology more commonly used in science subjects than in other subjects.

3.1.3. Video and sound

Computer equipment for video and sound editing makes it possible for learners to produce audiovisual materials and audio recordings.

Video recording systems encourage students' in-depth analysis and self-made reflection on the sources of success or failure in sport.

Internet Web2.0³ software such as podcasts was reported in one school to be useful for developing speaking in a foreign language.

Audio recording software was used by a teacher in one school to provide feedback.

² These three days also included a visit to a teacher education institution in each country. The results of these visits will not be discussed in this article.

³ The term Web 2.0 refers to web applications which facilitate human communication, such as blogs, wiki, social networking, video-sharing sites and folksonomies.

3.1.4. PowerPoint

Most schools reported using PowerPoint to support lectures. PowerPoint presentations are often prepared by teachers, but there are also examples of teachers using prepared presentations. Also in many schools, students are encouraged to use PowerPoint to present the results of thematic work, group work or individual work.

3.1.5. Animations

Most schools reported using different computer programmes and web pages to animate issues which they want to show and to explain to the students. The idea behind this is to make lectures more concrete. This way of working could be found in many different subjects, but it seemed to be more frequently used in science subjects than in other subjects.

3.1.6. Finding information on internet

Most schools reported using internet to find information. This includes a large number of different approaches from thematic cross-curricula work in groups to the encouragement of students to look for information as part of their homework. In some cases this was a standard approach to replace and/or supplement textbooks with more up-to-date information from the web. In other cases this approach was used at various occasions to collect information which could not be found elsewhere. Some schools reported about new packages of textbooks which included access to websites specially designed as a part of this package. This seemed to be the case for some newly published textbooks in foreign languages.

3.1.7. Internet and e-mail for communication

Internet and e-mail are frequently used for communication. This includes a large number of different types of communication, for example communication student – teacher, teacher – teacher, student – student, head teacher – teachers and head teacher – students. This communication was facilitated by the use of different platforms for communication and learning in some schools (for example Moodle), while other schools relied on normal e-mail communication. In some schools students regularly kept in contact with their teachers through platforms and/or e-mail. They were expected to send their work electronically to the teachers and received their comments electronically. There were also schools where the head teachers used platforms or e-mail to communicate on a regular basis with the teachers and with the students.

3.1.8. Learning platforms

Learning platforms such as Moodle, Fronter and Skoleintra used as a means of communication between teachers and students are also used as a storage of the course content. The schools use learning platforms only for blended learning instruction to facilitate, support and organise classroom pedagogical practices.

3.1.9. Dissemination of information

Web pages and platforms are in many cases used not only to post general information about the school to an audience outside the school, but also to disseminate information to teachers and students and to create archives with information. In some schools the students could find PowerPoint presentations and presentations made on Smart Boards in archives which were available through websites and/or platforms.

3.1.10. Contacts with other schools

Most of the schools visited had established contact with other schools. In some cases these contacts were schools in their own country, but in many cases it also involved schools in other countries. These contacts could be very different in character. Sometimes individual teachers had established contact with colleagues in other countries and through these organised different types of exchange of experiences and co-operation. In other cases schools were part of organised projects where regular contacts with other schools were an important part.

3.1.11. Distance education

None of the schools visited claimed they organised distance education. However, one school offered something close to distance education to some students. Due to the participation in sport activities at an advanced level some students spent much time in training camps and in competitions away from school. Thanks to the availability of information, lessons and tasks on the school's website these students had the opportunity to continue their school work when they were not able to attend school.

In some schools advanced use of ICT was not only to be found, or in some cases not even mainly to be found, during the normal school hours, but in activities outside the normal school day. Several schools offered out of school activities such as theatre, bird watching, film-making and astronomy. In all these activities the use of ICT played an important role. This role varied from being an instrument to produce films to be a tool to communicate with bird watchers in other countries. These activities were also more or less linked to the school. In some cases they were part of regular extra-curricular activities offered by the school and in other cases a private initiative of some teachers who had been allowed to use school computers.

3.2 Factors supporting or hindering the use of ICT oriented methodologies

Most of the ways in which ICT was used mentioned in section 5.1 are perceived by teachers and students as positive, but there are also circumstances that make the picture more complex. Below a number of observations illustrate supporting and hindering factors.

All schools visited had according to themselves a more or less sufficient number of computers available. In some schools the wish was expressed to have more computers, but in no case the lack of computers was a problem. Most available computers also seemed to be modern computers equipped for multimedia use and with access to the internet and e-mail. Schools also seemed to have access to the software considered to be relevant for the learning and teaching in the schools. *The infrastructure was not experienced as a problem in any of the schools.* On the contrary most schools seemed to be rather satisfied with the ICT equipment they had. However, if they perceive the need for new tools they either improvise or plan to develop infrastructure.

The teachers we met during the school visits can be divided into at least three groups. The first category embraces teachers who seemed to be confident and enthusiastic users of ICT. They reported that they had learned how to use ICT, both technically and pedagogically, in many different ways.

The second category consists of teachers who were placed in the ICT-rich learning environment. Thus, they have to use the infrastructure available in the school. Gradually they become more and more confident. They are aware of changes introduced by ICT into their teaching practices.

A third category consists of those teachers who have not integrated ICT into their teaching. This group did not exist in all schools we visited, but most likely in several of the schools. How large this group is we do not know. References made to these teachers indicated that the majority of these teachers consisted of teachers close to retirement.

The use of in-service training/education to develop the use of ICT in the schools could be described as very mixed. In some schools it is possible to follow in-service courses. In most cases these courses were organised at a national level by the Ministry of Education or other national institutions. In some schools school management has initiated local courses for teachers. To a great extent teachers' learning the use of ICT in teaching is experienced through trial and error and learning from each other.

Teachers' professional development varied between schools. The practice of organising teachers' professional development varies between countries and the individual schools also have different patterns and traditions. Some of the education systems from which ELFE1 schools came have a fairly decentralized way of using resources. In these countries the schools could decide themselves about courses the teachers wanted to attend and even decide to pay for external courses that seemed to be of particular interest to the school. The education systems in some of the countries that participated in ELFE2 seem to give individual schools only limited possibilities to decide about professional development. This reduces the options for head teachers. They can nevertheless encourage teachers in these schools to learn from each other. This also seemed to be the actual practice in the visited schools.

The formal and informal training both in technical and pedagogical use of ICT is equally valid. There are two approaches to *in-service training/education*. *In some institutions teachers participate regularly in formal in-school or outside school ICT-courses or workshops. They also share their knowledge and experience with other teachers in workshops and conference presentations. New teachers are taught how to develop their ICT and pedagogical skills. The second approach shows that in-service education does not seem to have been used systematically as a way to develop the pedagogical use of ICT in all schools.*

Most head teachers and teachers we interviewed had ideas about why they wanted to use ICT and how it could be used. Some teachers felt that they are forced to use ICT by students, parents and school authorities. Some had further ideas about how the use of ICT could be developed. With few exceptions these visions were the visions of individuals. In addition to individual visions there were also national plans on how the use of ICT in education should be developed. In some schools the vision of the head teacher or government was shared by the teaching staff and put into organizational structures. In other schools a vision had been developed in a dialogue between the head teacher and teachers and put into practice. In most schools, however, a kind of school vision discussed and decided upon in local dialogue was not existent. Few schools had worked on the development of a shared vision. In these institutions *to elaborate a vision together did not seem to be a major instrument to develop the use of ICT.*

Another factor crucial for enhancing the pedagogically sound use of ICT in education is the margin for risk and trial. Any innovation by nature may prove to be successful or not. Thus, the teacher's right to build on both small scale successes and failures is perceived as the key to further progress. Moreover the right to disseminate and discuss both good practices and procedures that should be avoided in teaching may increase motivation to implement innovative use of ICT, may also reduce the teachers' tension and pressure.

In some schools boys were regarded to be better and more interested than girls in using ICT. This was also reflected in some cases where the student focus group we met consisted of only boys. Gender was not perceived as a relevant issue in the discussion of the use of ICT although a regular remark concerned the girls' preferences to use ICT for chatting and, the boys' preference to playing computer games. *No school reported about any special measures that had been taken to support girls' use of ICT.*

The fact that social differences exist between students and that they may have an impact on the students' opportunities were acknowledged in most of the schools. There were also differences between the visited schools. In some cases the head teacher and the teachers assumed that most students had access to computers at home, which was also confirmed by the students, while in other schools it was generally noted that many students did not have access to computers outside school. Whether the students had access to a computer at home was not perceived as influential on their educational achievements by the schools. In some cases measures had been taken *to provide more students with access to computers*. Such measures included computer rooms which were available for students not only during school hours, but also in some cases outside school hours. In a few cases students were given sponsored computers for personal use. In some schools the computers used at school were also available for parents and the surrounding community. The number of persons who used the computers after school hours varied depending on the community. If the school infrastructure was used in a structured way by community organisations supporting life long learning it was used more intensively.

From an ethnic perspective the school population is either fairly homogenous or dominated by various ethnic groups. That is, in some schools there were few or hardly any immigrant students. In other schools, on the contrary, the majority of students came from different ethnic backgrounds. In most of the schools *ethnicity did not seem to be an issue and no measures related to ethnicity and ICT were mentioned.*

Most of the participating schools seemed to be involved in other innovations. This means that the innovative use of ICT is often part of a general innovative approach to the educational practices applied in the school.

The leadership style of the head teachers seemed to be important in most of the schools. The head teachers were either themselves initiators of developing ways of using ICT or at least in some way or another supporting it.

Integration of ICT in the school's culture was something that varied largely between schools. All schools certainly use ICT to a large extent but this does not mean that the use of ICT is something that affects all students every day. Even if many students listen to lectures supported with PowerPoint many of them do not use computers themselves during a normal school day. However, there are two exceptions. In the two Danish schools students used their personal laptops on everyday basis. How frequently ICT was used as a means for communication varied for the most part between the schools.

There seem to be diverse practices concerning teacher collaboration in the different schools. Some schools have a tradition of cooperation and this has probably facilitated the increase of the use of ICT. In other schools an increased use of ICT has led to increased collaboration between teachers. There are also schools where the use of ICT has increased, but there are no signs that this affected the degree of co-operation among teachers.

A strong link was noted between schools' use of ICT and the support from external policies. All government policies surely favour an increase in the use of ICT in education, although this wish is not always followed by necessary budgetary means. Schools which manage to develop the use of ICT are rewarded in some way or another, most often through a general positive recognition from relevant authorities about their work. Schools in Great Britain seemed to be an exception. Although ICT infrastructure was fully supported by the state funds in the UK, the school recognition is based on the national exams not on the innovative use of the resources provided. Parents do not seem to be much involved in the work of the schools in most of the visited institutions, but when the parents express an opinion it is in favour of using ICT in the schools. What is more in some schools there is a pressure from students and school communities on the intensive use of ICT in education.

4. Discussion

In this section the research method will be shortly evaluated. Did the method work as expected? That discussion will be followed by some observations concerning the findings presented in section 3. The findings will also be discussed in relation to other research in this field.

4.1. The research method

As mentioned in section 2 the idea behind the selection of a small number of schools with an advanced practice is that this could give some hints about developments, problems and challenges other schools will be faced with in the future. If this should be the case it is important to reflect on whether we found the type of schools we were looking for.

The visited schools believed they had a more advanced use of ICT than other schools they know about. This could be regarded as an indication that we actually found what we were looking for. It should not be interpreted that the visited school necessarily are the most advanced ICT users in their countries, but rather that they are among those schools in the respective country that have an advanced use of ICT.

One criterion for the selection of schools which has to be discussed was the intention to select schools which could be regarded as *"normal" and not received extra budgets and support as part of a specific project*". Several of the selected schools did receive extra financial support which is not available to all schools. In this respect the selection of schools failed. The further implications of that will be discussed below.

4.2. Some findings

It is important to emphasize that the small number of schools that were included in ELFE2 does not make it possible to generalise from the observations to European or national level. The findings from ELFE2 have to be compared with other similar studies in order to say something more general about the facts identified. Many of the observations are similar to those observed in the SITES-Module 2 study [6] [7] and to the phenomena recognised in ELFE1 [1] [2]. What these findings may help us to see are the risks and opportunities that other schools will meet in the years to come.

The findings are discussed 1) from the perspective of different stages in the development of the use of ICT in schools, 2) in relation to the findings from ELFE1 and 3) from the perspective transferability and sustainability of ICT use in schools.

4.2.1. Different stages in the development of the use of ICT in schools

According to Plomp, Brummelhuis, & Rapmund [8] three different stages in the development of the use of ICT in schools can be observed:

- 1) The teachers use computers to support traditional methods of teaching, such as drill-and-practice, text orientation, whole group lectures and seatwork.
- 2) The teachers gain confidence and use technology as part of more innovative instruction, including, team teaching, interdisciplinary project based instruction, and individually pace instruction.
- 3) The teachers enter an inventive stage in which they experiment and change the use of technology to support active, creative and collaborative learning.

Comparing the different ways used in the schools and reported in section 3.1 with these stages (1 to 3) it can be concluded that several of the methodologies would fit into the first phase described. PowerPoint presentations, animations and experiments are ways of using ICT to support traditional methods of teaching. The use of internet to find information and e-mail to communicate could be described as attempts to use ICT in a more innovative way, a way which includes the development of other methods than the traditional ones. In some cases this could also be close to different ways of active, creative and collaborative learning. Generally it can be concluded that in most cases the school practices are in the process of moving from using ICT as a support to traditional teaching methods to a more innovative use of ICT which includes using new technology to find new way of teaching and learning. There are also some signs of entering the third stage.

4.2.2. A comparison with the findings from ELFE1

In the ELFE1 project a number of factors which influence the intensive use of ICT were found [1] [2]. These seven factors were:

- 1) Vision on teaching and learning,
- 2) School's involvement in other innovations,
- 3) Leadership style of the head teacher,
- 4) Integration of ICT in the school's culture,
- 5) Teachers' professional development,
- 6) Teacher collaboration,
- 7) External policies and linkages relevant for ICT use and pedagogical changes.

When these factors are compared with the findings of ELFE2 a number of reflections can be made.

Visions on teaching and learning may have had a less important role in the schools in ELFE2 than in the schools in ELFE1.

Schools' involvement in other innovations did not seem to be a necessary prerequisite for an innovative use of ICT in ELFE1, but several of the participating schools had a history of participation in other innovative projects. In ELFE2 this seemed to be the case in most of the participating schools..

Concerning the importance of school head teachers' leadership style related to the use of ELFE1 and ELFE2 come to the same conclusion. Similar conclusions have been drawn in several other studies (see for example [9]; [10]).

Integration of ICT in the school's culture was something that varied largely between schools in ELFE1 and this may be even more the case among the schools that participated in ELFE2.

Teachers' professional development varied between schools in ELFE1 and even more so between the schools in ELFE2. Some of the education systems from which ELFE1 schools came have a fairly decentralized way of using resources. In these countries the schools could decide themselves about courses the teachers wanted to attend and even decide to pay for external courses that seemed to be of particular interest to the school. This was used by some head teachers in the ELFE1 schools to organise professional development specially designed for the schools. The education systems in some of the countries that participated in ELFE2 seem to give individual schools only limited possibilities to decide about professional development.

In ELFE1 it was noted that the increased use of ICT often lead to intensified collaboration between teachers, but that it also sometimes seemed to be the other way around – that existing good collaboration between teachers lead to the enhanced use of ICT. In ELFE2 there seem to be diverse practices in the different schools.

In ELFE1 a strong link was noted between schools' use of ICT and the support from external policies. This is obviously also the case in the ELFE2 schools.

4.2.3. Transferability and sustainability

Of general importance when the findings from the studied schools are discussed is to consider to which extent work in these schools is transferable and sustainable. Transferability is understood as the extent to which experiences gained in these schools can be transposed to other schools. Sustainability is understood to which extent it is possible for the studied schools to continue their work and to further develop it.

Firstly, as far as transferability and sustainability are concerned the budgetary issues of introducing computers into schools, the maintenance of the existing infrastructure and upgrading both hardware and software seemed to be essential.

The critical issue in this context is that the studied schools had access to financial resources which have not been available to other schools and which may not be available to other schools in the near future. To get a certain number of computers may be critical to make use of ICT in a school. If there are not enough computers it is difficult to integrate the use of ICT into the school's every day practice. If other schools would like to advance their use of ICT they would need to get an adequate number of computers and it is doubtful whether the normal funding of a school would be sufficient to get the number of computers needed.

Equally critical in this case is the sustainability. Additional funds from a project or a sponsor are usually restricted in time. A project will come to an end or the contract with the sponsor will need to be renegotiated. This may mean that it will not be possible to continue the work on the same scale as the plans of the school would then have to be adjusted to a smaller budget. This could of course also happen in the case of regular funding, but the difference is that regular funding is supposed to be provided on regular basis to give the schools the opportunity to cover all, or at least most, necessary costs. When a school receives additional funding it is necessary to consider how these funds can be used in a sustainable way. It is also important to know for how long time the additional funding can be counted on and to make the plans accordingly.

Secondly, the issue of transferability and sustainability of pedagogic practices needs to be discussed. All institutions planned changes either in educational hardware or software. New technology introduces new teaching practices. Change as a process is sustainable in education, as teachers are working on new methods and approaches and on how to use ICT. The positive attitude towards change and innovative practices can be sustained in the institutions visited and transferred to any other school.

Transferability of teaching practices can be bi-directional. On the one hand institutions less favourably equipped may learn how to plan their progress in ICT-based instruction. On the other hand institutions better equipped may get varied teaching practice that is prerequisite in a learning environment, but may be an option in another.

5. Summary

The number of schools visited and the selection procedure does not make it possible to draw any conclusions that can be generalised as the situation in the involved countries or the situation in Europe. The idea behind this selection is that by studying schools with what is experienced as an advance practice it will be possible to get some hints about developments, problems and challenges other schools face in future. In order to be able to use this result it is important that the selected schools meet the criteria for selection. The criteria that the schools should be regarded “as advanced in respect of ICT use in their countries” seems to have been met, but the criteria that schools “should be 'normal' as opposed to schools that receive extra budgets” may not have been met.

Although the schools differ much in the ICT infrastructure available for educational use, the teachers approaches to how ICT is used are quite unanimous.

Teachers in the visited schools work enthusiastically to explore ways to use ICT. A number of different approaches are used in the schools:

- PowerPoint supported lectures,
- Animations used to make lectures more concrete (mainly science subjects),
- Experiments supported by ICT (mainly science subjects),
- Using internet to find information,
- Using internet and e-mail for communication,
- Websites to make information available to the public and to students,
- Contacts with other schools (also in other countries),
- Blended learning,
- Out of school activities.

The ICT infrastructure in the visited schools has generally been perceived to be good. In-service training and work with shared visions could be used more systematically to develop the use of ICT. A challenge for the schools is to enter a more inventive stage in which they experiment and change using technology to support active, creative and collaborative learning.

Many of the schools visited received additional funding from different sources. In order to get sufficient number of computers and relevant programmes the regular financial support provided for schools may not be sufficient. In order to develop the use of ICT in learning and teaching it is necessary to find additional resources. A critical question in this context is how this will affect transferability and sustainability of the use of ICT in education.

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