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## **Policy Paper**

*Policy recommendations on ICT*

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## **Foreword**

One of the most radical changes experienced by European societies during the last twenty years has been the introduction of ICT into the world of work and into many homes. Our lives, both in the workplace and at home, have changed in many ways. Some of these changes have made life easier, while others may raise new problems and challenges.

Schools have also been affected by these changes. Some people would say that schools have been affected to a lesser extent than other sectors of society. Some would also argue that ICT has a huge potential to change education, schooling and teaching as we know it today.

For teachers it is of the utmost importance to reflect on the changes that have already been seen in schools as well as changes that may yet come. This raises questions related to how we would like to shape education, schooling and teaching for the future. In order to provide the opportunity and resources required to think through these issues in depth the ETUCE (European Trade Union Committee for Education) applied for funds from the European Commission for a project on the use of ICT in schools. The European Commission accepted this project and funds were made available. The project was entitled ELFE (The European e-Learning Forum for Education) and its objective has been to create a better understanding of the strengths and weaknesses of using ICT in primary and secondary education. This has been done through three types of action:

- Analysis and exchange of good experiences and identification of good practices in different countries implementing the use of ICT in their education systems;
- Study of the possibilities for transferring good practices in the pedagogical use of ICT across all the European countries and the way this transfer could be take place, and
- Launch of a wide-ranging debate on how the European policy on the use of ICT in schools should - from a pedagogical point of view - take into consideration social effects and the political approach to be followed in future education plans.

For the analysis of good practices a number of schools in Denmark, Germany, Norway, Portugal and the United Kingdom were identified by teachers' organisations from the countries concerned. These schools were visited by a group comprising a researcher, a representative of a teachers' union in another country and a teachers' union representative from the host country. The results of these visits have been presented in a special report. These policy recommendations are based on the findings in that report and policies articulated earlier by ETUCE and EI (Education International).

A special thanks to those schools who participated in the project (see list in the project report) and to Gymnasieskolernes Laererforening (GL, the Danish Union for teachers in upper secondary education), Gewerkschaft Erziehung und Wissenschaft (GEW, the German union for workers in education and research sectors), Utdanningsforbundet (Union of Education, Norway), Federação Nacional dos Sindicatos da Educação (FNE, the National Federation of Education Unions, Portugal) and National Union of Teachers (NUT, UK). These unions participated in the project and were represented on the Project Steering Committee together with three educational experts. (For more information on the ELFE project see the ELFE report or visit the ELFE webpage <http://www.elfe-eu.net>).

## **1. Do schools need ICT?**

Schools use ICT. Some people would argue that schools could use ICT to a large extent, while others may argue that there are reasons to be restrictive about the use of ICT in education. An important starting point may be to ask whether schools actually need ICT? In the following paragraphs arguments both for and against the use of ICT in schools will be examined.

### **1.1 Many governments want to increase the use of ICT in education**

Today many governments are keen to introduce ICT in education. This is also manifest at European level. In the Presidency Conclusions of the Lisbon European Council, the Council called on *“the Member States to ensure that all schools in the Union have access to the Internet and multimedia resources by the end of 2001, and that all the teachers are skilled in the use of the Internet and multimedia resources by the of 2002”* (Lisbon European Council: Presidency Conclusions, Paragraph 11).

Politicians and other decision-makers in education sometimes seem to have too strong a belief in the use of ICT. ICT is sometimes described as the instrument to solve all problems. As will be discussed in this document, there are reasons to be optimistic about how ICT can be used in education, but it is also necessary to realise that ICT is only a tool. Uncritical optimism combined with lobbying from computer companies can lead to excessive investment in ICT equipment in schools at the expense of other equally important resources such as training and professional development on ICT. The problem could also be that these investments replace other investment. Sometimes, there may be things schools need more than computers and there are certain types of basic investment, which need to be made before schools are given computers.

## **1.2 Some scepticism among teachers**

At the same time as governments are often enthusiastic about ICT it can be noted that this interest is not always matched by a similar enthusiasm among teachers. Using ICT may mean that work in school has to be organised in new ways and it may sometimes be difficult to figure out how to find new pedagogical methods that work well together with new technologies. Teachers are sometimes accused of being conservative when it comes to working methods in the classroom. This is debatable, but it can certainly be argued that teachers have a responsibility to find methods in their teaching that they believe in and that they know will work. From that perspective a certain amount of scepticism may be healthy. One reason for being sceptical towards the use of ICT in schools, which has been expressed by teachers, is that students need training in traditional literacy and numeracy skills. If schools are not providing this training, the students will never receive it. The use of computers, on the other hand, is something some teachers believe students can learn at home.

ICT can be used to improve the students' skills, but it requires that teachers have been trained to use ICT pedagogically in order to include the use of ICT in their planning of their lessons. Many teachers fear that the use of ICT takes time away from their required subject teaching. With insufficient relevant training use of ICT is extra time consuming and stresses many teachers.

## **1.3 Commercialisation**

One of the most serious risks related to the use of ICT in schools may be an increased commercialisation of education. This development can be looked at from several perspectives. It is obvious that there is a strong interest for companies producing both hardware and software to sell their products. It is also clear that, with the introduction of new technologies in education, a new market has been opened up. It cannot be excluded that one reason for the interest shown by many governments in introducing new technologies into education is related to successful lobbying by computer companies.

There is a further aspect to how ICT can be used to commercialise education. New technologies offer many possibilities for organising education in new ways. Distance learning and cyber universities are examples of this. These new ways of delivering education are not only easy to organise; once the necessary equipment is available, they are also easy

to run for profit. There are already many examples of distance education, which can be bought on-line. Private schools, distance learning institutes and open universities as a complement to regular education have existed for some time. The problem with the new technologies is that as new opportunities to sell education are created, in many cases clear rules to regulate these matters do not exist. One issue is the lack of quality control in relation to many new on-line educational offers.

#### **1.4 Good reasons to use ICT**

Still there are several good reasons for schools to start using ICT. One argument in favour of the use of ICT in education is that the use of computers is increasingly becoming an integral part of everyday life. Much of the practical application of knowledge today is linked to the use of ICT. In the same way that schools have the role of providing students with knowledge about other tools which can be used to communicate and obtain information, they are also responsible for helping students learn to use computers as a tool in a relevant, efficient and responsible way.

There is another important dimension to this. Even though access to computers and the Internet has increased rapidly in recent years, in many countries there are still large groups of families who do not have access to a computer. It is likely that this group will get smaller and smaller, but it cannot be ignored that in many societies there will always be groups of people who do not have a computer. Even in a society where almost everyone owns a computer, there will be differences between those who have access to the most modern computers and those who will still use models, which are not up-to-date with the latest developments in technology. In the same way that all people do not have the latest models of car, people will have different models of computers. Already today, computer literacy is a prerequisite for many jobs and those who have not had the opportunity to learn to use the most up-to-date computers and the newest programmes are disadvantaged. This may be even more evident in the future.

In this context schools may have an important role to play in bridging the digital divide between homes. If schools provide access to the most modern computers and the most up-to-date programmes, this will create better opportunities for children from disadvantaged homes to obtain the same skills and knowledge as those from more wealthy homes.

In addition to these arguments for using ICT in schools it can also be argued that ICT actually has the potential to improve education. This does not mean that all use of ICT will automatically improve the quality of education, but it does mean that ICT is a powerful

instrument with tremendous potential. This potential has been used to change, and in many cases also improve, work in many other sectors of society. Why should not ICT have the same impact in the sector of education?

Even without radical changes in teaching methods, ICT offers many possibilities for improving teaching in the classroom: it is easier for the teacher to produce material that is tailored to the needs of specific students; PowerPoint slides can be used to improve on traditional lectures; computer programmes containing drill-and-practice exercises can make what used to be ordinary paper and pencil exercises more exciting and demanding.

ICT offers opportunities to organise school work in new ways and to gain confidence in using technology as part of more innovative instruction. Such instruction may include interactive team teaching, interdisciplinary project-based instruction, individually paced instruction and other approaches. There are possibilities to experiment and change, using technology to support active, creative and collaborative learning. There are many possibilities for improving instruction in the classroom and education more generally, but new pedagogical models also need to be further researched and evaluated.

As can be concluded from the discussion above, there are good reasons for schools to provide an education in which computers and the use of ICT are an integrated part. The crucial issue is how this should be done. As is so often the case in the debate on how to improve education, it is of extreme importance to underline that this must be done in accordance with the needs and demands that teachers experience in schools. Teachers need to be in control of the process. ICT should not be something which teachers are forced to use in a prescribed way. Instead, teachers must be asked to show how computers and ICT can be used in a positive and constructive way in schools.

### **1.5 ICT has pedagogical implications**

One of the main problems related to discussions on ICT in education is that ICT has in far too many contexts been discussed from a technological perspective. It is of course correct to say that ICT is a technology, but the challenge for schools is not whether they use this technology or not but how they use it.

ICT does not solely provide a set of technological tools. It must also be linked to educational goals and objectives. All too often schools and different education authorities have focused exclusively on technology, but not on the questions of why and indeed how ICT should be used. Many governments have launched expensive programmes to introduce



ICT, but have forgotten to focus on how to use ICT in the classroom. There is a need to further develop ICT pedagogy. Schools must be aware, that good pedagogical use of ICT must be part of a whole school development strategy. ICT is only a pedagogical tool, not a goal in itself.

ICT in education has equal opportunities' implications. Equal opportunities issues need to be built into national, local and school policies on the use of ICT, taking into account the particular context of countries and schools, for example different ethnic groups.

ICT changes the nature of teachers' work, requiring different skills and competences such as facilitating independent work, critical review and analysis.

Lacking experience on how to use ICT pedagogically costs extra time in preparing ICT-integrated lessons. The important issue for teachers is to identify what they would like to do and how ICT can help. In order to do this it is important to look at both the risks and the opportunities that ICT may provide.

## **2. Risks and opportunities**

A discussion about the risks and opportunities resulting from the introduction of ICT in education is in many ways a discussion on the development of schools and the role of teachers. We could say, in other words, that this is a discussion about the future of schools and teachers, both of short-term changes and long-term trends.

All change gives rise to both risks and opportunities. It would seem logical to try to identify these risks and opportunities with a view to influencing future developments so as to minimise the risks and support developments towards positive opportunities. This analysis makes use of the findings from the ELFE study and other research. The number of schools that participated in the ELFE project was too small to infer general statements. However a number of important conclusions can be drawn from the data from the schools in the five countries included in the ELFE project.

### **2.1 Opportunities**

As mentioned in section 1.4 there are many strong arguments for using ICT in education. One of the reasons identified is that ICT can provide opportunities to improve education. In the following sections some of these opportunities are further explored.

### **2.1.1 More up-to-date information and content**

By accessing websites and using e-mails for quick communication, schools are able to obtain much more up-to-date information than school books could ever provide. When studying geography there is no need to refer to the data available in a textbook only. The very latest information can be found and used on the web. In the schools visited within the ELFE project it was obvious that many teachers refer their students to the World Wide Web as a source of information on the topics students are studying and/or encourage them to communicate by e-mail with experts outside the school. In such settings, ICT serves as a catalyst for finding and retrieving new materials and resources. The World Wide Web is used for searching for information and processing this as part of project work and other learning tasks.

### **2.1.2 More interesting school work**

Related to the opportunities to access more up-to-date material is also the opportunity for teachers to make school work more interesting. Those teachers involved in innovative work using ICT visited by the ELFE project had reported that their students were more motivated and enthusiastic about learning with ICT.

Generally, students do not seem to experience any problems in working with ICT. Students seem, in most cases, to enjoy working with computers. They see it as a tool for communication that makes working in groups easier. They also believe that they have the freedom but also the responsibility to plan their work when they work independently on learning tasks or projects.

Students also feel it to be important to learn to use ICT. It is interesting that students in a number of the ELFE schools believe that using ICT in school provides them with skills and experiences that are important for their future and for further education.

### **2.1.3 Supporting skills for looking for and finding information**

In a world in which more and more information is available and in which everyone has to take part in lifelong learning, skills related to how to look for and find information are becoming increasingly important. The data collected through the ELFE project shows that student competences such as learning to search for information, learning search strategies to find diverse types of relevant information and learning to assemble, organise and inte-

grate information are very much supported by the use of ICT. ICT seems to be used to a large extent to undertake activities where students look for information independently. It's important that the teacher train the students to be critical when they look for and select relevant information.

#### **2.1.4 Cross-curricular skills**

Traditionally learning and teaching in schools have been organised using timetables containing different subjects. The world outside schools has of course never been split up into subjects. As part of the increased emphasis on lifelong learning and skill-based learning it is increasingly appreciated that students learn to use knowledge from different domains and combine them in order to solve problems and meet new challenges.

Although there is much variation between schools and between teachers (and even within schools), one scenario for innovative instructional practices does emerge from the ELFE schools. The data shows that many schools that are considered to be exemplary work to encourage more cooperative and project-based learning. Many schools apply project-based learning (or give students learning tasks) in which students work independently in small groups or pairs, whilst the teacher takes on the role of facilitator. Such projects are often multidisciplinary, and students are 'challenged' to develop and/or apply new skills such as information handling, problem solving, collaboration, communication and presentation skills. In such learning environments ICT (in addition to traditional resource centres like libraries) provides students with access to a variety of resources.

#### **2.1.5 Independent work and independent learning**

If everyone in society is to participate in lifelong learning it will also become more important for each person to be able to organise their learning individually. Students are, according to the information from most of the schools, which participated in the ELFE project, becoming noticeably more independent learners who are able to collaborate and process information responsibly and critically. The data shows that many schools that are considered to be exemplary work to develop students' independence and responsibility for their own learning and to promote active learning strategies.

#### **2.1.6 Bespoke teaching according to each student's needs and resources**

One of the major challenges facing teachers has always been to find approaches that make it possible to provide each student with that kind of education he or she needs. This has often been referred to as the individualisation of teaching and learning. The data collected through the ELFE project shows that many schools that are considered to be exemplary work to individualize student learning experiences. It is clear that the use of ICT has increased enormously the opportunity for an individual approach to learning and teaching.

Schools report changes in grouping: from only (or mainly) whole class teaching to much smaller group and individual learning. Students work on projects in small groups or individually. A number of teachers and schools in the ELFE project are able to achieve more individualised instruction whilst applying a whole class approach. One example is a school in which teachers use ICT to individualise the development of language skills. Teachers in another school stated that there is no change in methods, but with ICT they have richer resources to draw upon.

Some schools have a policy of using educational software for students with learning difficulties. Using ICT for this purpose has been an explicit choice in schools with 'special education' students. One of the advantages of ICT-based education could be to provide students with special needs with exercises on the level which they need.

### **2.1.7 Teamwork**

Whatever young people do in the future it can be assumed that they will need to be able to work in teams. It can also be assumed that teachers will need to work much more in teams in order to be able to cope with new demands for more varied teaching and knowledge. ICT can be used to promote teamwork both among students and teachers.

The use of ICT has increased the possibilities of organising small group projects. All of the schools, which participated in the ELFE project reported changes in groupings. Students work on projects in small groups and in doing so they not only cooperate within the group, but also help each other and communicate with each other outside school hours. In other words, classrooms show much more variation as whole class lecturing and discussion is alternated with small group and individual work. Teachers involved in these changes mentioned that they experienced students developing new competences such as cooperative skills.

Students mention that ICT is the dominant tool for collaborative learning in projects. Students see ICT as a tool for communication that makes working in groups easier. Some-

times students 'teach' teachers and/or help their peers in aspects of ICT use. Some innovative teachers reported that they saw this student activity as a spin-off of the more open interaction with students when students work in projects and/or small groups whilst the teacher acts as a facilitator and moderator of the learning process.

The use of ICT may also have positive effects on teamwork among teachers. When schools opt for multidisciplinary projects, teachers of various subjects collaborate in supporting and coaching the project teams. Teachers from the schools, which participated in the ELFE project felt the collaboration with other teachers which came out of working with ICT as enriching.

Another aspect related to teamwork is the more open relationship between students and teachers, who often develop active communication (either via e-mail or the communication platform the school is using). This relationship is also shown in some schools where students assist or even train teachers in technical aspects of using ICT.

The use of ICT also opens up the opportunity to work with students and teachers in other schools. Many schools have implemented policies that enable teachers and students to use e-mail via the school. Some of these schools have organised projects in which ICT is specifically used for collaboration with other schools.

### **2.1.8 Student responsibility**

The ability to work and learn independently is to a large extent related to students' own responsibility. In order to be able to plan your own learning you also have to be able to take responsibility for your learning. Reports from the ELFE schools indicate that students learn to take more responsibility for their studies when they are involved in projects that involve the use of ICT. Students feel that they have the freedom, but also the responsibility to plan their work when they work independently on learning tasks or in projects. In many schools students reported that they were able to work independently on projects. Also, the teachers involved in these changes mentioned that the students' self-esteem had increased.

### **2.1.9 Preparing presentations**

Learning is not only done for individual benefit. It is also important to be able to communicate what you have found to others. Using ICT students are able to produce attractive

presentations. Even students who have problems with writing and drawing may succeed in preparing good presentations thanks to PowerPoint and other programmes. In doing this, the students also gain skills in using ICT for presentations, which are useful in many later situations in life.

### **2.1.10 Including an international dimension in teaching**

It can be assumed that students will increasingly have contacts with people from other countries, both in the world of work and in their private lives. Many schools have implemented policies enabling teachers and students to e-mail via the school. This provides opportunities to contact schools in other countries. Students in several ELFE schools mention that they use e-mail for communication with students in other countries. Many schools also participate in different programmes including contacts and exchanges with other schools.

## **2.2 Risks**

As seen in section 2.1 the use of ICT provides a number of opportunities for supporting students in obtaining important skills and knowledge, but there are also a number of risks. Below are some of the problems related to use of ICT in education are flagged up.

### **2.2.1 Surface instead of depth**

The use of ICT can help students to prepare very good presentations (see 2.1.8 above), but there is also a risk that the presentation itself becomes more important than the content. Students may be tempted to judge the quality of a presentation from the perspective of which computer programmes have been used and different special effects rather than from the content of the presentation. Students also tend to neglect resources other than those, which are ICT-based.

Concern was expressed by some teachers in the ELFE schools about superficial presentations. Some teachers did not see the advantages of using ICT, in some cases because they did not wish teaching to become less structured and less subject-oriented. Some teachers are also concerned about diminishing interest in traditional disciplines. This is partly related to an obvious risk that students will learn to find information and put it together into an attractive presentation, but will not reflect on the information they find. Sophisticated

presentation programmes place the focus on the surface. If students are not given the time and support to get beyond the surface there is a risk that they will never learn to go to the heart of an issue. One remark made by principals and teachers is that students must learn to evaluate the quality of websites they access.

The students themselves also expressed concerns about overly stereotyped ways of working. One student felt that in tasks involving the use of the computer, the working method was excessively rigid and there was too much standardization of tasks. She wanted to do things her way.

### **2.2.2 Copying**

Very much related to the above issue is the growing tendency to cut and paste. It is easy to copy information from web pages and it is obviously very tempting for students to do this if they believe that this is generally accepted. Many teachers and principals interviewed in the ELFE project expressed concern about copying from the Internet and/or from other students. One school abandoned 'traditional' homework reports from students, because they concluded that other students could easily copy assignments sent in via the web. Teachers need to be aware that this type of cheating will probably increase in many schools if it is not tackled. One way of getting around the problem is to focus more on project reports where the teacher follows the writing process.

### **2.2.3 Individualised work**

Although ICT does provide better opportunities to work in groups and promotes teamwork, as mentioned above, there is also a danger that in reality much work will become individualised. Students who work on their own without any support and input from the teacher may be easily distracted and may spend considerable time on visiting unwanted websites instead of working on their tasks.

Differences in ICT skills may frustrate collaboration when students do group work. This frustration may work in two directions: the less skilled students (often also students that have no computer at home) may feel that they cannot fully cope, whilst the better skilled students may become frustrated because they have to spend time on aspects that are 'trivial' for them. Some students may spend considerable time sitting alone in front of a computer trying to solve a task which could have more easily been solved in other ways or discussed with other students. Students in one of the ELFE schools, where small group

and independent learning was applied, indicated that cooperation was more about how to work and to a lesser extent on developing jointly the content part of a project or learning task. Basically the students decided how to split up the work and then each individual student did his/her part.

Teachers and principals in the ELFE schools advised that teachers should be aware that there are students who have problems with working independently. If these students are left on their own they will not learn to work independently, in fact they will not learn anything at all. It is important to recognise that some students need specific help and attention.

Even if it may be assumed that the use of ICT will help teachers to ensure that every student gets the support he or she may need this may not always be the case. It may be tempting to use ICT in other ways. Some students in the ELFE schools were rather critical about how teachers used ICT. One student said that the teaching is not as "rich" in the computer room as in the classroom – everyone looks at the computer, talks to each other and the teacher does not always have time to speak to students as they do in the classroom. Another student complained that some teachers assume students know what to do and they sit there and do nothing. The students concluded that students in general are not as able to work with ICT as the teachers think. The teacher needs to go around and actively help the students with ideas and advice on how they can work. Yet another student said students sometimes have the feeling that the computer gives the teacher the opportunity to give students work to keep them busy.

The examples shows that it is crucial that the teacher has time available to prepare ICT-based lessons, and important to consider how the teacher can support the individual students so they benefit from the use of ICT in education.

#### **2.2.4 Less focus on oral skills and students' own writing skills**

Many teachers interviewed as part of the ELFE project expressed fears that students may forget how to use other (non-ICT) learning resources. Students may not complete enough hands-on activities. They are given fewer opportunities to use oral skills and handwriting. Some students expressed the opinion that ICT gave them an opportunity to evade handwriting.

Generally the use of ICT puts more focus on written work than on the spoken word. Presentations are sent to the teacher and in many cases it is not certain to which extent the



students have written the texts themselves or just cut and pasted parts from different websites.

Also some students reported in interviews that they found it boring to use computers all the time. They preferred mixed working methods, where ICT is used as one of many options.

### **2.2.5 Increased workload for both teacher and student**

Another risk related to the introduction of ICT in schools concerns the workload of teachers. New working methods in classrooms can in general be assumed to lead to more work initially. This is probably also the case with working methods based on the use of ICT. In the ELFE schools it was reported that some teachers showed a lack of interest in exploring how to integrate ICT into teaching and learning. They feared that it would bring more work and that in the end it would not improve their teaching

Teachers who have worked actively with ICT often confirmed that they needed more time to find out how ICT could be used in a constructive way in the classroom. What they concluded often was that this investment in time paid off in the long run. The work in the classroom became more efficient and more rewarding. Support from the head teacher and relevant in-service training were factors that seemed to help teachers to transform the increased investment in time into good and feasible practice in the long run.

Another aspect of teachers' workloads is the increased demand for written communication with students and parents through e-mail in addition to more written assignments to students. In the same way as e-mail provides an opportunity for improved communication between teachers, students and parents it also demands that teachers increasingly have to write replies to requests from students and parents. Written replies are more official and to write something is not the same as to give a rapid oral response. Teachers spend time in front of the computer polishing wordings instead of giving direct oral replies during lessons and meetings with parents.

The use of ICT and the higher focus on the written dimension can also lead to increased workload for students. Students believed that they have the freedom but also the responsibility to plan their work when they work independently on learning tasks or projects. This is not always seen as easy. Some students find it difficult to organise themselves and experience problems when they have to work on projects and independent tasks using ICT.

If these students do not get appropriate support they may find themselves working more and more and yet becoming increasingly frustrated.

Students in one school expressed some concern about how the teacher could identify and evaluate individuals' own work when they work in groups. Unclear procedures related to the evaluation of students' work may create frustration both for teachers and students and add to the workload.

### **2.2.6 Negative side effect due to changes in the role of the teachers**

The use of ICT in education together with new project based working methods put higher emphasis on the role of teacher as facilitator and counsellor. If this reduces the teacher's role as a learning capacity it may undermine the teacher's authority both in relation to students and parents, and in relation to school authorities and society at large.

## **3 What to do?**

ICT offers schools both new opportunities and new problems. If it is agreed that the opportunities are great enough to outweigh the problems, an important question is how to solve existing problems and avoid future obstacles.

### **3.1 Changes to curriculum and assessment**

It is important for the teaching profession to enter into a professional debate on how ICT may affect the curriculum and assessment. A change in daily teaching with a sharper focus on the use of ICT must be reflected in both the curriculum and examination regulations. It is important that there is coherence between the various components of the curriculum and the teaching and learning process.

Increased use of ICT raises questions about new disciplinary challenges in schools. If students are expected to use computers they also need to be given the practical skills required to work efficiently with computers. Some schools give students an introduction to the computer system and the software used at the beginning of the school year. Some students in the ELFE schools reported that this is not sufficient, especially when teachers expect them to work with rather complex packages like Excel. They suggested that schools provide specific training throughout the year. Students also admitted that they are

not good typists and suggested that school should provide opportunities to develop keyboard skills.

The use of ICT makes it possible for schools to adopt a much more project-oriented and cross-curricular approach to learning. Such an approach is also often used as a good example of teaching adjusted to the needs of society and the labour market. Many national curricula still deal with learning and teaching from the perspective of discrete subjects. But if a country requires a project-oriented approach to part of the learning, this aspect must be included in the assessment system, too.

There is no hard evidence of the impact on students of intensive use of ICT in subjects and/or in projects and independent learning tasks. Nonetheless, in many schools students (and teachers and principals) reported on the impact on students:

- They acquire new competencies such as being able to work independently on projects, to search for information, collaborate and communicate, etc. One principal uses terms such as better research skills, better presentation skills and better writing skills.
- Students also show more confidence and have better learning motivation when they use ICT either to develop certain skills (e.g. language skills), work on projects or use ICT for individual subjects.
- In a number of schools, students and teachers also report better learning results.

In some countries these issues are well covered in the curriculum, while in other countries this may not be the case. When the use of ICT in schools expands it will be of increasing importance to discuss to what extent this should also be reflected in the curriculum.

The ELFE study shows, that students benefit from the use of ICT in education as they acquire the new competences and that this training does not take time away from the traditional subject training. But to be successful in training these competences, teachers must plan project-oriented work and use a cross-curricular approach based on solid pedagogical considerations, it not enough just to use ICT.

ICT is used in more and more schools as a daily tool. At the same time examinations are usually of the traditional paper-and-pen type. If the students are used to working with computers, they should be allowed to do the same during at least some of their examinations. Examinations must reflect the teaching that takes place over the school year.

An increasing amount of work in schools also seems to take place through different types of group work. The use of ICT contributes to this. Students in one school in the ELFE pro-

ject expressed some concern about the evaluation of their work when they work in groups. How can teachers assess the work of the individual when large parts of this work take place in a group? There is a need to review assessment practice in many countries from this perspective. If schools seriously want students to work in groups this also has to be recognised in student assessment.

### **3.2 Investment in hardware**

In order to develop ICT pedagogy there is a need for investment in computers, networks, printers, etc. Innovative use of ICT is only possible where a certain amount of computers are available.

In most of the ELFE schools the student/computer ratio is below 6, which means that a relatively high number of computers are available in these schools for use by students. Most of the schools seemed to have access to laser printers, CD-ROM drives, devices for digital image or video processing, colour printers, CD/DVD writers, video projectors and scanners. Graphic tablets and LCD –panels were often lacking, whilst a number of schools do not have devices for disabled students (presumably because they do not need these).

As could be expected, hardware provision in the sample schools is, generally speaking, good. And yet many of these schools would like to have more computers and update the technical quality of their hardware. In most schools insufficient computers was mentioned as a problem, although only very few schools saw it as a major problem. A number of schools feel that their hardware infrastructure is outdated – this is a common problem for schools which were forerunners and do not have a sufficient budget to keep up with the rapid technological developments. Some students mention that more computers are needed, as now they have to share with fellow students or even wait. In some schools students complained about the ‘slowness’ of the computers and the system. Only very few comments were made about computers not working, which can be seen as an indicator that in general the infrastructure is well maintained.

One important conclusion from the ELFE schools may be that schools need to be fairly well equipped with computers and peripherals in order to find innovative ways of using ICT in education. This is supported by the results from a much bigger study, the SITES study (Pelgrum & Anderson, 2001). The results from this study indicate that the factor of greatest importance in stimulating innovative teaching methods is to lower the student:computer ratio. In order to use the potential of ICT in schools it is necessary to make investments in hardware.

One of the best investments that can be done seems to be in computers to the teachers. It makes a huge difference in teachers' readiness to include ICT in education if they themselves have easy access to their own computer. The Evaluation report from the Pedagogical ICT-Driver Licence in-service training in Denmark shows, that the effect of the pedagogical ICT-training in the daily teaching afterwards is much larger if the teacher has access to his/her own computer. (An English resume of the evaluation can be seen on [http://www.epict.org/organisational\\_setup/evaluation/index.html](http://www.epict.org/organisational_setup/evaluation/index.html)).

A safe working environment must also be ensured. It is of special importance to avoid risks from radiation or incorrect ergonomics. Government regulations and negotiated solutions should be sought to ensure this goal of protecting staff. It should also be recognised that schools have a responsibility towards their students and teachers to provide good computer work stations to show how such work should be organised in a safe and healthy way and to protect users from injuries which can occur as a result of poor ergonomics.

### **3.3 Investment in digital learning resources**

It is not enough only to have hardware; it is also necessary to have appropriate software – relevant digital learning resources. The ELFE schools have access to both the Internet and the World Wide Web and a variety of software for education purposes. The ELFE schools have a good variety of software to be used for teaching and learning. A few schools mention not having enough software for educational purposes.

The availability of software is greatest for mathematics, sciences, languages (both mother tongue and foreign), and computer education. The general conclusion is that the ELFE schools do have a good variety of software to be used for teaching and learning at their disposal. Nonetheless, the students in some schools mentioned that more educational software is needed. Some ICT coordinators also mentioned that insufficient copies of software is a major problem. Obviously a lot of software is available in the ELFE schools, but there may still be a problem in some schools in terms of providing sufficient numbers of programmes to meet needs.

Teachers in some of the schools also raised questions concerning the quality of some of the available software. With respect to availability of educational software, some principals mentioned the lack of variety of software as a major problem. Another problem mentioned was that of the 'curriculum incompatibility' of some software: much of the available software does not fit the curriculum the schools are teaching.

In general the ELFE schools seemed to be well equipped with software, but the experiences from the schools do raise some urgent questions. The issues raised related to the quality and the 'curriculum compatibility' of programmes, underlining the need to invest in the pedagogical development of software. As software becomes increasingly important as a tool in schools it will become equally necessary to examine how educational software replaces textbooks. There is a need for more educational research on software and how it can be used. There is also an increasing need for teachers to actively evaluate software and to find ways of communicating their findings to colleagues.

### **3.4 Investment in school buildings**

In almost all of the ELFE schools, all computers are placed on a local area network with access to both the internet and the World Wide Web. Most of the computers are multimedia computers, allowing for the use of advanced software. An important observation is that there is quite a variation in the numbers of computers placed in special computer rooms or labs. In most schools, computers are located in classrooms (although a number of schools do not have this as their policy), but also in special rooms and places where students can work in small groups or individually, depending on the purpose of the ICT use. Some principals mentioned that they find it difficult to locate computers appropriately. The point for them was that for project-based learning and small group work small rooms and cubicles are preferable, where students can work on computers and discuss their projects.

If the use of ICT in education shall be used effectively in the learning process the school buildings must facilitate both the use of ICT in the individual classrooms and access to computers during group and project work outside the classroom.

### **3.5 Investment in maintenance and support**

Computers, which are widely used in the classroom, can allow the teacher to organise education in new ways, but they also make the whole education process more vulnerable. When computers do not function and programmes do not work properly, the teacher needs to know what to do or where to get support. If teachers themselves do not have

the skills to solve such problems and if there is no support available in schools, this creates computer stress.

The general impression from the visits of the ELFE team is that the schools see technical support as an important factor influencing the success of integrating ICT into teaching and learning. Those schools that are 'under-supported' will experience problems in getting ICT fully integrated into all teaching and learning activities.

The importance of maintenance of computers and school networks is often underestimated. A dangerous scenario is when schools have spent a lot of money on buying new computers and new software, but do not have any money left to maintain their computers.

An important aspect of integrating ICT into daily teaching and learning activities is that schools do need a new type of support staff in (or available for) the school. Resources have to be made available for continuous support of ICT systems. Schools all too often need to improvise in these areas. New posts need to be created for ICT coordinators, network technicians etc.

All of the ELFE schools do have at their disposal some sort of technical assistance to support the school, teachers and students in using ICT. The data show great discrepancies in how this support is available to the schools: apart from technicians within the school other models are found, such as technical support made available by local authorities or through a contract with an external company. Some schools have arranged their technical support internally in a more informal way by having one (or several) teachers acting as ICT experts for their colleagues. Several of the ELFE schools have reduced the workload of specific teachers to allow them to support their colleagues in using ICT in their classes.

In order to allow teachers to play a professional role it is important that sufficient support mechanisms are in place. Support is needed in terms of maintenance of hardware and other resources. The maintenance and operation of school-level networks is a specific task comprising a complex and time-consuming series of duties and requiring special skills and qualifications. Either teachers are given the training needed to acquire this expertise and the time needed to support their colleagues in this respect or schools must make sure that computer experts are hired to take care of support functions. For technical support, including electronic networking, schools ideally need the assistance of a help desk, ICT systems manager or ICT specialist.

Pedagogical support is another important success factor. It is of great importance that schools not only arrange for technical support, but also provide teachers with pedagogical (or didactic) support. The persons providing pedagogical ICT support must have an educational background, while those providing technical support do not need to be teachers.

### **3.6 Investment in people**

Teachers are the key actors in effecting change in schools and classrooms. Developing new ways of teaching is not only a matter of hardware and software. It is also necessary to ensure that people are given the skills and knowledge to use them.

More teachers become designer of web-based learning material – a role few of them have been trained for. Both preservice- and inservice training new to include this aspect of the teachers work.

The high expectations and demands attached to all educational activity in the ICT context must be accompanied by correspondingly generous investment in the development of teachers' and head teachers' skills and professionalism. Heavy investment in the development of teachers' professionalism in the use of ICT will pay dividends and will make all the difference to pedagogical development in all educational activity. Governments must provide the funds necessary to organise training and education for teachers. Initial teacher training for all teachers should include compulsory ICT training to an adequate level of competency and skill both in technical and pedagogical use of ICT.

Teachers need training to teach their students to master life-long learning skills, such as problem solving, information handling, collaboration and communication skills – and skills to judge the quality of information that students find on the web.

All teachers should have the right to a minimum level of continuous professional development on pedagogical ICT skills in the course of their careers. How this time is determined must be decided in negotiations between educational authorities and representatives of teachers' organisations.

Almost all of the schools from which data are available in the ELFE project do have staff development policies and provide facilities for their teachers (sometimes regionally and/or locally coordinated). Countries differ to the extent that some have a national policy on staff development for ICT in education.



In many of the ELFE schools, a distinction is made between basic ICT courses and staff development focusing on pedagogical use of ICT. An example of such basic ICT courses is the ECDL (European Computer Driving Licence). Training for pedagogical use of ICT is very much linked to the type of ICT use that schools are pursuing. A number of innovative teachers refer to specific pedagogical skills when they point to the importance of being able to motivate students, encourage them to cooperate and assist them in developing new competencies.

It is worth mentioning that several of the ELFE schools specifically mentioned the importance of support from the school principal and/or management. Principals and management teams have been very supportive in introducing intensive use of ICT in instructional processes. This finding underlines what is known from the research literature, viz. that managerial and administrative support is one of the necessary conditions for implementing a change in schools.

It is important for school management to develop a policy on the use of ICT in the school, to find the necessary resources and to create opportunities for more advanced teachers at the same time as giving support to teachers with extra needs in order to use ICT in their classes. This should be done based on the idea that not all need to teach in the same way, but there may be some minimum requirements. It is interesting to see that many schools have developed, or are developing, a common vision on the use of ICT.

In order to allow teachers to develop their professional skills in the use of ICT there is also a need to see that they are given sufficient time for course evaluation, student assessment, networking, development and administration related to their work and ICT use. It should be noted however, that the use of ICT has a potential to reduce the amount of time spent on administration.

Another important factor influencing the introduction and implementation of all innovations is that teachers do not operate in isolation, rather they work in teams (within the school or with colleagues from other schools) that provide a 'home' and interaction base for discussing strategies and problems to be solved. From the interviews in the ELFE schools the picture emerges that the 'innovative' teachers in all schools, i.e. those teachers who are actively working on getting ICT integrated into their school's instructional practices, are working closely together in collaborative teams. Those teams are not always formed on the basis of a joint interest in using ICT, but may emerge from the intended pedagogical innovation, e.g. when schools introduce project-based learning supported by ICT, or they are formed by the school leadership as a general way of organising the peda-

gological work in schools. Quite a number of ELFE schools also mentioned that they are interested in partnerships with other schools.

In conclusion, factors common to all of the sample schools are that they have

- a clear vision of what they want to accomplish when they implement ICT-supported teaching and learning,
- a principal or school leadership that is supportive and monitors the processes of change,
- introduced ICT as part of the school's culture (although not yet fully in all schools),
- a policy on staff development (although not yet fully realised in all schools).

These findings clearly indicate that teachers must have real opportunities to influence a number of decisions concerning the use of ICT in schools. The type of computers and software chosen for a particular study programme should be decided after discussions at local level. There must be a democratic process in schools. Work programmes need to be established through discussions in schools. Bottom-up processes, and not only top-down processes, are needed.

National, regional and local initiatives must be discussed with teachers' organisations. The need for and development of new technologies should always be included in deliberations concerning education planning, both at a general level and in greater detail for individual subjects or fields of study and training.

It is important for the teaching profession to conduct a professional debate on how to find time for training in the new skills involved in the use of ICT so as to ensure it supports the traditional subject goals instead of taking time away from subject learning.

#### **4 Special problems which need to be addressed**

In addition to the major issues mentioned in section 3 there are also a number of specific matters which need to be raised. These are dealt with below.

##### **4.1 Copyright issues**

The aim of ICT is to distribute information. This also includes opening schools up to more information from different sources. In most countries the copyright issues related to use by teachers of material from web pages and teachers' own material published on web pages are not fully regulated. In some cases material may be available on the web, but it

is not clear whether schools have to pay for it or not. The worst scenario are cases in which teachers find out after using materials that they are obliged to pay. Other scenarios may be that teachers publish their work for free on the web, but find that others have used their material for commercial purposes. It is important to bring more clarity into these issues. Schools and appropriate school authorities must enter into general agreements with providers of programmes and web pages so as to regulate these issues. The guiding principles must be that teachers are free to use as much electronically available educational material as possible and that the rights of teachers who produce electronically available material are protected so that this material is not used in contexts other than those intended.

#### **4.2 Ethical questions**

It is important for schools to address the issue of norms and values when using the internet/WWW. By accessing the internet/WWW students may come across all kinds of web pages, including pages with sexist or racist content. In order to make clear what students, and teachers, may do and not do with the school's computers some general rules and guidelines must exist on computer use. Such rules may be a commitment from students, teachers and others using the school computers not to access certain types of WebPages. They may also contain rules about how to send e-mail and what is sometimes referred to as "netiquette".

#### **4.3 Availability of teachers**

New forms of communication such as e-mail and websites create many possibilities to improve contacts between teachers and their students as well as contact with parents. These means of communication create a kind of accessibility, which did not previously exist. In many cases this may make the work of teachers easier, but there is also a need to be prudent. More availability can create stress and can increase demands placed on teachers to be on-line all the time.

It is important to discuss and to develop guidelines concerning the availability of teachers on the net. Clear provisions must be made as to when teachers are expected to work, including times at which teachers are expected to be available (on the net, on the phone etc.) response times and time set aside for preparing lessons.

Some of these problems must be solved in general working condition agreements, but it's equally important that each school discuss requirements and expectations regarding the electronic communication. The students at the schools must know what they reasonably can expect and what they cannot expect, regarding availability, deadlines, responses individually or in plenum etc. There must be a limit on the amount of time teachers should be contactable outside school hours, in order to protect teachers from excessive workload.

#### **4.4 Access to hardware and software at work and at home**

The issues outlined above (4.3) also raise questions about where teachers are expected to work. If teachers are expected to prepare lessons that integrate the use of ICT, to use ICT in their communication with students and parents as well as in their follow-up of lessons they need to have access to appropriate hardware and software. A minimum requirement is that schools should have workstations available for teachers with up-to-date computers and access to all programmes needed. If teachers are to be able to communicate with parents outside the hours they are expected to be in school and are to be given the opportunity to use computer-aided preparation and follow-up of lessons there is a need for teachers to have access to computers and relevant programmes in their homes. Teacher access to personal computers makes a huge difference and promotes the use of ICT in teaching (see section 3.2). A computer has become a 'tool of the trade' for teachers as it is now needed for all aspects of their work.

Related to this is also the extent to which teachers are allowed to use computers owned by the school for private purposes. In order to avoid ambiguity it may be important to establish clear rules and guidelines.

#### **4.5 Security issues**

As the number of computers increases in schools and as schools gain access to the internet and e-mail the risk of viruses on networks and hackers in systems grows. It is important to determine to what extent schools have sensitive data available on the net. If schools have such information available measures must be taken to protect it. Schools must have insurance against theft also for teachers using school-owned computers at home.

Schools must develop rules and guidelines concerning computer security. Such rules must be discussed among teachers and with students' representatives and made available to all users of the school's machines.

#### **4.6 National standards and school autonomy**

As shown in section 3.5, head teachers play an important role in supporting innovative work related to ICT. It can be concluded that head teachers must be given a certain degree of freedom to act to be able to play this supportive role. In schools where it was possible to take local decisions about what in-service training should be offered to teachers it seemed to be easier to tailor this training. This indicates the advantages of a degree of autonomy for schools.

At the same time, although it can be seen that a certain degree of autonomy can give schools more opportunities to find innovative ways of organising learning and teaching, it may also be necessary to identify the need for national standards in education to guarantee that all students receive an education of equal quality.

A balance must be struck between school autonomy and local need on the one hand and the need for a national standard on the other. Local autonomy might in this respect increase the options available to schools for finding the required resources and differentiating between teachers so each teacher does what he/she does best.

### **5 Policy actions at different levels**

Based on the findings from the ELFE project and the discussion above a number of policy actions could be recommended to teacher organisations themselves, national governments and the European Union.

#### **5.1 What the unions can do through their ICT in education policy**

Teachers' unions have a key interest in promoting the right conditions for quality in the education system. The use of ICT has become an important part of education today. A fundamental task of teachers' organisations is to defend the interests of education personnel with respect to working conditions, career opportunities and intellectual property rights and to develop codes of good practice on these and related issues. In order to do

that there is a need for teachers' organisations to undertake action so that public authorities can take advantage of ICT to guarantee the fair distribution of information and knowledge.

Teachers' organisations should in their negotiations of teachers' salary and working conditions with the employer include teacher education, in-service training and professional development with respect to the use of ICT and the introduction of ICT, especially with regard to health and safety aspects.

Teachers' organisations must support and encourage discussion among their members on how ICT can be used and how teachers would like to use ICT in order to improve access to education at all levels and the quality of education.

## **5.2 Recommendations from teachers' unions to school owners and national or regional governments**

Through their contacts with governments, through negotiations and/or consultation, teachers' organisations must make sure that:

1. ICT is not a replacement for teachers. Indeed, increased use of ICT should be used as a lever for investment as it requires highly skilled teachers who use their professional skills and knowledge to determine the most effective pedagogical use of ICT for their students.
2. All teachers are given opportunities through education, in-service training, professional development and other means to master ICT technically and pedagogically and to assess different applications in all forms of education. Teachers must also be capable of critically evaluating new technical working aids.
3. Teacher education, in-service training and professional development should be publicly funded.
4. All teachers working within teacher education must be given adequate ICT education so pedagogical use of ICT can be part of the pre-service education for teachers.
5. It is recognised that school management teams have a special duty to create in schools an atmosphere encouraging the use of new technologies in a dialogue with the teachers.
6. Certain teachers should be appointed with special responsibility for the introduction and development of ICT in their schools. These teachers should have the task of helping, supporting and inspiring other teachers to attain greater active preparedness in the IT sector. In an area with small schools such teachers can be responsible for supporting several schools.

7. All teachers must have personal access to ICT, both at school and at home, in order to be able to use ICT in all aspects of their work.
8. The type of hardware and software to be introduced for a particular study programme should be decided after discussions at school level.
9. The choice of hardware and software should be continuously evaluated and renewed under the leadership of serving teachers, in the same way as is at present expected with regard to traditional teaching materials of different kinds ;
10. The development of learning materials and new techniques for different types of school must always be based on educational values.
11. Software must be available in the mother tongue of the students. Teacher involvement in software development is essential, so software reflects professional teachers' pedagogical preferences.
12. National authorities must create the prerequisites for building up school data networks and facilitate the development of effective tools for serving teachers.
13. The development of new (ICT-based) learning environment should be supported by educational research (so called 'development research') with a view to exploring and analysing the different pedagogical ways of using ICT. Teachers must be actively participating in this research so as to assure that the findings have relevance for educational practice.
14. Particular attention must be given to the 'digital divide', in order that all pupils enjoy equality of opportunity to use ICT to their full potential.

### **5.3 ETUCE recommendations to the European Union**

ETUCE defends the interests of education personnel with respect to working conditions at a European level. This is done through regular consultations with appropriate bodies, directorates and agencies within the European Union.

ETUCE also undertakes action that will help the European Union to take advantage of ICT to guarantee the fair distribution of information and knowledge and meet with the challenges it poses for "quality public education for all" in the Third Millennium. At European level ETUCE ensures that the European Union takes all the necessary initiatives to support member countries in their efforts to provide all teachers and education personnel with adequate training in the use of ICT as promised in the Presidency conclusions from the Lisbon European Council ("*...that all the teachers are skilled in the use of the Internet and multimedia resources by the end of 2002,*" Lisbon European Council: Presidency Conclusions, Paragraph 11). It is also important for the European Union to support member countries in providing access to the internet for all schools. This was also stated in the

Presidency conclusions from the Lisbon European Council ("*...to ensure that all schools in the Union have access to the Internet and multimedia resources by the end of 2001,*" Lisbon European Council: Presidency Conclusions, Paragraph 11).

One way to support the development of teacher use of ICT is to give teachers opportunities to visit schools in other countries and to learn from the experiences of other schools. The European Union could in different ways support information interchange between schools, exchanges of teachers and pupils and the establishment of partnerships and networks between schools in different countries. This could be done through programmes for teacher exchanges and through support for projects including teacher exchanges and school twinning. Teacher organisations could be invited to play a role in such exchange programmes. Within the framework of such exchange programmes joint development projects could be drafted.

As the ELFE project has shown a lot of further research is required in relation to ICT and education. The European Union ought to take initiatives to support projects aimed at deepening our knowledge as to how ICT can be used in education. Such research may include the pedagogical use of ICT and the learning impact of the use of ICT in education. We have seen that the use of ICT in education can train new competences not at the cost of traditional subject training. But the ambition must be to learn to use ICT so students both master new competences and become better learners in all traditional subjects. Other research tasks could be to collect information and good examples ("best practices") and make them available to teachers and schools in Europe.

## **6 Summary**

The use of ICT may create opportunities for more widespread and diversified access to knowledge, but will pose at the same time major challenges for education personnel and their organisations. ICT must be a means for improving education by facilitating access to information and democracy. Teachers and their organisations have to take these challenges into consideration and define appropriate strategies so that ICT becomes an instrument of democratisation providing access to "quality public education for all". Teachers must retain their key role in the learning process. New methods for teaching and learning will require more teachers with higher skills than ever before.

The use of ICT in education creates the opportunity to better organise teaching and learning in schools in many ways:

- it offers opportunities to use more up-to-date information in schools;



- it provides an opportunity to make school work in general more interesting for students;
- it makes it possible to support the skills of looking for and finding information;
- it makes it possible to support the development of cross-curricular skills among students;
- it provides opportunities to support independent work and independent learning among students;
- it makes it possible to differentiate teaching according to each student's need and the resources available;
- it provides opportunities to organise teamwork both among students and teachers;
- it makes it possible to give students more responsibility for their own learning;
- it provides opportunities for students to learn how to prepare presentations;
- it makes it easier to include an international dimension in teaching.

The use of ICT in education also includes a number of risks:

- teaching and learning may focus more on surface issues instead of depth;
- it is easy for students to cheat through copying from web pages and from each other;
- a substantial part of work with ICT may be individualised work where students are left alone in front of a computer screen without any guidance or support;
- the focus may be on compiling attractive presentations using different web pages and less on oral skills and students' own writing and analysis skills;
- the workload of both teachers and students may increase without necessarily leading to more or better learning.

However, when comparing the opportunities and risks it can be agreed that the former outweigh the latter. In order to take advantage of these opportunities a number of initiatives must be taken:

- Changes to the curriculum and evaluations are needed to better harness the opportunities offered by more ICT-oriented working methods and to meet the demands posed by new ways of working.
- There is a need to invest in hardware. Schools have to be well equipped in respect of the number of computers and peripherals in order to find innovative ways of using ICT in education. This should be done in such a way that a safe working environment is ensured.
- The physical environment at the schools need to adapted to facilitate the use of ICT both in the individual classrooms and in study areas outside the classrooms where groups of students can use computers during group- and project work.
- It is necessary for schools to have appropriate software which is of good quality and to enjoy 'curriculum compatibility' There is a need for more educational research into

software and how it can be used. There is also an increasing need for teachers to actively evaluate software and to find ways of communicating their findings to colleagues.

- There must be adequate maintenance and support of computers and networks. Schools need support staff for continuous support of ICT systems. There is a need for regular posts for ICT coordinators, network technicians etc. It is of great importance that schools not only arrange for technical support, but also provide teachers with pedagogical (or didactical) support.
- Teachers are the key actors in bringing about change in schools and classrooms. They must be given appropriate education, in-service training and professional development to work with ICT both from a technical and pedagogical perspective. Teachers must also have real opportunities to influence a number of decisions concerning the use of ICT in schools.

In addition to these issues a number of other matters need to be further looked into:

- Copyright issues: schools and appropriate school authorities must enter into general agreements with providers of programmes and web pages to regulate copyright. The guiding principles of such agreements must be that teachers are able to use as much electronically available educational material as possible and that the rights of teachers who produce electronically available material are protected so that this material is not used in contexts other than those intended.
- Ethical questions: schools must address the issue of norms and values when using the internet/WWW. In order to make clear what students, and teachers, may do and not do with the schools computers some general rules and guidelines on computer use are needed.
- Availability of teachers: it is important to discuss and to develop guidelines concerning the availability of teachers on the Internet.
- Access to hardware and software at work and at home: if teachers are expected to use ICT they need to have access to appropriate hardware and software in their schools. If teachers are expected to be able to work with computers outside regulated working hours they also need access to computers and relevant programmes in their homes. Computers to teachers have proven to be a very profitable investment, which makes a huge difference in daily teaching.
- Security issues: increased risk for schools of viruses and hackers getting in to systems. It is important that schools develop rules and guidelines concerning computer security.
- National standards and school autonomy: it can be noticed that a certain degree of autonomy gives schools more opportunities to find innovative ways to organise learning and teaching, but it is also necessary to note that there is a need for national standards in education to guarantee that all students get an education of equal quality.

Based on the findings from the ELFE project and the discussions in this document a number of policy actions could be recommended to teachers' organisations themselves, national governments and the European Union.

*What unions can do* through their ICT in education policy.

- The fundamental task of teachers' organisations is to defend the interests of education personnel with respect to working conditions.
- Teachers' organisations should reach agreements with the employer concerning teacher education, in-service training and professional development in the use of ICT and the introduction of ICT, including its health and safety aspects.
- Teachers' organisations must support and encourage discussion among their members on how ICT can be used and how teachers would like to use ICT in order to improve access to education at all levels and the quality of education.

*Recommendations from teachers' unions to school owners* and national or regional governments:

- All teachers must be given opportunities to master ICT through education, in-service training, professional development and other means.
- To support the use of ICT in education all schools must have both adequate technical and pedagogical ICT support.
- National- and local authorities as well as the school principals should be required to create an atmosphere encouraging the use of new technology in a dialogue with the teachers. Any requirement to use ICT must leave room for local variations with room for frontrunner teachers and support to teacher's with need for help in their use of ICT in their teaching.
- There is a need for certain teachers to be appointed with the special responsibility for the introduction and development of ICT in their schools.
- All teachers must have personal access to ICT.
- The development of software must be based on educational values.
- Research in education must be developed and supported with the purpose of exploring and analyzing the different ways of using ICT in education.

*ETUCE recommendations to the European Union:*

- The European Union must take all the necessary initiatives to support member countries in their efforts to provide all teachers and education personnel with *adequate training* in the use of ICT as promised in the Presidency conclusions from the Lisbon European Council.

- The European Union must support member countries in their efforts to *provide access to the internet for all schools*. This was also stated in the Presidency conclusions from the Lisbon European Council.
- The European Union can in different ways *support information interchange between schools, exchanges of teachers and pupils and the build-up of partnerships and networks between schools in different countries*.
- The European Union ought to take initiatives to support *research projects* aiming at deepening our knowledge about how ICT can be used in education.

### Acronyms

ECDL	The European Computer Driving Licence (ECDL) is a (modular) course in which a large number of end-user ICT skills are taught. The ECDL is widespread in Europe (and beyond) and is governed by the European Computer Driving Licence Foundation, which is responsible for monitoring cross-nationally that all programmes result in the ECDL certificate (see <a href="http://www.ecdl.com">http://www.ecdl.com</a> )
EI	Education International
ELFE	The European e-Learning Forum for Education
ETUCE	European Trade Union Committee for Education
FNE	Federação Nacional dos Sindicatos da Educação (National Federation of Education Unions, Portugal)
GEW	Gewerkschaft Erziehung und Wissenschaft (union of workers in the education and research sectors, Germany)
GL	Gymnasieskolernes Laererforening (union of teachers in upper secondary education, Denmark)
ICT	Information Communication Technology
NUT	National Union of Teachers, England and Wales
WWW	World Wide Web

## Further reading

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