LEARNING, INNOVATION and ICT

Lessons learned by the ICT cluster

Education & Training 2010 programme

This Report presents the outcomes of the ICT cluster that the Commission has set up under the Education and Training 2010 programme as part of the Lisbon objectives set for 2010. This is an independent report. The views expressed herein are those of the independent experts which do not necessarily reflect the official position of the European Commission.

Table of contents

Introduction

New technologies and digital media have made significant progress and generated impact and improvement on the conditions for learning in education, training and Lifelong Learning (LLL). Information and Communications Technology (ICT) is more widespread than ever before. All EU Member States have developed programmes and specific actions for the integration of ICT in education and training.

In most EU Member States, a first intensive effort on infrastructure, equipment and teacher training has evolved into a more mature and also more pervasive use of ICT for learning. All European countries have had to address similar challenges[1] in similar ways and

> *"We used to look in wonder at the areas in which ICT were used to boost productivity. Today we wonder how the economy, technology and society could have done without ICT".*

with similar degrees of urgency. The current global economic crisis is simultaneously affecting the education sector as well as other sectors in society across Europe. Knowledge, innovation and technology remain key elements in the future strategies.

The Cluster on ICT for learning (launched in 2005) is one of eight clusters[2] [3], organised by the European Commission, DG Education and Culture, under the framework of the Education & Training (E&T) 2010 work programme[4], and its follow-up, the Updated Strategic Framework for European Cooperation in Education and Training adopted by the Council in May 2009[5].

EU education and training policy has been given added impetus since the adoption of the Lisbon Strategy in 2000. ICT for learning has, since the start, formed an integral part of the E&T 2010 Programme. The increased use of new technologies in work, leisure and daily life has raised the importance of Member States learning from each other. The importance of ICT for teaching and learning has been reinforced in the follow-up of the E&T 2010 Programme both in terms of digital competences as an essential life and career competence, as well as the enabling role of ICT for creativity and innovation.

> *"ICT for learning has, since the start, formed an integral part of the E&T 2010 Programme".*

The work of the Cluster on ICT – as is the case of all the other clusters – contributes, on the one hand, to the initiation of the policy development process at *European* level (reflection and ideas) and, on the other hand, to supporting *national* policy development and implementation of agreed European objectives and principles through mutual learning and exchange of good practice.

The cluster has built on the extensive work of the ICT working group C: Integration of ICT in education and training, which was launched in 2001. The Cluster on ICT started its work in 2005 with 18 participating countries: Austria, Bulgaria, Cyprus, Germany, Estonia, Greece, Finland, France, Hungary, Luxembourg, Malta, Poland, Slovenia, Slovakia, United Kingdom (Northern Ireland), Iceland, Norway, and Turkey (see Appendix A for more details). The European Training Foundation, Cedefop, the Institute for Prospective Technological Studies (IPTS), the Centre for Research on Lifelong Learning (CRELL) and the Executive Agency of DG EAC have also participated regularly in the meetings.

The following paper brings the most significant findings and lessons learned from the Cluster on ICT together in a single report. The report is intended to further disseminate the main conclusions from the ICT cluster discussions. The lessons learned stem from in-depth discussions among the ICT cluster members, feedback from national experts, from evidence of reviews, projects and studies, and from

---

[1] Equipping schools, training teachers, facilitating digital content production curriculum development, maintenance of IT infrastructure, opening up class rooms, recognizing possibilities for non- and informal learning, etc.

[2] The word 'cluster' is used to mean the regrouping of interested countries around a specific theme, corresponding to their national policy priorities, and on which they have expressed a desire to learn from other interested countries, or to share with others their successful or unsuccessful experiences.

[3] The 8 clusters are: (1) Modernisation of higher education; (2) Teachers and trainers; (3) Making best use of resources; (4) Maths, science and technology; (5) Access and social inclusion; (6) Key competences; (7) ICT; and (8) Recognition of learning outcomes. For more details see the website: www.kslk.org

[4] ec.europa.eu/education/lifelong-learning-policy/doc28_en.htm

[5] ec.europa.eu/education/lifelong-learning-policy/doc1120_en.htm

reflections on the school visits during the Peer Learning Activities (PLAs)[6]. Seven PLAs have been undertaken by the participating countries since 2005.

This final report on "Key Lessons Learned by the ICT cluster" emphasises four main themes and two crosscutting topics, which were discussed in the various ICT cluster meetings and the Peer Learning activities. Each theme will be presented in a similar format: *(i) Bottlenecks and challenges; (ii) Scope, and (iii) Key lessons learned.*
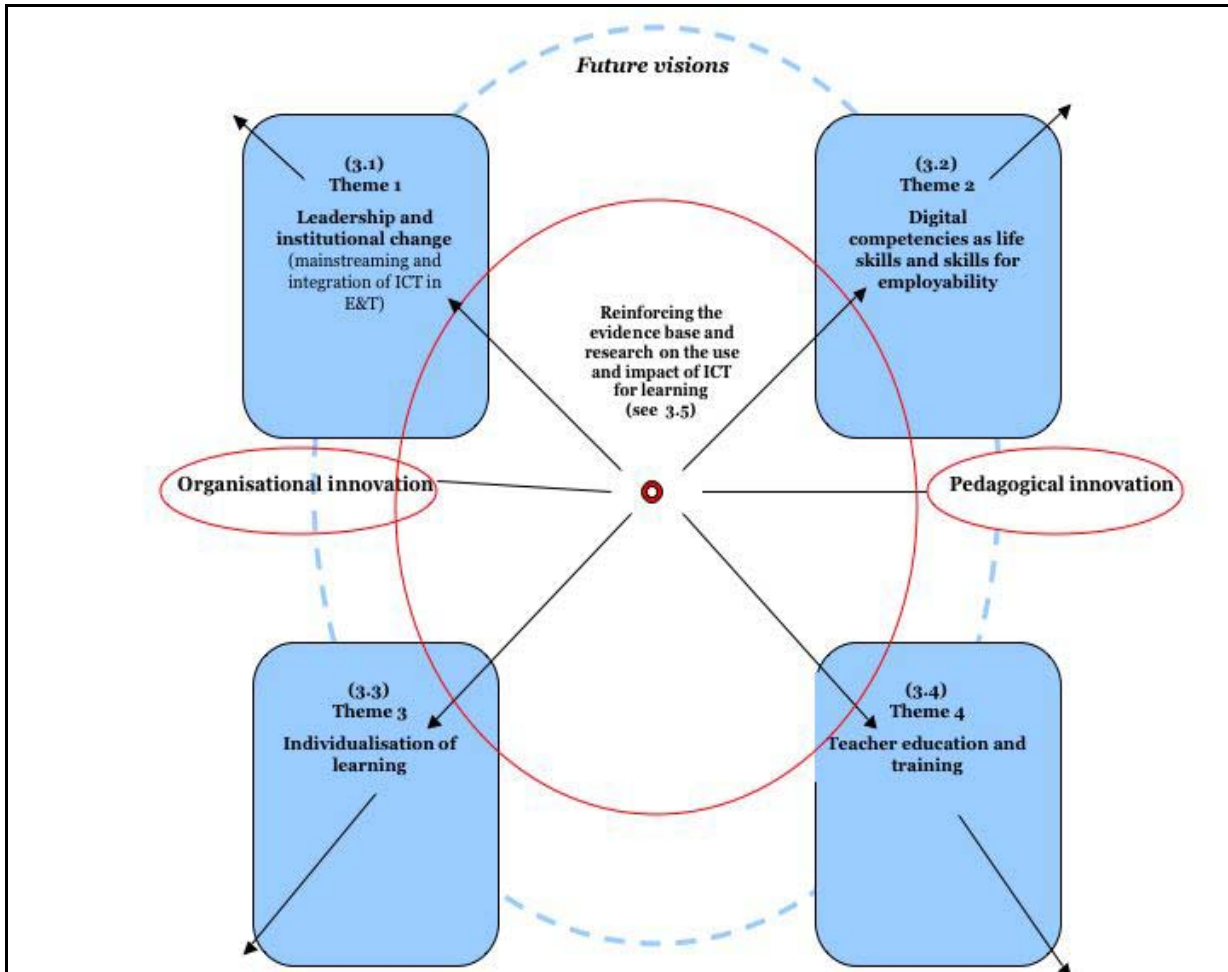
1. **Theme 1: Leadership and institutional change.** One major theme which has been on the agenda of each ICT cluster meeting and PLA is the increased mainstreaming of ICT in education and training, both as a support tool and as a driver for change in educational systems and culture. Across the ICT cluster meetings and PLAs, the participating countries described their national e-strategies and how these are implemented in their lifelong learning strategies.

2. **Theme 2: Digital competences as core life and employability skills.** The second theme is the increased need for digital competences for the future workforce as well as for citizens in a networked society and how ICT can be an instrument, opening up lifelong learning for all.

3. **Theme 3:   Individualisation of learning.** The third theme is a scrutiny of pedagogical innovations that ICT could bring in terms of enhancing a more learner-centred approach, an enabler of innovative learning and teaching processes.

---

[6] Peer learning is a process of cooperation at European level whereby policy makers and practitioners from one country learn, through direct contact and practical cooperation, from experiences of their counterparts elsewhere in Europe in implementing reforms in areas of shared interest and concern.

4. **Theme 4: Teacher education and training**. The forth theme is focusing on the professional development of teachers and school leaders.

5. **Crosscutting topic 1:** The first crosscutting topic underlines the importance of **enlarging the evidence and indicator base** on the use and impact of ICT for learning. It will be addressed in a separate section after the fourth theme.

6. **Crosscutting topic 2:** The second crosscutting topic sets out **the future of ICT for learning.** This topic will be addressed in a separate section at the end of the report, thus functioning both as an outlook and a conclusion. The section can also be read separately, as a summary of the report.

The conclusions will feed into the ongoing policy debates that currently are at the top of the European agenda around lifelong learning, key competencies, creativity and innovation, new skills for new jobs and the discussion on new 'beyond Lisbon' objectives.

1. Outcomes of the cluster on 'ICT for learning'

The use of new technologies in education and training, its added value for qualitative and innovative learning and its contribution to attracting groups at risk of exclusion are an increasingly important issue for EU Member States. Indeed, substantial progress in the use of ICT for education and training has been made across Europe but still more has to happen. Studies have shown that ICT has not yet had as significant an impact as expected. Furthermore, the recent economic crisis and the current debates in Europe on *New Skills for New Jobs, Creativity and Innovation* skills, *Key Competences*, etc., have raised the importance of the use of digital competences and the enhancing role of ICT for innovation in E&T systems and for learning new competences.

The major strategic objective of the Cluster on ICT is to identify key factors for improving the quality of ICT integration in teaching, learning and education in European education systems. The cluster supports national reviews of ICT for learning strategies as well as the development of European monitoring and evaluation tools such as ICT indicators.

The main outcomes of the cluster activities are the exchange of good practice, a Compendium of Good Practice (2008), contributions to the changing discourse around e-learning and the changing role of ICT as an enhancer of innovative learning; and the identification of a set of key recommendations on the implementation and integration of ICT in education and training (see Chapter 3).

1.1 From peer learning ...

Peer Learning Activities were organised in the following places and order: Oslo 2005, Helsinki 2006, Luxembourg 2006, Budapest 2007, Birmingham 2007, Thessaloniki 2008 and Vienna 2008. The PLAs have provided a meeting space for sharing evidence, informal benchmarking, peer learning and sharing examples of strategies and implementation of ICT for learning in different European countries. The PLA reports can be found on the Knowledge System for Lifelong learning website: www.kslll.net

> *"The cluster fulfilled clearly the objectives of stocktaking, exchange and learning exercise."*
> **(Extract of 'Future Avenues', 2008)[7]**

Peer Learning Activities

1. *PLA Oslo (Norway), 21-23 September 2005, Learning Networks*

2. *PLA Helsinki (Finland), 25-27 January 2006, Finnish Digital Content Production and Use*

3. *PLA Luxembourg (Luxembourg), 27-29 September 2006, Portals and Collaboration: Building learning networks for sharing information and knowledge and boosting students' success through collaborative learning environments*

4. *PLA Budapest (Hungary), 25-27 April 2007, ICT infrastructure and content (quality, relevance and the role of teachers); Digital competences and digital literacy*

5. *PLA Birmingham (United Kingdom - hosted by BECTA), 4-5 October 2007, Leadership in ICT and parental engagement*

6. *PLA Thessaloniki (Greece), 8-10 October 2008, E-skills and digital literacy and partnerships for LLL strategies (In combination with the e-Skills Conference, October 2008)*

7. *PLA Vienna, 30 November 2008 - 3 December 2009, e-Inclusion and Digital Competences (in combination with e-Inclusion Ministerial Conference, December 2008)*

The ICT cluster has been an important instrument in guiding and informing Member States in the stage of rethinking their strategies for ICT within education and training. A main impact of the work of the cluster at European level concerns (i) the development of an assessment culture for the implementation

---

[7] See "Future avenues of the ICT cluster and PLA activities. Recommendations from the ICT cluster members" (September 2008)

and integration of ICT, (ii) the creation of a platform for exchange of best practice allowing critical analysis of national initiatives and, (iii) providing a self-reflective mechanism. Also, some emerging issues have been identified in order for Member States to benefit from the full potential of ICT to renew education systems and practises at the European level. At national level the main impact has been to inform policy development and policy implementation. The Peer Learning Activities have also promoted cooperation between participating countries.

As the participating Member States of the ICT cluster were implementing ICT for learning strategies at different maturity levels, the cluster's work concentrated on successful (and unsuccessful) factors for implementing ICT strategies for learning. More precisely, while revising different strategies, various Member States involved the expertise of other participating countries or experts from the cluster. The recent move of some countries to implement "One laptop per child/teacher" programmes shows that continued exchanges of practices and experiences are required.

In 2008, the ICT cluster developed as a concrete working instrument a Compendium of Good Practice Cases of e-learning[8] containing national policy overviews and 43 concrete cases on the use of e-learning across the participating countries (see also Chapter 2).

1.2 ... towards a changed discourse on ICT for learning

The various cluster meetings and PLAs illustrate the changing discourse in ICT for learning: from a focus on access and investment in infrastructure and content production; towards a focus on fostering digital competences in lifelong learning and embedding the use of ICT in broader educational strategies. As such the cluster has contributed to a fundamental change in discourse from *accessibility* to *innovative learning* through the support of ICT.

> *"The cluster has contributed to a fundamental change in discourse from accessibility to innovative learning through the support of ICT".*

At the beginning, emphasis was given to Member States policies regarding access to ICT facilities and infrastructure.

The first PLA activities in 2005 highlighted the need:

- to continuously invest in infrastructure

- to adapt equipment levels to constraints and challenges faced by schools

- to plan renewal of hardware in the medium term

- to invest in the production of content, learning repositories of teaching and learning materials and learning management systems with significant input from teachers and learners.

> *"It is timely to move away from perceiving ICT diffusion and usage as a goal and instead see ICT as an enabler of teaching and learning. It is not about ICT but about transformation ..."*
> **(Extract from 'Future Avenues', 2008)**

Around 2005-2006, the emphasis changed from *accessibility* to the various modalities of *using* ICT in education and training, collaborative organisational change, and training and to the *quality of the use of ICT for learning and teaching processes*. The current discourse is focusing on the importance of learning digital competences as future life and career skills, skills needed throughout life, and on the enhancing role of new technologies to innovate learning, teaching, and other services around education.

1.3 ICT for learning as a transversal topic in lifelong learning

The cluster also organised meetings with other thematic clusters to reinforce the integration of the usage of ICT in learning and teaching. It identified synergies with the three clusters: Clusters on Teachers and Trainers; Key Competences; and Mathematics, Science and Technology. Joint cluster meetings transferred the main messages and recommendations from the ICT cluster to the policy agendas of these other clusters.

As mentioned in the introduction, the European Training Foundation, Cedefop, the Institute for Prospective and Technical Studies (IPTS), the Centre for Research on Lifelong Learning (CRELL) and

---

[8] For further reading, see www.kslll.net/Documents/Compendium e-learningfinal.DOC

the Executive Agency of DG EAC have participated regularly at the meetings. Their contributions are also reflected in this report.

1.4 National and European policy impact

Various policy recommendations have been produced by the Cluster on ICT and disseminated through short user-friendly policy reviews such as the following:

> *"Bilateral cooperation schemes between national governments have been set up, which would not have happened without the ICT cluster"*
>
> *"It is seen as a two-way learning and impact exercise, enhancing discussions and concrete implementations at regional and national level and influencing European policy making."*
> **(Extracts from 'Future Avenues', 2008)**

- "How to achieve leadership and parental involvement in e-learning" (October 2007);

- "Recommendations from the ICT cluster members with regard to future avenues of the ICT cluster" (January 2008);

- "Novel pedagogies for learning and teaching maths, science and technology (MST) and how ICT can be an added value" (Recommendations issued by the Maths, Science and Technology cluster and the ICT cluster, May 2008);

- "Bottlenecks and enablers of innovative learning and teaching and the role of ICT" (September 2008);

- "Digital competences and e-skills for lifelong learning for all" (December, 2008); and

- "Digital competences as a life and career skill" and "Teacher education & training and ICT" (Joint recommendations by the clusters on ICT, Key Competences and Teachers and Trainers, September 2009).

All these policy recommendations can be found on the Knowledge System for Lifelong Learning[9] website. They have been taken into account while drafting this final report.

The cluster has contributed to European LLL policies such as to the drafting of the Commission Staff Working Paper on the "Use of ICT to support innovation and lifelong learning for all" (December 2008). The Compendium of Good Practice collated by the ICT cluster was annexed to the Commission Staff Communication. The cluster is also closely associated with the preparation of the "2009 European year on Creativity and Innovation" and the follow-up activities of the "New Skills for New Jobs" Communication.

Last but not least, the ICT cluster's work has made a great impact on European policy-making on Digital competence across various Commission policies such as Lifelong Learning (Directorate General Education and Culture), Digital literacy and e-Inclusion (Directorate General Information Society) and e-Skills (Directorate General Enterprise). Both

> *"The cluster has contributed to a fundamental change in discourse from accessibility to innovative learning through the support of ICT".*

the assessment of digital competences as well as the importance of the role of E&T for developing these competences in partnership with industry and research has been put on the policy agenda.

1.5 Contribution to evidence base, benchmarks and indicators

From the start, the ICT cluster has also influenced the development of improved indicators for measuring ICT use and impact. This has led to the first European-wide comparative study on the use and impact of ICT in school education (STEPS, 2009)[10].

---

[9] www.kslll.net

[10] "Study on Technology's impact in primary schools" (STEPS) by Empirica and European Schoolnet(2009); "The ICT Impact Report - A review of studies of ICT impact on schools in Europe" (2006) by European Schoolnet; "Study on Indicators on ICT in Education" (IIE) (2009); The reports are available on the European Commission website at http://eacea.ec.europa.eu/llp/studies/studies_en.php.

See also Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Europe's Digital Competitiveness Report: main achievements of the i2010 strategy 2005-2009, ec.europa.eu/information_society/eeurope/i2010/docs/annual_report/2009/sec_2009_1103.pdf

The study of the impact of technology in primary schools provides the most detailed picture yet of national ICT strategies and their impact in primary schools in the 27 countries of the European Union, as well as in Liechtenstein, Iceland and Norway. Funded by the European Commission, this landmark study of ICT in Europe's 209,000 primary schools was undertaken by European Schoolnet (EUN) and Empirica GmbH, with the support of

> *"The ICT cluster has influenced the development of improved indicators for measuring ICT use and impact. This has led to the first European-wide comparative study on the use and impact of ICT in school education".*

national correspondents, researchers, policy-makers, teachers and pupils in 30 countries. The study includes an analysis of interviews with 18,000 primary school teachers and head teachers, a review of relevant research in Europe (amounting to 60 research studies published in 22 countries), a survey of policy makers in 30 Ministries of Education on national ICT policies, 25 case studies of good practice and 30 country briefs. The study presents baseline data on 30 national primary education systems and their ICT strategies, and investigates the impact of ICT in three key areas of the education system: learners and learning, teachers and teaching and the school as a whole.

The evidence shows that ICT related strategies at national, regional and local level have resulted in:

- Increased access to and use of ICT in primary schools;

- ICT-supported learning and ICT-enabled wider educational goals;

- Higher levels of teacher and learner motivation, leading to competence development and an engagement with lifelong learning;

- First steps towards systemic change and modernisation of planning.

The ICT cluster members have also been closely involved in a second study on 'Indicators of ICT in primary and secondary education' (IIPSE, 2009). This study funded by the European Commission, shows that throughout the EU there is a need for international comparative indicators regarding ICT in education. This study was focussed on the 27 EU Member States, the 3 candidate countries and the countries from the European Economic Area.

Policy-makers need educational monitors in order to make inferences about the strengths and weaknesses in the competencies of students, how these are developing over time and what are the potential causes of weaknesses. With regard to ICT the core questions which should be addressed by educational monitoring are: (1) are students during compulsory education sufficiently skilled to use ICT in the competency areas that are targeted by the European Commission for benchmarking, and (2) do students have sufficient opportunities to learn about ICT (in this study abbreviated as 'OTL-ICT') at and/or outside school? Indicators are needed for addressing these questions. Suitable indicator definitions do not exist for the key competency areas that should (ideally) constitute the core for monitoring ICT in education, namely the ICT-related student outcomes and opportunities to learn, which are called in this study 'primary indicators'.

The main issues that were addressed in this study concerned the characteristics of educational monitoring, policy concerns regarding the introduction and use of ICT in education, indicator needs and availability of international comparative data, and recommendations and potential actions by the European Commission. The conclusions indicate that there is an urgent need for monitoring the use and impact of ICT in the EU. For

> *"The conclusions indicate that there is an urgent need for monitoring the use and impact of ICT in the EU".*

developing a regular monitor, initiatives from many actors are needed and an organizational model needs to be developed.

1.6 Summary of the key recommendations by the ICT cluster

Theme 1: Leadership and institutional change for a renewed strategy on learning

- **Develop open and inclusive policies enhancing full integration of ICT in education and training in Europe**

  – **The policies on 'ICT for learning' should be based on long-term educational objectives and become an integral part of the core educational agenda'**

  – **'ICT for learning' policies should be dynamic and holistic**

  – **Policies and their implementations should be based on sound research and evaluation**

  – **Drop the "e" in e-learning – it is about learning in a digital and networked society**

  – **Bring the work on e-learning closer to the work of innovation in education and training**

Theme 2: Digital competences and new transversal skills as core life and employability skills

- **Make sure digital competences and new transversal skills are acquired by all, also including the most vulnerable and socially excluded people in society through learning settings which are the most effective (formal or informal)**

Theme 3: Towards a new learning paradigm

- **Allow more learner-centred approaches**

Theme 4: Professional development – the teacher as learner at the centre

- **Adapt teacher education and training as to embrace more open and flexible learning environments**

Theme 5: Research on learning in a digital society

- **Research and studies need to look for holistic approaches and solutions and the effective use of ICT and its impact on learning processes, outcomes and standards**

Theme 6: Envisioning the future of learning in a digital society

- **A need for envisioning future learning that is more efficient, equitable, innovative and meaningful than it ever was in the past**

2. Context setting: the actual use of 'ICT for learning' in the EU Member States

A core objective of the ICT cluster and PLA meetings was to exchange experiences of integration of ICT in the national education and training systems. At PLA meetings, the PLA host country would make an in-depth presentation of their e-strategies and their integration in their lifelong learning strategies. The other country participants would present their views and experiences.

The ICT cluster also collected 43 cases of good practice in a Compendium (2008)[11]. The cases highlight national policies for improving the use of e-learning across European countries. The Compendium provided the opportunity to discuss which practices can be transferred between countries and which may be specific to a national context. It also facilitated the discussion on whether there are any preconditions for making an e-learning initiative successful. As such the compendium is as a useful body of evidence that can be used to support the work of the ICT Cluster group in its national ICT strategies and for continuous peer learning and knowledge exchange.

We have continued this tradition in this report and have summarised current developments in the use of ICT in the various countries (Appendix C).

The updates on participating country developments were collected between August and October 2009 through brief individual conversations with country representatives. The participating countries were asked to elaborate on current and future activities and policies in the field of 'ICT for learning' in their respective countries.

The collected material covered a number of areas:

- Developments in schools

- Digital literacy and competences

- e-Learning partnerships

- Future developments

- Government policy and initiatives

- Lifelong learning

The progress reports in the member countries (see Appendix C) as well as the collection of cases in the Compendium provide a fairly complete picture of national 'ICT for learning' strategies or reforms for the entire educational system in a given country.

Although member countries may be at very different stages when it comes to embedding ICT in education and training, they appear to have in common a number of policies or activities with similar aims and goals.

Firstly, all participating countries are, in some form or another, equipping schools, classrooms and working towards lowering the ratio between the number of computers available for learning purposes and number of learners. Some of the countries are moving into the direction of one-laptop-per-child strategies. Schools (learners and education staff) are being equipped with (quality) Internet connections, Wi-Fi access, computers, laptops, projectors, USB sticks, interactive white boards and other tools aimed at building up digital competency skills.

- For instance, Hungary is reported to be spending €24M on classroom equipment in 2009.

Participating countries are also considering policies to allow flexible access to digital content materials from schools and outside of school.

Throughout the countries, school curricula are being updated.

- In Cyprus, 25% of the curriculum is reported to be digitalised.

---

[11] www.kslll.net/PoliciesAndAchievements/ExampleList.cfm?clusterid=8

- In the German Bundesland Hessen, older curricula are being replaced with new 'interdisciplinary education standards', which include media literacy. To accompany this, teacher training curricula encompass media training and education through three phases: studies, practical training and teaching.

- In Slovakia, pilot trials have led to new curricula for both primary and lower secondary schools.

- In Malta, an annual professional development session on e-learning has become mandatory as from 2007.

The education, training as well as the motivation of teachers appear to be high priorities across the member countries. Some of these initiatives are done in partnership with industry and local communities.

- In France, a new plan for the development of ICT in 5,000 rural schools was launched in 2009, with 50M Euros being allocated to schools in small towns (with fewer than 2,000 inhabitants) for the acquisition of laptops, interactive whiteboards and software. This measure aims to reduce the digital divide between rural and city schools[12].

- There is also an increasing awareness of all the digital content materials suitable for teaching and learning.

Platforms and websites are being developed to help pupils, students, and adult learners as well as teachers, trainers and other educational staff to communicate, collaborate and exchange knowledge.

- In Malta, teachers have had the opportunity to study for a certificate in e-learning. A group of ICT teachers evaluates and promotes emerging technologies while supporting teachers who are encouraged to embed ICT in their work.

A number of governments have announced broader ICT policies.

- In Estonia, a foresight study aimed at identifying the most important – both socially and economically – ICT areas in the country throughout the next decade, believed education to be the most significant field.

- In Finland, upcoming 'ICT for learning' reforms take into account a larger reshaping of education policies, steering systems and financing mechanisms of education.

- Northern Ireland is emphasising the importance of implementing 'holistic' policies, and is keen to see an increase in the uptake and more efficient use of ICT by school management as a tool to improve leadership capacity.

- Norway is in the process of restructuring educational institutions, and is creating a new national centre for ICT and education, which should be in operation in 2010.

A few lifelong learning initiatives in participating countries are stretching beyond traditional educational institutions, leading to informal and non-formal learning opportunities.

- Turkey has invested in free Internet centres for low-income groups.

- German Brandenburg e-learning initiatives involve the basic education of inmates.

- In Finland, liberal adult education institutions have an increasingly important role in reducing the digital divide within the information society. Study vouchers have been allocated for selected target groups (at risk).

---

[12] www.educnet.education.fr/primaire/actualites/plan-de-developpement-du-numerique-dans-les-ecoles

3. Lessons learned

3.1 Theme 1: Leadership and institutional change – towards 'real' mainstreaming

Main messages

- Good quality leadership at all levels is the critical ingredient for determining that learners have worthwhile and challenging experiences in ICT. Successful leadership of ICT is characterised by:

- ICT development work that is supported strongly by the head teacher and other leaders in schools and educational institutions as well as government;

- An ambitious but realistic vision for ICT, which is set out clearly in the school development plan and associated departmental planning at local, regional and national levels;

- The roles and responsibilities of the ICT leaders are supported by the allocation of adequate time and resources to undertake effectively the complex management, co-ordination and evaluative functions;

- A strong emphasis on collaboration and clustering with other institutions to ensure that staff benefit from the best possible continuous professional development in order to transform their practice; and

- The implementation of robust self-evaluation processes leading to improvement in the full integration of ICT into all elements of schooling.

3.1.1 Bottlenecks and challenges

- Many school leaders are unaware of the potential of managed learning environments for the efficient and effective administration, organisation and management of their schools.

- The lack of adequate training opportunities is a major barrier to progress in building the capacity of school leadership teams to increase their competences in the use of learning platforms.

- Learning platforms are currently used mostly as a repository for resources but there is much scope for school leaders to use the more advanced features more widely for accelerating whole school improvement and raising the standards of pupil performance.

- A mature vision for the sustainable use of ICT for learning is required by leaders and policy makers in order to drive forward strategic whole school approaches to embedding ICT within the education system.

- The majority of teachers use ICT in their every day lives but some lack the pedagogy to use their knowledge in class.

3.1.2 Scope

ICT is triggering major changes and innovation in schooling today. Countries across Europe are at varying stages of development in relation to the incorporation of ICT within the different aspects of education and in determining their forward planning for ICT and schooling. While several European countries are either re-launching or revising their policies, others are at the early stages of formulating a strategy for ICT. It must be borne in mind also that ICT has not been a top priority for several countries.

It is timely that all European countries consider placing a greater emphasis on providing adequate ICT solutions for their schools and education institutions given the increasing pace of technological change and the real or perceived possibility of a disconnect between society and education, and the generational, digital divide between young and old.

There is an on-going cultural change occurring in institutional organisation as a result of the rapid technological advances within education and the increasing penetration of online solutions. The

mainstreaming of ICT into learning, teaching, and into the administration and management of schools is gradually becoming a reality.

Technology helps transform education and can make a positive difference to effective schooling when the users understand its possibilities and embrace it as a teaching and learning tool. Many schools have already begun to optimize the use of technology for the benefit of learners, teachers and managers. ICT offers a range of new possibilities. ICT can add value if used effectively and can facilitate school leaders in the management and administration of their institutions.

Leaders set the agenda for schools. School leadership has been identified as an important factor for the further penetration of ICT into the education system, for establishing effective communities of practice and for the identification of ICT champions within individual institutions and networks of schools working collaboratively.

Research has also shown that investment in technology in schools has a positive impact on pupils' views about their school and subsequently their learning.

> *"School leadership has been identified as an important factor for the further penetration of ICT into the education system".*

The realisation of a strategy determined at ministerial level depends much on the commitment of those in charge of implementation; the role of senior management in leading ICT effectively in schools is also crucial. Research and inspection evidence indicate that there needs to be an increased focus on the development of strategic ICT leadership skills for school leaders and senior managers. The potential of technology to deliver the priorities set by and for school leaders cannot be underestimated. With strong and informed school leadership that engages in effective self-evaluation, schools can use a number of tools designed to inform whole school planning and raise standards through ICT usage.

3.1.3 Key lessons learned

The following factors are crucial for school leaders of a successful, ICT enabled institution.

- *ICT development work should be supported strongly by the head teacher and other school leaders and the local community, as well as nationally*

School managers set the tone among the teachers and foster positive attitudes to ICT. They can lead by example by embracing ICT to its maximum and by setting an appropriate strategic vision for the school community. It is important that the Head teacher is regarded as a supporter of integrating ICT into all aspects of school policies, practices and procedures. They can facilitate the development of ICT throughout the school and create an environment conducive to the development of ICT. It is vital that the Principal and school management team recognise the potential of technology and provide strong leadership by gaining the commitment of the staff and their engagement to a common vision for ICT. School leaders are charged with providing a suitable infrastructure and resources, and appropriate professional development to upskill the workforce.

> *"Do not plan for ICT; plan for transformation and future learning".*

It is imperative that school leaders appreciate the advantages afforded by an ICT-enabled school. A critical role of school managers is to monitor, review and evaluate the effectiveness and quality of ICT throughout the school. There should be regular evaluation of the school's ICT strategy at all levels across the school. The leadership team must base future planning upon evidence-based monitoring and evaluation of progress. The investment made by schools in a wide range of ICT resources should be monitored effectively in terms of its impact on the curriculum and the achievement of pupils. While some subject teachers use ICT on a regular or daily basis others rarely engage with technology. As a result, the pupils have uneven experiences of ICT from teacher to teacher and school to school. It is also essential that leaders at all levels within an institution – including middle managers, subject co-ordinators and heads of department – are involved in embedding ICT effectively in their area of responsibility. Keeping ICT at the forefront of innovation and change will bring about transformation.

- *An ambitious but realistic vision for ICT, should be set out clearly in the school development plan and associated departmental planning*

ICT should be a priority for development for all schools featuring prominently on the school development plan. Whole school planning for the development of ICT must ensure coherent and strategic implementation. School Development Planning is a key management process which can also be aided by the use of relevant ICT tools. Embedding ICT development strategies into the general School Development Planning in a compulsory way – as practice shows – can lead to the integration of ICT into the school system.

It is vital that schools adopt an approach encompassing the whole institution – and at the same time, based on the current nationwide approach – to using ICT. Schools that have developed such an approach across key areas such as

> *"The need for strategic holistic national and European policies for integrating ICT into education and training."*

leadership, learning and teaching, teacher development and curriculum organisation improve pupil results at a faster rate then those that do not.

ICT can exercise a great influence, for example, on school improvement. In this regard, school leaders have a key role to play in effectively harnessing ICT to improve educational attainment and outcomes.

ICT has an important role to play in the goal of raising achievement and educational outcomes among the pupils. In addition, ICT contributes greatly to improving the pupils' motivation and experiences. It is vital that school leaders employ ICT effectively in order to raise standards and improve educational achievement. It is expected that more schools will integrate these approaches into their practices and procedures.

ICT can be used to raise standards in literacy through a variety of teaching methods that can lead to improvements in writing and reading skills as well as speaking and listening. Learning in mathematics also can benefit from the judicious use of interactive whiteboards, animations and simulations, which help pupils to grasp difficult concepts and offer new and dynamic ways of representing mathematical ideas. These concepts and possibilities can, of course, be applied to many other subject areas, engaging pupils and motivating them to learn and achieve.

Beyond the school environment the extended use of ICT has also contributed a range of benefits including increased motivation, raising the self-esteem of low achievers and enabling those with additional educational needs to demonstrate their ability.

- *Successful leadership of ICT is characterised by the implementation of robust self-evaluation processes leading to improvement in learning in all levels of education*

School leaders must analyse and interpret the data available to them more effectively in order to evaluate pupils' progress, inform future planning and for the better deployment of resources. Useful data generated by school management information systems provides a rich source of material for leaders to interrogate and analyse. Decision-making based on reliable and up-to-date data is essential. There is now a trend towards providing more online examinations and computerised assessment that will provide useful databases on pupil performance at local, regional and national levels.

Schools tend to be data rich but information poor. School leaders need to develop their data awareness and proficiency for assessment, both formative and summative, using the new technologies.

Annual reports and assessment outcomes will be electronically accessible to support teachers and parents. A substantial growth in online assessment and examinations, and the increased use of technology in reporting progress to students and their parents, can be expected.

Teachers must be aware of the discrepancy between, in some cases, the frequent home use of ICT by their pupils and school under-use and they must plan to address such inequalities. It is imperative that school leaders at all levels make maximum use of ICT for the efficient management of schools. Education systems and schools are beginning to use computer-generated data for assessment and performance purposes.

- *A strong emphasis on collaboration and clustering with other institutions to ensure that staff benefit from the best possible continuous professional development in order to transform their practice*

School leaders must build the confidence and competence of their staff to use ICT and must provide opportunities for the teachers to engage in suitable and relevant continuous professional development to sharpen their expertise in ICT. The effective school leader will create a community of ICT learning within the school, encouraging peer learning and the sharing of best practice in ICT among all the staff and pupils.

- *The roles and responsibilities of the ICT leaders should be supported by the allocation of adequate time to undertake effectively the complex management, co-ordination and evaluative functions*

Technology can impact positively upon school management functioning and administration. There are specific benefits to using technology for the better management and administration of schools. The effective use of ICT can enable school leaders to monitor pupil achievement, progress and attendance with more success.

Technology has been shown to provide gains in terms of workforce efficiency and productivity. It is common today for ICT to support lesson planning, curriculum mapping and classroom teaching. This has enabled teachers to locate and integrate richer digital teaching and learning resources, which have added value to their lessons resulting in improved outcomes for pupils and students. For leaders, the availability of key pupil/student performance data in a variety of electronic formats is an important management tool for future planning and decision-making. For example, school leaders can target extra resources at groups of pupils that are under-performing based on rigorous assessment data generated by diagnostic testing.

School administrators have benefited from the significant shift in the use of electronic information and communication. The availability of online and electronic records has greatly improved efficiency. Communication with parents, pupils and teachers is much easier and the elimination of paper-based records is a major advantage. Electronic registers mean that pupil attendance records are up-to-date and response times swifter for emergencies.

Head teachers can organise their schools more efficiently in a number of ways with electronic solutions. They can control truancy more effectively and can map timetables and the curriculum more efficiently. Schools can connect more easily to digital materials for learning and with other schools and communities through video conferencing materials.

School managers demonstrate pedagogical leadership by promoting a suitable vision for ICT across the school and by inspiring, encouraging and enabling the teachers to integrate ICT into their planning and teaching approaches. School leaders need to develop a clear vision for learning, which clearly encompasses the contribution of ICT. This vision for using ICT will be shared throughout the school community-staff, pupils and parents. E-mature schools using ICT for learning have been established in several European countries offering virtual learning and teaching and online examinations and computerised assessments.

3.2 Theme 2: Digital competences as core life and employability skills – mismatch between real life and educational systems

Main messages

- ICT must be a continuous part of the curriculum from early childhood.
- Support research on the impact of ICT for learning.
- Education must act to close new digital gaps.
- Education must react to IT job market needs.

3.2.1 Bottlenecks and challenges

- Students are technology savvy but require 21st century competencies, such as digital competencies. A new concept of learning needs to be redefined for the future.

- Student use of ICT at schools does not match their use at home. ICT is often used for different purposes at home and at school. Currently the different uses are mutually exclusive.

- Schools need equipment: there is lack of computers, and Internet broadband. There are also large variations between countries.

- Education must take account of new digital gap(s) / divides within schools and communities (pupils, students and staff, gender differences, and groups at risk), between schools and institutions, and between regions and nationally.

- Schools do not produce enough graduates for the IT job market: there is a lack of IT practitioners, a lack of women looking for IT career, and a lack of IT teachers. As a result, there are a lot of self-educated individuals working in IT.

> *"In an age in which computers feature strongly in everyday life and in education, the minority of students who have little access to them, who use them little and who are not confident in using ICT are not performing well".*
> "Are Students Ready for a Technology-rich World? What PISA studies tell us" **(OECD 2005)**

- Teacher attitudes towards ICT is a challenge – 20% of teachers are still reluctant to make use of ICT and believe that the use of computers in class does not have significant learning benefits for pupils.

- There is not enough support for teachers – in the form of maintenance, and ICT advisers, for example.

- There is not enough content, or measures for quality.

3.2.2 Scope

Education must prepare students with skills and competencies that enable them to navigate and make well-founded choices in their lives and working careers. Many countries have tried to meet the ICT challenge by defining ICT as a basic skill together with reading, writing and arithmetic. However, quite often one will find ICT regarded more as tool for enhancing student outcomes in different subject areas,

Figure 2.4 ■ Percentage of students reporting that there is a computer available for them to use at home, school or other places

and not as an area of competence in its own right. Subsequently, the use of ICT is narrowed down to a rather basic use at school – digital competence, that is the confident and critical use of ICT in various situations in life – falls short, and the full potential of ICT as an enhancer of innovation is not utilised.

ICT in the past was used only by experts or technicians. With the appearance of personal computer it started to penetrate work and leisure and become a domain of boys and men.

ICT is everywhere in society and we all need digital competencies. The Internet as we know it has been around for a rather short time. But the Internet is changing. As more Internet services have developed, the main impact on citizens has been on electronic services for public administration, e-banking, e-travelling, etc. Children mostly use computers for playing games, downloading music, and communicating through social networks. None of them have no or few ideas about safety risks or legal rights. Computers are not used only by IT experts and technicians any more.
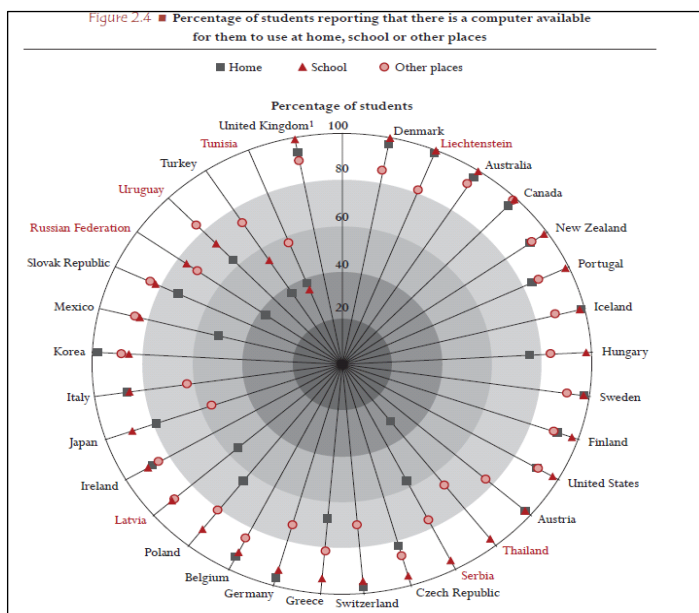
The rise of Web 2.0 has been embraced by many, including educationalists. Some have dealt with Web 2.0 by looking for creative ways of using this new opportunity; others have, for example, banned Facebook from schools. Still we all need to be able to access, and make effective use of, digitally based services including those based on Web 2.0. At the same time, we must be aware of legal and security issues - identity theft, and viruses. Information security is an important part of digital competency. Hence, we must ask the question to what extent education addresses this issue.

One might discuss whether education should be at the forefront of technological development. In any case, education must come to terms with how to harness this technology in better ways than today. As stated in the ICT/PISA-report: "In fact, once accounting for socio-economic background, the performance advantage associated with home computer access remains in 23 of the 31 countries where data is available. These performance differences are significant and present a challenge to the school community. The performance difference associated with student access to a computer at school is less clear-cut than in the case of access at home."

Figure 4.4 ■ Length of time students have been using a computer and mean performance in mathematics
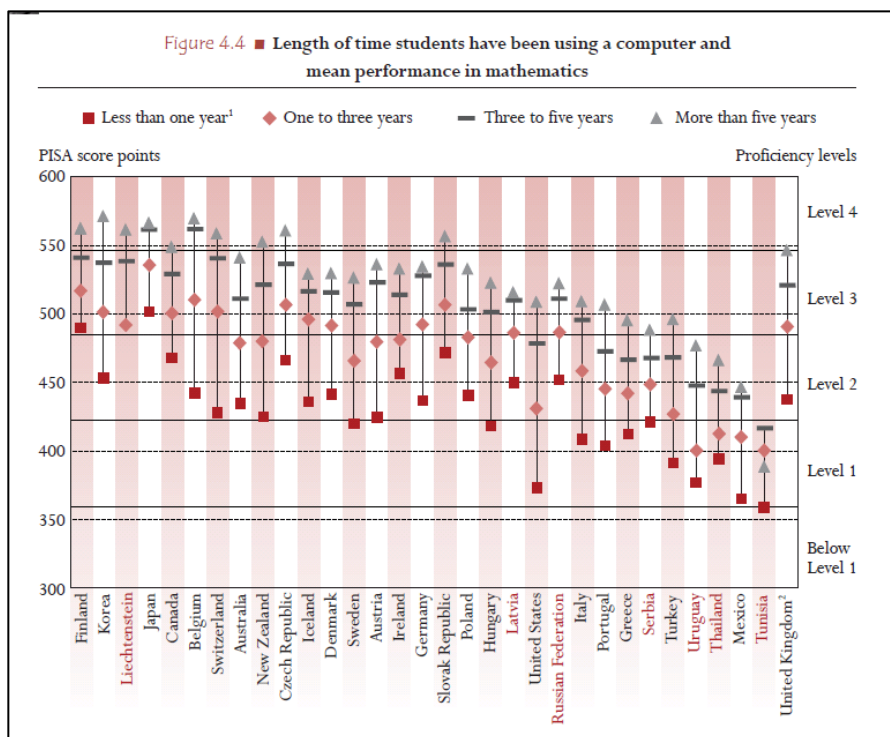
Another interesting finding from the ICT/PISA (2003) study relates to the ICT familiarity. Once socio-economic background has been accounted for, the performance differences between students who have used a computer for more than five years and students who have used a computer for less than one year, remained the equivalent of one proficiency level or more in several countries.

Today's students are also described as the New Millennium Learners. They use ICT in a far more creative and innovative way at home than at school since ICT is used for different purposes at home than is generally the case in school. They collaborate and they communicate more when at home. Most young children who enter school will bring with them some basic skills on how to use ICT and some expectations on how to use ICT in a far more advanced way than most schools will offer. We need to understand the new generation of learners and understand their expectations and attitudes.

> *"The new social computing networks illustrate the new ways of learning amongst youngsters and in future working life".*

There is a group of students who work on school projects, work creatively with educational software and digital resources, use social networking tools for communicating with peers, and participate in competitions. Large numbers of teachers are able to assist those students, nevertheless, a large number still work 'traditionally', without computers, and do not see
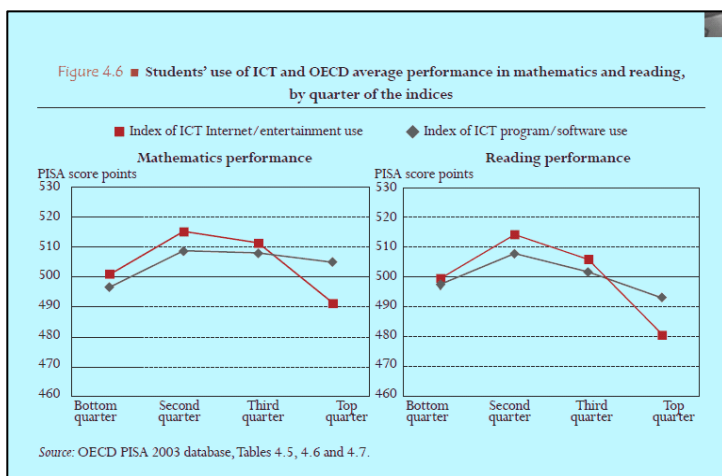
benefit of using computers. ICT in education and training is still not a priority in some educational systems.

The Internet has also enabled increased cooperation on a national and international level and so pushes for more transversal skills – teamwork, network, communication and presentation skills. The use of ICT accelerates the demand for new skills. This is not yet well understood by many educational systems as they do not yet produce enough graduates with adequate education, especially IT education.

3.2.3 Key lessons learned

- *ICT must be a continuous part of the curriculum from early childhood*

ICT has become an important tool for teaching and learning. It allows for more personalized learning and more flexibility in schools. The OECD 'New Millennium Learners' programme examines aspects of the major implications for education that the emergence of digital native learners will encounter. We need to take into consideration the impact of digital technologies on cognitive skills and on learning

Figure 4.6 ■ Students' use of ICT and OECD average performance in mathematics and reading, by quarter of the indices

Source: OECD PISA 2003 database, Tables 4.5, 4.6 and 4.7.

expectations. Further, the evolution of social values and lifestyles are important issues. All this will impact on education, and must be taken into account when designing new syllabuses. It should also be noted that the enhanced use of ICT also would influence assessment techniques. Using ICT throughout the academic year and then providing end-of-year pen and paper tests are not a compatible exercise and will affect adversely the pupil performance. Hence assessment should also mirror how ICT has been utilised in the classroom and in education in general.

The STEPS study (2009) [13] funded by the Lifelong Learning programme provided interesting results under-pinning the Report's recommendations:

- Eighty-seven per cent of pupils are more motivated when using ICT. ICT impact not only on pupils' digital literacy, but also to their communication, language, social and cognitive skills. The drivers for enhancing ICT impact in teaching and learning in primary education are equipment, support and content. But the big impact will have subject-based didactics for ICT. The last recommendation comes out from the discussion of experts, ICT cluster experts and other stakeholders that attended the STEPS study workshop in June 2009.

- ICT in secondary schools is usually two-fold, ICT is used as a tool throughout the curriculum depending on the access to equipment and resources, but also as a separate subject in its own right – informatics. According to experts who met at the International Olympiad in Informatics in Plovdiv this year (2009), programming is of great importance in the curriculum. It has impact on student's competences that are not developed through other subjects, and on pupils' possibilities to choose informatics as a future career.

- *Education must act to close new digital gaps*

Not all students will have access to digital resources at home or other places for several reasons. In the most advanced countries there are PCs in close to 100% of the homes, but there are still some homes

---

[13] The study of the impact of technology in primary schools (STEPS) provides a detailed picture of national ICT strategies and their impact in primary schools in the 27 countries of the European Union, as well as in Liechtenstein, Iceland and Norway. Funded by the EU Lifelong Learning programme, this study of ICT in Europe's 209,000 primary schools was undertaken by European Schoolnet (EUN) and Empirica GmbH, with the support of national correspondents, researchers, policy makers, teachers and pupils in 30 countries.
For more details, please see: eacea.ec.europa.eu/llp/studies/study_impact_technology_primary_school_en.php.

without. Some will not have access to the Internet (or broadband) due to where they live or their socio-economic status. Schools will need to provide these students with the opportunity to develop digital literacy.

3.3 Theme 3: The use of digital media and individualisation of learning– the learner at the centre

Main messages

ICT and learning environments can lead to greater personalised learning whereby individual learners take greater responsibility for his or her own learning. In this scenario, the teacher/trainer becomes a facilitator. This allows each learner to work at their own pace depending on his or her stage of development and readiness to progress. This is a learner-centred model, based on the individual preconditions and needs of each student and demands a change of culture by the teacher/trainer facilitating learners along different pathways of self-directed learning. Personalised learning environments provide scope for reaching those in society who for some reason or another have been 'hard to help'. These include adult learners, lifelong learners, migrants and early school leavers. In the personalised space of tomorrow's education and training digital media will be created by a variety of authors, including the teacher, the learner and materials that are produced commercially. Teachers are a potentially very rich source of digital content. In many instances they are beginning to share and collaborate within and across schools.

- The use of ICT as an obligatory teaching and learning aid can be integrated into the curricula for almost every subject. It is not sufficient to teach the handling of digital tools as students have to learn how to learn with the help of ICT.

- In teacher education and in-service-training teachers have to become familiarized with a broad variety of teaching methods and especially learning processes which gain from embedding digital media. Learning becomes more open ended in contrast to today's trend to be more standard oriented.

- Individualised learning encourages teachers/trainers and learners to collaborate. ICT provide good tools for co-operative working methods in learning. Individualised learning allows learners to take their own experiences into the learning processes (instead of externally defined).

- ICT-based learning can benefit from the immense pool of content to be found on the Internet, but cannot be based only on that. Subject-oriented and didactically organised, purposeful and bespoke digital content is indispensable. The demand for pedagogically developed software is so basic that nationwide strategies for the supply of professional products are necessary.

3.3.1 Bottlenecks and challenges

Many teachers/trainers still refrain from embedding ICT into their classroom activities. Numerous other teachers, however, have risen to the challenge of embedding ICT into their repertoire of teaching approaches. They recognise the vast pedagogical potential of ICT in education & training, and use ICT daily in their teaching and learning programmes.

- Learning environments are at an early stage of development and need to become more integrated in the life and work of most schools.

- The educational purposes of online pedagogies are not well known. They can support a range of independent work and they can promote blended learning, that is a combination of face-to-face sessions and online learning.

- Some teachers have made the first step towards e-maturity and are using ICT purposefully to teach. The next required step is to let the learners use ICT in their classroom.

- School graduates should have basic e-skills necessary for competent and effective participating in the knowledge based society.

- Fundamental is the ability of learners to set motivating individual learning objectives and to direct the studies towards achieving the objectives.

3.3.2 Scope

The positive impact of ICT on learning and teaching, and on pupil motivation is well evidenced. The individualisation of learning or personalised learning is supported successfully by ICT solutions.

Students have to be treated as subjects who participate in learning processes. Interactive teaching approaches using ICT offer all learners the opportunity of learning by doing. Active learning approaches help develop positive self-esteem and prepare learners for LLL.

> *"The individualisation of learning or personalised learning is supported successfully by ICT solutions".*

Given the ubiquity of ICT there is no longer a need to justify the necessity to teach how to use ICT skilfully. For the last quarter of a century, EU Member States have invested in ICT infrastructure for schools and have provided pre-service and in-service training to teachers in the area of ICT.

The changing role of digital media owes a great deal to the "rediscovery" of pedagogical concepts such as the German "Reformpädagogik" which was developed at the beginning of last century. With personalised learning approaches, pupils are no longer objects who are instructed according to a prescribed curriculum. In contrast, pupils can now actively participate in their personal education.

With the increasingly heterogeneous classroom ICT and learning environments can lead to greater personalised programmes suited to each learner. This approach can permit each pupil to work at a pace appropriate to his or her stage of development and readiness to progress. In this way the individual learning needs of different students can be catered for through tailored ICT solutions.

Personalised learning, supported by meaningful ICT solutions, has many benefits. One of the most obvious is the emphasis that can be placed on formative assessment approaches. There are many programmes available that give immediate diagnostic feedback both to teachers and pupils, and

> *"The cultural change issues whereby a shift in the traditional teaching paradigm will give way to effective blended learning approaches and leading to more enriching learning and teaching experiences for all".*

guide them in their mastery of skills and knowledge in a range of subjects. In this way the teacher can monitor the progress of the individual learners and set smart targets for each pupil to achieve; often this has a positive motivational effect on the learner leading to better outcomes.

Pupils and teachers can gain immensely from the successful use of learning platforms. Pupils can work from home or in school and follow online courses. They are able to submit their work electronically and take part in discussion forums. Collaborating with pupils from other schools and other countries broadens their horizons. Pupils personalise their own space and upload their own information.

For teachers, a learning environment enriches methodology and enhances and extends the pupils' experiences. By designing suitable online courses and devising interactive tasks they can monitor and track pupil progress.

For the administrator a platform can facilitate communication between school and home and between administration and staff. It also helps all stakeholders to be more responsible.

3.3.3 Key lessons learned

The above developments place high demands on learning environments. They need to be flexible enough to allow decisions to be made about the variety of content and learning paths while ensuring reliable learning results. Hence, it is not surprising that individualised learning is entering schools only slowly. Moreover, teachers need to adapt to the new demands associated with individualised teaching and learning methodology, at least at the beginning. They need to rethink and reshape their role, making the transition from instruction to individualised teaching. The transition to individualised teaching/personalised learning implies a reduction in the traditional role of the teacher as imparter of knowledge. The teacher at least partly hands over his / her role

> *"The importance of raising not only the awareness but the skills of teachers and leaders for embedding ICT into educational practice".*

as imparter of knowledge to third parties, mostly media. But teachers still play an important role in deciding upon appropriate media and learning environments with reference to the individual learning conditions of their pupils.

Individualised teaching implies that the teacher needs to be able to diagnose pupil strengths and weaknesses. Only if the teacher is able to assess the learning opportunities of pupils correctly and reliably, can he or she prepare the learning process in a way that empowers pupils. The ability to diagnose is needed both for monitoring the learning process as well as assessing learning outcomes. The more individualised learning there is, the less a teacher can rely on uniform assessment systems. Hence, assessment systems need to become more diversified too.

Of course, the proposed transition to individualised learning can also be achieved without the assistance of digital media. Indeed, concepts of individualised learning were produced in a time when computers did not exist. However, the many ways in which digital media can contribute to individualised learning makes its use self-evident.

- *Continual monitoring and assessment of learning outcomes*

There is a large range of computer-assisted and online tests that assess pupil learning outcomes.

Many schools and institutions have also invested in educational software programmes. The individualised nature of the computer programmes, the immediate feedback on the correctness or otherwise of their responses, along with the visual and auditory dimensions of the software serve to motivate the learners; they enjoy the programmes and teachers report that it improves their concentration and confidence.

These programmes allow for the monitoring and evaluation of individual performance data. A critical factor in the use of such programmes is the ease with which teachers can quickly establish a baseline position for the learners and therefore monitor their progress over time against recognised benchmark data. Learner under-performance is immediately identified and intervention strategies to improve learning and achievement are implemented. Such software facilitates access to the 'value added' input from the school and the setting of targets for improvements on an individual, year group, subject or whole-school basis.

The use of e-portfolios for and by pupils is another trend. Portfolios document achievements and progress in pre-defined areas of competence. They are excellent tools to document the educational career of a learner in different subjects and over the years. Learning Management Systems (LMS) can be used for portfolios as they encourage learners to provide evidence for their stated competences. They can generate a formative profile and a career entry profile. This is an ICT based method of tracking learner progress through the recording of evidence. In addition, e-portfolios are essential for the professional learning of teachers and for the creation of communities of professional practice.

- *Towards more pedagogical innovation with self-directed learning and teaching*

Good use of a variety of media (podcasts, texts, video-clips, live discussions) by pupils can support their learning and provide a deeper knowledge and understanding of content and concepts.

The use of interactive and multimedia software differs across and within member states and schools. Countries that have a tradition of self-directed teaching and of steering pupils towards independent learning methods tend to find it easier to take advantage of the opportunities offered by digital media, compared to countries where teaching has traditionally been more teacher-centred. However, the potential of digital media for self-directed teaching and learning, and for contributing to the overall aims and targets of LLL, is immense.

Digital media is a good tool in all stages of individualised teaching:

- It produces a thorough understanding for problems and issues by illustrating them

- It motivates pupils to find solutions to those problems

- It offers information and ideas as to how problems can be solved

- It supports subject-related cooperation and communication among pupils as well as between pupils and teachers

- It helps record and present learning outcomes

- It can be used for assessing progress (diagnosis).

The pedagogical advantages of digital media can be illustrated by the following examples:

- *A multimedia-learning environment that offers pupils an adequate range of opportunities and assignments, allows them to pursue different learning paths based on their background, individual pace of work, and motivation. This helps pupils achieve greater self-confidence and self-esteem.*

- *In contrast to printed text, hypertext can offer information in a dynamic and flexible way. The links embedded in the text offer readers the possibility to approach the text in an individual way and to build on their competences.*

- *Interactive models and simulations allow an active and exploratory introduction to a topic. They help formulate and confirm hypotheses, thus extending pupils' competences.*

- *The use of Internet-based Learning Management Systems offers new learning opportunities: Internet-based cooperation means that teamwork obtains a new dimension. Pupils who cannot attend class due to unforeseen circumstances can participate via the Internet, thus learning in the same learning environment as their classmates. They can be interactively – and possibly asynchronically – supported by the teacher.*

- *Internet research slowly contributes to building up strategic and methodological knowledge (successful search strategies) while promoting learning to learn strategies on the part of the learner.*

- *Using digital media to document and present results and problem-solving strategies accommodates individual preferences as to how to shape and express them, as they offer a myriad of processes and tools.*

These examples illustrate to what extent digital media support individualised teaching and help accommodate the heterogeneous classroom of today's world.

- *Appropriate learning environments (and content)*

Learning and teaching through the use of ICT requires suitably designed digital content. School leaders, together with local authorities, are called upon to take measures with regard to resources, classroom organisation and cooperation among teachers.

The provision of appropriate equipment, hardware, software and a suitable platform are necessary pre-requisites for the successful integration of ICT into the school development planning process. Teachers are a potentially very rich source of content and the challenge is to create the circumstances and the motivation for them to share and collaborate within and across schools. Movement towards this sort of collaborative working is already beginning with schools and colleges set up and relying on collaborative working and sharing learning platforms. Nevertheless teachers should not systemically be burdened with the production of content.

In many Member States, media from publishing and media houses are complemented by media from public media centres. Education policy needs to systematically support this process.

- *Learning to learn with digital media*

The use of ICT as an obligatory teaching and learning aid has to be integrated into the curricula for almost every subject. It is not sufficient to teach the handling of digital tools, learners have to learn how to learn with the help of ICT.

The use of digital media promotes personalised self-directed learning, which in turn contributes to enabling pupils to engage in life-long learning. Interactive, not exclusively receptive use of digital media, under the professional supervision of teachers, requires pupils to develop media competences, both in terms of methodology and content. On the one hand, the continuous dynamic development of digital media requires that the user learns new skills. Successful adaptation to change strengthens a pupil's self-confidence and their willingness to tackle new subjects and topics. On the other hand, the ever increasing variety of information available online means that a pupil has to develop strategic and methodological knowledge in order to be able to select and use relevant information. By working with digital media, pupils become aware and experience for themselves how important it is to continually develop skills and competences, i.e. engage in lifelong learning.

- *In-service teacher training*

In education and in-service training, teachers have to become aware of the interaction between pedagogical objectives and the potential of ICT to support them.

Individualised teaching and learning means preparing learning environments, monitoring individual learning processes and assessing a group's learning outcomes. These tasks require in-depth teacher training, pre-service as well as in-service.

3.4 Theme 4: Teacher education and training – a change of mindset

Main messages

Turn digital competences into a key priority in teacher education & training. Teacher education and training (pre-service, in-service and mid-career) is central. However, it can also be the core bottleneck to the embedding of learning digital competence in education and training. Teacher training in all fields should include advanced digital competence, not concentrating only on the ICT user skills of teachers. All the teachers should be involved from the earliest education levels and in-service training courses for advanced digital competence and e-learning methodologies should be introduced. The training should consider aspects of using ICT both as a learning tool within subject teaching and a tool used by learners for their coursework outside school settings.

Learn 'critical' and 'quality' use of digital tools within context. Learning digital competence should include the development of a critical attitude to the digital media when using it. Teachers and trainers of all fields and disciplines should be confident and competent in these skills in order to encourage learners to use ICT for their learning in a critical and creative way within different subjects, when searching for relevant information, evaluating the reliability of online information, IPR aspects, critical attitude in publishing online content. Teacher education and training should bring teachers in touch with practice and hands-on experiences and resources that closely relate to their daily needs.

Encourage innovative learning approaches. Innovative teaching and learning approaches with ICT can be developed independent of the subject, in order to put learners at the centre and engage them actively in the learning process, promoting discovery and experiential learning, problem solving skills, etc. At the same time these aspects bring forward skills relating to digital competence, such as online collaboration with confident and critical use of the digital tools. Initial and in-service teacher training should disseminate insights and encourage teachers to use ICT more effectively in teaching and learning and in all school related activities.

3.4.1 Bottlenecks and Challenges

- Teacher trainers were socialised in different learning environments and adopted different teaching styles. Their expert knowledge is partly outdated and is no longer compatible with the requirements of learning and teaching in the 21st century. This also applies to qualified personnel for new media who often fail to grasp the digital space with all its opportunities.

- Education has been slow to introduce a job description for new teachers listing all necessary qualifications and to demand compulsory requalification for in-service teachers.

- Sabbaticals and exchange programmes which would give teachers time to get experience in other fields of work, in foreign countries, other school systems or courses for requalification are exceptional and not regular practice.

- Infrastructure in schools with well-equipped workplaces and e-tools for teachers do not have a system wide outreach. In addition there are only few incentives to promote e-work at schools among teachers.

- At the moment teachers usually do most of their preparations at home due to inadequate ICT infrastructure at school. If teachers are encouraged to spend more time at school, with their learners, they must be given adequate working conditions. This also includes an extension of the workplace into the virtual space. Services dedicated to teachers should be developed and offered to teachers to increase their commitment to apply new learning tools.

3.4.2 Scope

Embedding and integrating ICT in education and training is a slow but steady process which has to be approached through global and holistic strategies. Mainstreaming ICT in education and training has to take place on all fronts and requires global and large scale planning, decision making and actions, increasing access through infrastructure, use through content development and professional development, and quality of use through teacher guidance. A variety of actions is needed: blended learning content, development models, more demanding infrastructure, decision making and leadership, and quality of education staff.

> *"Embedding and integrating ICT in education and training is a slow but steady process, which has to be approached through global and holistic strategies".*

The education and training of teachers and trainers is of utmost importance. Teachers of all subjects must work towards becoming media "literate" as this set of skills is also one their learners need to acquire. Thus the focus of teacher education and training must be placed on teaching approaches and methodologies rather than on technical details and how to operate specific applications. Teachers confronted with an approach oriented solely on technology are often scared away and may feel inadequate, even out of place. Resistance against the use of ICT in schools may occur if teachers cannot understand why it matters to consider ICT in the classroom and feel patronised or overstrained. If questions on technology,

> *"ICT pedagogics and didactics are key for professional development of teachers and trainers".*

however, result from methodological requirements and an interest in software embedded in a given context and are not done purely for their own sake, a lasting effect can be achieved that encourages teachers to really take their new competences into the classrooms and to their learners.

3.4.3 Key lessons learned

- *First the basic ICT skills…and then critical and creative use of ICT*

Teachers are in general able to work with the most common software to help them with their work (research, writing documents, producing presentations, etc.). But few are able to deal with ICT tools inside the teaching and training arena.

Teachers need to be empowered for learning and innovation. A good way to introduce teachers to more ICT-based learner-centred teaching styles is to teach them in this way. We know from experience that teachers teach the way they are trained. The only way to get the teacher training colleges on board is to make ICT mandatory in initial teacher training. But there is also a need for incentives for individuals to take first steps.

Teacher training has entered a new stage, looking into the skills required and the use of ICT in creative and critical ways:

- How to use ICT critically for all kinds of subjects. The competence to use these technologies in a confident and critical way is essential to any further integration of new technologies in learning and teaching

- The added-value of ICT as a teaching tool

- New forms of communication (outside the classroom)

- … And then the next step to take is teaching approaches using ICT pedagogies, learning environments and digital media

> **An example: European Pedagogical ICT Licence – EPICT**
>
> *Austria chose to introduce a teacher-training programme in cooperation with EPICT, the Danish model for distant in-service training. As the label EPICT suggests, this training focuses entirely on pedagogical and didactic questions.*
>
> *For a year on average, teachers participating in an EPICT course set a few hours per week apart to work together with two or three colleagues on learning materials provided by the EPICT office, directly at their schools,*

> *at their workplaces. In groups, teachers study and discuss the materials for every module and then design a learning sequence. In contrast to the Danish model, Austrian teachers additionally have to try out their planning in class and include a reflection about the lesson(s) in the assignment report.*
>
> *EPICT ensures a lasting effect on teacher and school development by placing the learning directly into the environment of the participants. Teachers do not attend seminars far away from the school but meet and discuss, try out and reflect amongst their colleagues. Their achievements can be witnessed by other teachers and thus they might spark off further development at their schools. By preparing and trying out actual lessons, an authentic learning environment is created which prepares teachers for the real situation in the classroom instead of leading to wrong expectations, either positive or negative.*

- *Listen more carefully to the needs of the teachers and trainers*

Perhaps the huge difficulty that teachers and trainers experience would be in changing their professional paradigm, shifting from the teacher-centred approach to the learner-centre approach, has so far been underestimated. The changes in teaching style necessary to take full advantage of ICT for learning may be difficult to accept by teachers and trainers.

We need to take greater account of the problems and dangers teachers and trainers see in integrating ICT in their teaching. If teachers are asked, the first problem they see is security. Actual teacher training does not start from these users' concerns. In other words, teacher training should start from direct need. Happy slapping, cyber bullying etc. creates resistance to ICT.

These needs are fulfilled in Austria by the e-LISA academy, a virtual teacher training institution providing online seminars for teachers. Usually teacher training in Austria is taken care of by the "Pädagogische Hochschule" (pedagogical universities), which organise seminars and courses teachers may attend in person. Teachers submit certificates for completed courses to their superiors to document their training. The e-LISA academy cooperates with the "Pädagogische Hochschule" to issue the same type of certificates. Online learning therefore receives an official status within Austria's teacher training system and becomes visible also to those people working in the educational sector who do not realise the potential of cooperative online learning immediately.

More than 10 years ago, e-LISA academy courses consisted mainly of self-study material that led to a final assignment, which had to be completed in order to earn a certificate. These courses were adjusted to the needs of specific subjects and so teachers could extend their knowledge of teaching English, German or mathematics using new media. In 2006, the complete course system of the e-LISA academy was reformed. Today, the self-study tutorials are mainly used as reference materials rather than as courses. Instead, cooperative online seminars were introduced. They are characterised by a specific timeframe between one and four weeks, by collaborative work among the participants and by the support of a qualified tutor who helps the participants to achieve their learning objectives.

Today's online seminars cover a wider range of topics than the earlier online tutorials. E-learning and e-didactics are still central themes running all the way through the seminars, but there are also courses about how to cope with conflicts in the classroom or how to organise school events, for example. Thousands of teachers have successfully completed cooperative online seminars so far and many take part in more than one. These observations show that e-learning has moved slightly from the peripheral in the teacher's perception towards the centre and is now considered an accepted and common method for teacher training.

Apart from that, technology supported teaching in schools often is still made difficult by the fact that not all learners have access to a computer or the internet all the time. The ideal situation would be one computer for every learner, at school as well as at home. This is crucial for making teachers see the potential of new, innovative teaching and develop fresh and imaginative learning scenarios.

- *Teach the teachers in a more innovative way*

It is easy to build infrastructures and buy equipment but to change one's teaching style is more difficult. Teachers need to be familiar with new pedagogical concepts and their use in an ICT context. Current trends in education suggest that many learning platforms and learning management systems are designed along the socio-constructivist and collaborative learning approach. However, experience

shows that teachers are more familiar with traditional pedagogical and didactical methods and therefore will need support for change.

Initial and in-service teacher training should encourage innovative learning approaches. ICT didactics should be developed for innovative pedagogical approaches through trials, pilots, and experiments among teachers. Special training environments, training schools, where teacher trainees and their instructors may try out new approaches and experience for themselves what it means to teach and learn in the 21st century should be set up. Universities are key partners in this respect for accompanying and evaluating experiments and innovations scientifically.

Teachers shall be introduced to the blended learning approach of delivery of education, combining technology based materials and face-to-face sessions. Combining professionally produced and self-produced content by teachers will be an important task and open source materials should be identified.

Learning objectives and outcomes should be changed to reflect skills training and the acquisition of competences. In order to guide the learners towards the achievement of learning objectives and outcomes; theory shall be combined with practical examples from the area. This will lead to a change in the style of examining and assessing learner performance, with an impact on the whole education system. This will be a challenge to be addressed by key decision-makers who are still influenced by their own outdated experience as learners.

- *Next to formal in-service and continuous teacher training, the most important is informal learning*

It is the way our kids learn – watch them and see the behaviour of the "digital natives". Experience suggests that the take-up rate of ICT by children through informal learning is high. However, there are no indications on the quality outputs of their learning. Education experts will need to investigate how teacher training might benefit from new and informal approaches to learning.

The PLAs have demonstrated interesting and very good examples of bottom-up developments stimulating engagement and involvement, and of peer learning approaches with coaches and buddies:

- eBuddy training (one-to-one training): creates a comfortable atmosphere in which to learn. The initiative has a high success rate with contacts continuing after the training is completed.

- Blended learning resources: blending of professionally produced and self-produced content. Professionally produced software is very expensive, self-produced content does not always exploit the opportunities of ICT. Blending is a solution.

The eBuddy concept, in particular, may provide a lasting effect on teacher development due to its low threshold approach. eBuddies are teachers who are experienced in the use of ICT in the classroom and who are willing to share their experience with colleagues, who might not feel competent enough to cope with difficult situations. eBuddies offer a personal training focused on the trainee that is based on two important aspects: participation in each other's lessons (trainees may get inspiration by attending the eBuddy's lessons and eBuddies on the other hand may help trainees with their first steps in technology supported teaching) and the creation of a learning sequence together.

This one-to-one training concept creates a comfortable atmosphere in which teachers may learn and develop further by directly trying out new ideas in the classroom instead of discussing them in seminars far away from their schools. eBuddy training may extend over the period of eight weeks, then a standardised report has to be submitted by the eBuddy, which provides the basis for further scientific studies. The eBuddy concept provides an opportunity to reduce anxieties, to introduce teamwork at schools, to make teachers familiar with sitting in on classes and giving and receiving feedback. The key to success is an approach based on many small steps that give teachers the chance to gradually adapt their methods and teaching style.

An example of a handbook for teachers by the European Training Foundation: Harnessing new technologies for quality teaching and learning in the MEDA Region

The regional MEDA ETE (Education and Training for Employment) and its project component on "eLearning for

teachers and trainers in the MEDA region" focuses on developing methodological and pedagogical capacities to enable teachers and trainers not only to use new technologies in their everyday working environment but also to develop practical experience to make teaching and learning more flexible and closer to the trainees' needs.

The strong points of the project consist in having developed a distinctive course with the support of high level experts and the teacher training institutions of the MEDA countries concerned. Particularly, the institutions have cooperated in filling in the training needs analysis that served as a basis for the course design and for the development of the course curriculum, which touches, in a comprehensive way, the whole system of learning.

The course brings the teachers and trainers through the different stages of how to design, develop and deliver an online course with a strong emphasis on collaborative learning. The learning process is supported by tutoring actions that support learners while creating trust and confidence in the new learning methods. In addition to providing direct support through the platform, teacher training institutions in the country are committed to providing support to and motivating trainees during course implementation.

It has been decided to adopt a blended learning approach for course delivery, combining multiple approaches to learning with particular reference to technology-based materials and face to face sessions. The idea at the project's start was to focus on online training (through the online platform) interspersed with face to face meetings with the trainees in the countries and regional events. During course delivery, however, it became clear that trainees demanded more face to face meetings and stronger online tutorial support.

As is often pointed out by teacher training institutions, and as is often the case in e-learning, it is difficult to sustain the motivation of trainees, avoid drop-outs and promote 'drop-ins'. With the aim of overcoming this difficulty, country-specific virtual meetings were organised to gain a better understanding of the major difficulties from trainees, to provide them with ad hoc support and to motivate them for the phases to come. In addition, additional face to face meetings in the countries took place. Along with these ad hoc activities, online tutoring support has been reviewed and a revised plan for tutoring actions has been put into place to strengthen regular support to trainees. Teacher training institutions in the countries have collaborated by providing continuous support through monitoring of trainees' progress and organisation of specific training sessions. These measures have led to the successful completion of the course with 130 out of 150 trainees eligible for the final certificate.

3.5 Reinforcing the evidence base and research on the use and impact of ICT for learning

Main message

Research should provide answers not only to all currently recognised major problems but also proactively develop new solutions and pedagogies for the effective application of emerging technologies.

Research communities should be expanded with representatives of all stakeholders including learners.

The bottom-up initiative of researchers should be adequately supported by top-down legal and financial instruments.

3.5.1 Bottlenecks and challenges

- Research in learning and use of ICT in learning is fragmented and research groups are often not sustainable;
- Permanent research clusters or networks and centres of excellence are needed for long-term development;
- Lack of resources for PhD studies and high level research, in particular for international comparative research;
- Project based nature of research hinders long-term systematic research, monitoring and impact assessment;
- Knowledge transfer from research to practice is insufficient.

3.5.2 Scope

Educational processes have been profoundly changed during the last two decades: instead of textbooks and blackboards as the main tools and classroom teaching as the main form of education, different learning environments, tools, communities and pedagogies are currently available for every single learner; most of these new features are supported by ICT. Consequently, the role of self-direction of learners in planning and performing learning activities independently as well as the complexity of the whole learning ecosystem has increased tremendously.

> *"The impact of ICT and digital media for:*
> - *the consolidation of learning and teaching. Engaging learners, enabling them to take part in distance and group work as well as independent learning;*
> - *the curriculum and the creation and storage of resources to be accessed online;*
> - *supporting assessment, lesson planning and personalised learning;*
> - *collaboration and discussion forums and blogs that develop professional communities of learners and the sharing of materials;*
> - *professional development of teachers and trainers;*
> - *leadership development, the effective administration of institutions and the management of pupil information through e-portfolios;*
> - *supporting parents in helping their children's learning".*

The ICT cluster meetings and PLAs were an opportunity to take a closer look at and discuss and generalise good practice. The report "Mapping of Recommendations", approved at the ICT cluster (Group C) meeting on 19 November 2004, formulated four key recommendations including "develop research, establish new indicators and provide access to results".

The members of the ICT cluster provided the EC with support and advice on how to gather further evidence on the use and impact of ICT for learning. The Commission Staff Working paper "The use of ICT to support innovation and lifelong learning for all – A report in progress"[14] resulted directly from the need for further evidence and has been extensively discussed; it also identified the need for a comparison of different solutions across different countries. The PLAs provided such a meeting space for sharing evidence, learning and examples of ICT educational implementation in different European countries.

3.5.3 Key lessons learned

The following recommendations were made by the ICT cluster to improve research and implement the results.

- *Encourage more transnational research on the impact of ICT in education and training*

The PLAs have gathered evidence relating to the impact of ICT on learning outcomes, teachers and teaching that has largely arisen in national contexts. However, these findings cannot as such be transferred to other parts of the country not to mention to other countries or contexts. There is also a geographical imbalance of national evidence of ICT impact across Europe. Either there is a lack of relevant research and/or the research is difficult to access because of language, expensive access to publications and fragmentation of research. Many of the findings relate to the United Kingdom and the Nordic countries.

Consequently, there is a need to obtain a more comprehensive and balanced overview of the situation in Europe. International comparisons should move beyond baseline data and give more qualitative insights into ICT use by learners but even more by teachers. Mechanisms at European and national levels are required for disseminating the results of such research, e.g. set up a repository of abstracts of national, European and international research.

The extensive work under the Lifelong Learning Programme (2007-2013) on new approaches for measuring the use and impact of ICT in primary school education such as through the "Study on Technology's impact in primary schools" (STEPS)[15] by Empirica and European Schoolnet and the European-wide collection and analysis of indicators through "Study on Indicators on ICT in Education" (IIE) by Hans Pelgrum are very much appreciated. However, the ICT cluster would like to see this

---

[14] SEC(2008) 2629 final
[15] insight.eun.org/ww/en/pub/insight/minisites/steps.htm

research expanded towards all learning areas in the lifelong learning area. Research must also tackle the policy issues. It would be useful to have a study of the official ICT policies in the different countries and compare the educational goal they are pursuing regarding the integration of ICT.

- *Intensify research on the phenomenon of ICT for learning*

The growing relevance of the use of ICT in mainstream education and training, and the increasing acceptance of the potential of new technologies to affect learning systems have brought attention to the scarcity of reliable quantitative and qualitative information on the Learning phenomenon. This is hardly surprising, given the nature of the two components of the 'e-learning mix': ICT, as one of the fast changing components of our society, and education, a recognised slower adopter of change. Furthermore, observation exercises[16] have led to the conclusion that today there are at least as many e-learning options as the different learning sub-systems (school, higher education, vocational training, corporate professional development, adult learning, informal learning). And finally – the collection, analysis and production of information on e-learning – using different methodologies and providing different outputs in terms of timing, geographical coverage and target users – would offer input data for research and for development of true innovations.

Observing the progress of e-learning in the upcoming years, assessing these tendencies and taking account of the e-learning dimension in larger foresight exercises on the future of education and training in Europe, require further efforts by both Member States as well as the Commission. Any new tool, method or idea deserves investigation so that it is better understood and implemented. The 'Learnovation' project[17] under the Lifelong Learning programme is certainly a step into this direction.

- *Merge research and research based development*

Universities are traditionally engaged mainly in research and the education of learners. Practical development of e-learning tools are often made during learner course work or during projects; permanent university staff for development work is in most cases non-existent. Even if a research-based working prototype is developed, it often remains a prototype. And if a solution is to gain wider popularity, it will need to be commercialised (example: WebCT). However, theoretical solutions not fitting into the business model of commercial software companies will not be implemented at all. This problem became apparent after free and open source software (including different social software services) started to spread in educational institutions. As a bottom-up initiative, several voluntary communities are contributing to the development. However, for effective and focused development, much more support is needed. Although university-enterprise cooperation is encouraged and supported in many countries, it only became a reality when it served the interests of enterprises. Therefore, the universities should get better opportunities and *resources* to develop innovative e-learning solutions themselves.

> **The Tiger Leap Foundation**
>
> *The Tiger Leap Foundation, Tallinn University, and the Estonian Educational and Research Network company EENet are partners in a complete life-cycle of educational software: based on a national ICT in education development plan, the foundation orders (and finances) the development of educational software; Tallinn University does the necessary research and develops the software; EENet distributes the software and provides user support.*

- *Intensify knowledge transfer from research to practice*

---

[16] Such as, amongst others: eWATCH, L-change, DELOS, HELIOS, POLE and LEONIE projects.

[17] 'Learnovation' is a consensus-building operation aiming at refreshing the European lifelong learning agenda by aggregating interest of the major EU and national actors active in education and e-learning (in the form of a Stakeholders Round Table) around a new shared vision of innovation in learning, that embeds ICT for learning as well as lifelong learning in a comprehensive and future-oriented perspective.
Link: www.elearningeuropa.info/learnovation

The existing gap between educational research and teaching practices is a major obstacle to innovation. The life-cycle of research usually ends with the publication of the results. As the research is predominantly rated (and financed) according to the number of publications, the incentives for 'translating' research results into practical solutions, as well as for dissemination and their exploitation, are weak. And even if R&D investments lead to pilot projects, the results are often not sustainable in the regular funding scheme and they stop after project completion. On the other hand, practitioners who could contribute to collecting necessary empirical data and implement research results do not have enough incentives either. Therefore, new organisational and financial models for creating and running interinstitutional and interdisciplinary competence centres are needed. The extent and quality of ICT application in teaching and learning depend mainly on the school teachers and school educational technologists. It is crucial is that both teachers and educational technologists are already involved with research communities during their university studies; teacher education has to be research based, hence responsibility for that clearly lies with the universities.

Successfully pursuing the last two recommendations would contribute immensely to solving the knowledge triangle problem – bridging the gaps between research, education and innovation.

4. Envisioning actions for the future of learning in Europe

The future of ICT for learning has been one of the crosscutting themes of the various ICT cluster meetings as well as the PLAs. The cluster acknowledged – together with other institutions such as the OECD and JRC-IPTS – that a certain disappointment amongst policy makers on the contribution of ICT to education has emerged during the last years. It is argued that a renewed vision and strategy is needed around ICT for learning whereby Education and Training has clear responsibilities and roles to play. The cluster has identified a set of essential actions and building blocks – structured around the key themes of this report – which can contribute to building up such an updated and reframed discourse. These are described in this section.

4.1 Theme 1: Leadership and institutional change for a renewed strategy on learning

ACTION 1: Develop open and inclusive policies enhancing full integration of ICT in education and training in Europe

Existing education and training institutions were designed largely in the 20th century to meet the economic needs of the industrial economy. In today's knowledge society, however, learning occurs in more complex individual, collaborative and participatory organisational settings. People and organisations increasingly learn and innovate using open-ended group processes enabled by ICT.

Policies on education and training have to follow these major changes in society and the economy, in particular by developing 'ICT for learning' policies closely linked to education and training policies.

The fundamental role of ICT policies in education and training was already stressed in 2003 by the ICT Working group (Group C). The Working group developed a methodological framework for analysis of educational ICT policies. Based on this framework, 14 good policy examples were selected and published in the 'Report on Mapping of Recommendations' (2004).

These showed how important it is that ICT for learning is fully absorbed and embedded in the policies and the culture of the institution/organisation and its environment. The potential of ICT as a catalyst for change towards novel learning approaches and systems can only be realised if ICT for learning is embedded in social and institutional change. Therefore, open policies are needed to make full ICT integration in the education and training a reality.

ACTION 1.1: The policies on 'ICT for learning' should be based on long-term educational objectives and become an integral part of the core educational agenda'

The policies should offer educational institutions the possibility to contribute more widely to lifelong learning and personal learning experiences in collaborative learning settings. It is vital to open and connect educational and training institutions to the outside world; to open the schools and libraries to local communities and working life; to make use of them as open training centres; and also as "community information points". National reform programmes centred on the integration of ICT and lifelong learning policies should be further developed and implemented in close synergy with the national and EU level instruments and programmes. Where ICT is extensively available and fully part of the overall strategy the benefits begin to take off. There may be a 'tipping point' when results do not seem to justify the investment, and then suddenly everything takes off and added value increases considerably.

Furthermore, this overall strategy needs to be developed and evaluated with all possible stakeholders. New indicators need to be developed for this purpose. Policies should therefore not focus on ICT alone, but include wider topics such as innovation and find instruments to capture and detect unexpected results and processes.

Replicating successful pilots from one setting to another has proved to be difficult. Therefore the policies need to be clearly embedded, articulated and more systematically planned and implemented. Areas where clear progress is seen should be recognised in legal, financial and other policy instruments.

Public-private partnerships have an important role to play. However, ICT in education and training policies should be linked, but not subordinated to industry / economic agendas that are defined outside education.

ACTION 1.2: 'ICT for learning' policies should be coherent, dynamic and holistic

It is clear that a lifelong learning and inclusive perspective will drive long-term policy development, and lead to the integration of educational systems with other environments available for learning. In a scenario in which there are separate policies (for example for compulsory education, for tertiary education, for digital learning resources, for ICT infrastructure, for teacher training etc), these policies and implementations should be coherent and balanced.

Particular attention needs to be paid to the relationship between the policies along territorial dimension (European, national, community, school), in order to ensure that the diversity and compatibility of cultures is always reflected. Education and training as an instrument for forming national and cultural identities should rely on already existing achievements, traditions and aspirations of a community.

It is also becoming obvious that for every Euro spent on ICT infrastructure another Euro should be spent on training and a third one on providing educational resources and software. Because of rapid technological innovation the policies should stress interoperability solutions from the beginning and be flexible enough in order to accommodate new developments; one should not forget that the information society calls for fundamental changes in education and culture, and that educational vision is in fact a moving target.

ACTION 1.3: Policies and their implementations should be based on sound research and evaluation

Although evidence and research exist on the impact of ICT on learning, it is argued that further studies and evidence of good practices and experimentation are needed for the development of sound policies. Quantitative data from large-scale national studies should be complemented with qualitative data arising from smaller scale studies or research projects. Large-scale international studies examining the formation of a common European learning space are also needed. The follow-up indicators need to be re-defined for continuous monitoring and allowing more automated and up-to-date means to collect the data. The overview of the different research outcomes already achieved and good practices can help policy makers to decide on a more specific national approach suited to their educational culture, goals and context. Both national and international (UNESCO, OECD, IEA, etc) studies should be taken into account.

However, policy makers should consider the following: measuring the influence of ICT against learners' attainment and improvement in their basic skills is one way of impact assessment, but one which assumes a fixed and closed education system in which school learning is primarily about mastering a pre-determined body of knowledge, skills and understanding. Today, information and communication technologies are very versatile and can be used in a variety of ways and purposes; the benefits and impact of ICT therefore vary likewise.

ACTION 1.4: Drop the "e" in e-learning – It is about learning in a digital and networked society

In the current society with changing jobs and skills needs, more voices are pleading for continuous and more profound reforms in education and training as a response to rapid societal, technological and economic changes. There is an increasing demand to identify new future skills for future jobs (e.g. the EC initiative 'New Skills for New Jobs and OECD's studies on 'New Millennium Learners'). Online and

mobile spaces and communities are fully part of the daily life of today's learners. These non-formal learning environments remain too often disconnected from the formal learning environments.

Based on a detailed analysis of the main trends, challenges and future issues to be addressed in the domain of ICT for learning, the Commission recommended that it was timely to build up a renewed vision for learning[18]. Other international organisations have in the meantime also been pleading for a change in discourse around e-Learning, i-Learning, or in general ICT with and for learning. The OECD[19] for instance, strongly pleads for a reframing of the initial unmet expectations on the potential of technology in education while recognising that technology has contributed to important contextual changes for education (OECD, 2009).

As we look towards the future, an exclusive focus on the impact of ICT for learning does not make sense as ICT will be fully embedded in everyday learning practices, both formally and informally. Therefore, it is suggested that we stop focussing on the "e" in e-learning but rather develop a rationale around learning and innovation integrating learning that occurs in formal, non-formal and informal contexts. Developments in open access repositories, social software and open source communities already offer opportunities for new collaboration, innovation and learning that can lead to renewed education and training systems.

ACTION 1.5: Bring the work on 'ICT for learning' closer to the work of innovation in education and training

In education, as in many other sectors, technology is expected to act as one driver for innovation. Recent studies have shown that innovation in education is seen differently by education staff than from a business economics perspective. There is a wealth of literature presenting impressive accounts of technology-based innovations in schools from the business perspective. There is a dearth of studies from an education perspective in the literature.

Some studies indicate that innovative teachers can best be described as learning experts, who continually explore and test new learning methods, act as peers or mentors in learning processes and are pedagogically inspiring. 'Research focus' is seen as integral element in everyday work and teaching methodologies .

The basis for 'new' teachers is laid in initial training. Teacher education should be upgraded to Masters level profession throughout Europe. Long-term investment in teacher training pays dividends in the long run. There are no shortcuts. Also, organisational culture has an important role to play in realising the full potential of innovative teachers and innovation in education and training. Still, in many European schools, learners are taught the way the teachers themselves were trained. A review of school cultures that allow innovation to take place can best be described as enabling and encouraging. In this context, a tradition of "facts and tests" lags far behind.

Web 2.0 technologies when used in pedagogically rich environment could lead to transformative changes in learning organisations and processes.

Innovation in education and training can only be expected if strategic leadership encourages new activity. Cultures that allow risk-taking are created. Open and fair dialogue with all stakeholders is facilitated and the teachers' work is valued and supported by education administration.

Ongoing research has been demonstrating that if a new technology is adopted in a context where leadership and processes are kept unchanged, technology may be found to be useless, if not obtrusive. The ICT cluster recommends investigating the explicit processes and relationships among technology, pedagogical strategies, psychological processes, and contextual factors in order to nurture innovation in education and training.

---

[18] Staff Working Paper on The use and Impact of ICT as an enabler of innovation and LLL, Work in progress, 2008

[19] Barbara Ischinger, Technology, education and the new millennium learners, (OECD, 2009). See www.OECD.edu.nml

4.2 Theme 2: Digital competences and new transversal skills as core life and employability skills

> ***ACTION 2: Make sure digital competences and new transversal skills are acquired by all, also including the most vulnerable and socially excluded people in society, through effective learning settings (formal or informal)***

Digital competences are one of the eight key competences identified by the European Institutions[20]. Digital competences involve the confident and critical use of ICT for employment, learning, self-development and participation in society. It is related to digital and media literacy consisting of the ability to access digital media and ICT, to understand and critically evaluate different aspects of digital media and media contents and to communicate effectively in a variety of contexts (IPTS 2008)[21].

Digital competence or digital media fluency are more than pure functional ICT skills. Although most learners go to school already equipped with technical skills, this alone does not make them mature and critical technology users. This does not automatically transform them into better or more effective learners. Moreover, in the absence of strategic planning of ICT in education and training, learners can hardly develop the competencies required to enhance their education by implementing these technical skills on their own.

Next to digital competences, new transversal competences are emerging in a digital society and economy. The increasing complexity of tasks and understanding needed for jobs requires developing transversal skills for collaboration, critical thinking, problem-solving, risk-taking, creativity and others. With the rise of new social technologies also new privacy, security and identity issues are emerging that people will have to learn to deal with.

It is therefore of the utmost importance that digital competence is clearly identified and operationalised and becomes an intrinsic part of the curricula, assessment and outcomes. The implementation of PIAAC (Programme for the International Assessment for Adult Competencies*)* to measure the digital competences of adults could prove a major step forward insofar that this is an attempt to develop new metrics for digital literacy linked to every day actions that require different forms of literacy.

However, formalised learning settings may not always be the most efficient and chosen settings for excluded and vulnerable groups of learners. Recent studies[22] and literature suggest that there is in fact insufficient knowledge about which type of approaches work best in terms of acquiring digital competences for different types of groupings. For the most vulnerable groups data suggests that education and training providers may not be those best situated to engage such groups in a transformational manner, and that models that engage community activists, NGOs in informal activities hold promising results.

Furthermore, learners are not only using computers; they also access other mobile technologies such as palm multimedia devices, notebooks, and mobile phones with Internet access. Nowadays, however, there is an increasing gap between the possibilities to use ICT at home and in educational institutions. It is important that learner's personal technology and space are linked with their academic lives. In this way, they can maximise the learning skills that they have gained informally by using these devices in- and outside school. Against this backdrop, educational and training institutions should be encouraged to develop a modern,

---

[20] The European Parliament and the Council (2006) recommended several topic-specific and transversal key competences which should be developed in order to support lifelong learning. (European Parliament and the Council, 2006)

[21] (IPTS, 2008) , Ala-Mutka, K., Punie, Y. & Redecker, C. (2008), Digital Competence for Lifelong Learning, JRC Technical Note 48708; Publication date: 11/2008.
ipts.jrc.ec.europa.eu/publications/pub.cfm?id=1820

[22] Digital Literacy Review (2008), European Commission Working Paper and Recommendations from Digital Literacy High-Level Expert Group. The report presents the outcome of the Digital Literacy Review undertaken by the Commission as part of the commitments made in the Riga Declaration in 2006 and in the eInclusion Communication in 2007 (COM(2007) 694 final). In the framework of this Review, 470 digital literacy initiatives across the EU were analysed together with the results of the digital literacy module of the Community Survey on ICT usage in Households and by Individuals. Original URL: http://ec.europa.eu/information_society/eeurope/i2010

technological environment in order to support pupils and provide them with the relevant ICT skills. Pupils are entitled to an educational experience that will equip them well in their life beyond school.

4.3 Theme 3: Towards a new learning paradigm

ACTION 3: Allow more learner-centred approaches

There is an increased interest in innovative practices with a focus on the individual learner, personalised learning paths, and on motivating and engaging the learner. Teaching and learning approaches considered innovative, are generally characterised as being "learner-centred", and "constructivist". The development of thinking and reasoning skills, skills for "learning-to-learn", and the ability to synthesise knowledge across the curriculum are emphasised. Teachers take on different roles, moving away from "front-of-the classroom" teaching to more active engagement in the learning process with learners; learners conduct their own inquiries (even small-scale research) and develop solutions. Teachers and learners may tailor programmes according to the learning needs and the interests of individual learners (OECD, forthcoming).

Research shows that ICT and in particular the recent wave of social computing technologies are strong enablers of more learner-centred approaches whereby learners are taking more control over what or how is learned, and when learning takes place. There are clear signs that this contributes to increasing the motivation for learning. At the same time, however, research shows that the learner-centred approaches only work if guidance from and interaction with teachers, instructors and/or other learners is planned for (IPTS 2009)[23]. Studies on early school leavers show that not all learners can cope with defining their own learning pathways and require more structured and guided approaches. Other studies on excluded and vulnerable youngsters show that 'personalisation' is effective if it is implemented outside the school structure through non- and informal learning. The real challenge is, however, to transfer and scale up these experiences into formalised learning environments. It is also vitally important that learner-centred approaches in education and training are implemented in a holistic and systemic way. For example, if learners are encouraged to work in interdisciplinary projects, to assess their own progress, then the final assessment should not take place discipline by discipline and through traditional testing methods.

4.4 Theme 4: Professional development – the teacher as learner at the centre

ACTION 4: Adapt teacher education and training as to embrace more open and flexible learning environments

Changing contexts need changing learning and teaching environments. The new generation of learners (sometimes called the New Millennium Learners (OECD, 2006, 2009) or digital kids (Worldbank)) are no longer the people traditional educational systems that were designed to teach in the 20th century, and their needs and expectations differ fundamentally. The learners of today live in environments where technology plays a crucial role. There is no reason why E&T should be excluded from this world. This calls for a renewed look into the type of physical and digital environments which will support the teaching and learning of 21st century skills and capabilities.

The continuing development of ICT skills among teachers is crucial to promoting positive educational outcomes for pupils. These ICT skills however, have to be accompanied by extending the range of approaches for teaching ICT and e-learning. Knowing when, when not, where, how and why to make use of the new technologies in teaching is crucial. ICT will as such become inextricably linked, integrated and embedded into all aspects of education and training and have a positive impact on learning processes and outcomes.

---

[23] (IPTS 2009) C. Redecker, K. Ala-Mutka, M. Bacigalupo, A. Ferrari and Y. Punie, Learning 2.0: The Impact of Web2.0 Innovation on Education and Training in Europe, EUR Number: 24103 EN, Publication date: 12/2009.

There needs to be further convergence is needed between the learners' use of their own personal technology and that available in education and training institutions. This implies that teachers and leaders need to keep abreast of the pace of change that is so naturally absorbed by 'digital natives'.

> **Learning Spaces**
>
> *In a foresight study by IPTS (IPTS 2006, Punie & Ala-Mutka, 2007)[24] for the European Commission, an interesting concept of 'Learning Spaces' was launched to describe the conditions for lifelong learning in the future Knowledge Society. The vision of learning spaces presents a desirable and necessary future for learning. It puts learners at the centre of learning, but, at the same time, conceives learning as a social process. Learners become co-producers and not just consumers of learning content. Guidance and interaction continue to be very important. The role of teachers, tutors and/or trainers will change, rather than disappear. This will require dedicated efforts to train and involve them in developing their changing role in the learning process. Learning spaces are not instructorless, computer-generated spaces without interaction and community building. Future learning spaces could take many different forms, digital and physical, hence their plural and dynamic aspect, meaning that they are by no means carved in stone.*

4.5 Theme 5: Research on learning in a digital society

> ***ACTION 5: Research and studies need to look for holistic approaches and solutions and the effective use of ICT and its impact on learning processes, outcomes and standards***

Progress in the use of ICT for education and training across Europe has been substantial in the last years. However, effective integration of ICT into education must go beyond simply replacing, streamlining or accelerating current practices. Only when all these processes and stages of learning are absorbed by the potential of ICT for learning, change will happen. Policy makers have to be aware of these systemic requirements for sustainable change – i.e. the necessary links between curriculum development, teacher training and assessment.

There are plenty of examples which suggest that the notion of innovation in education and training should be reframed and situated in a much broader notion of learning – where learning does not only cover formalised education but also learning within a broader frame of active citizenship, global engagement and community building. To advance opportunities for genuine transformative innovations, we will need to move beyond traditional approaches to studying and documenting promising practices through a case approach. In order to follow innovation dynamics over time and how they evolve into sustainable models of operation[25], there is a need to rethink the coupling of practices, research and policy making in iterative models where the current 'living lab' initiatives could be a source of inspiration. ICT is borderless, a feature which should actively be exploited.

4.6 Theme 6: Envisioning the future of learning in a digital society

> ***ACTION 6: A need for envisioning future learning that is more efficient, equitable, innovative and meaningful than it ever was in the past***

---

[24] (IPTS 2006) Y. Punie & M. Cabrero (2006) The Future of ICT and Learning in the Knowledge Society. Report on a Joint DG JRC/IPTS-DG EAC Workshop held in Sevilla, 20-21 October 2005, DG JRC-IPTS, European Communities, March 2006, EUR 22218 EN.
Y. Punie & K. Ala-Mutka (2007) Future Learning Spaces: new ways of learning and new digital competences to learn. Nordic Journal of Digital Literacy, Vol 2, No. 4, pp. 210-225.

[25] A study completed on Digital Literacy for DG Information Society (Technological Institute 2009) suggests that some of these emerging models building on community-based social capital are difficult to capture through traditional analytical methods, because they build on self-organising eco-systems that change considerably over time.

As our societies become more knowledge-based, digitalized and networked, what people need and want to learn, know, and do also changes. Knowledge, skills and attitudes necessary for working, living and participating in 21st century modern societies appear to be fundamentally different from the ones needed and acquired in 20th century industrial societies. There is a growing awareness in Europe and worldwide that there is a need for new visions of future learning that take into account the shifts and trends that are transforming the way people work, learn, train, make sense of their world, find meaning, and have fun in a digitalised, networked and knowledge-based society. One of the challenges is envisioning the strategic direction that ICT should take given the rapid and phenomenal technological advances that education and society are experiencing. This changing world also requires changing learning paradigms. It requires a re-thinking of the what, how, who and why of learning in a knowledge-based society.

From a skills perspective it is impossible to accurately predict what kind of new jobs will emerge in the next 10-20 years and the competences needed in 2020 and beyond. How society evolves over the next 20-50 years, which turns a more networked world will take, and which values may emerge in the tailwind of the current global crisis are impossible to predict. Foresight is, however, not about predicting the future but rather about elaborating and understanding different, plausible futures so that opportunities and threats can be envisioned before they occur.

IPTS Foresight project

IPTS is currently undertaking a foresight project, in collaboration with different stakeholders and experts that is looking at the following questions: In which way will the roles of the participants in the learning process, i.e. learners and teachers/trainers, change? How do assessment, certification and accreditation have to change in response to new learning patterns and pathways? What are the implications for existing Education and Training (E&T) institutions, systems and policy frameworks? What anticipatory measures can be taken to prepare current E&T institutions for the challenges ahead? How can present policy action address the envisaged changes? (See: "Future of Learning" Group on LinkedIn)[26].

Only the first signs – albeit powerful and rich – of this shift towards new ways of learning involving a new learning generation are becoming visible. The impact of the shift on existing learning practices and institutions will become broader, deeper and possibly disruptive in the next decades. This will bring new challenges some of which are already emerging today: the importance of transversal and transferable skills (e.g. learning to learn, creativity, innovation, collaboration, etc.) for future jobs, the crucial but changing role of teachers and/or facilitators, the increasing value of informal learning, alternative ways of assessing and certifying knowledge and skills, amongst others. There is a sense of urgency for education and training institutions, but also for other organisations and for policy makers to find ways to act in favour of the new learning generation, to enable new ways of learning and to ensure that the skills for future jobs are acquired. It is imperative to make sure that 21st century learning in Europe becomes more efficient, equitable, innovative and meaningful than it was in the past[27].

---

[26] www.linkedin.com/groups?home=&gid=2266966&trk=anet_ug_hm
[27] Punie, Y. & Carneiro R., 2009, Editorial, eLearning Papers n° 15 "The New Learning Generation" www.elearningpapers.eu

Appendix A - List of Peer Learning Activities (PLA) by the ICT Cluster

1. PLA Oslo, 21-23 September 2005, Learning Networks

    –   Topic derived from a Norwegian initiative launched in 2004 in the framework of the government's ICT initiative "Programme for Digital Literacy (2004-2008)"

    –   Three workshops and site visits to schools participating in Learning networks

http://www.kslll.net/PeerLearningActivities/PlaDetails.cfm?id=64

2. PLA Helsinki, 25-27 January 2005, Finnish Digital Content Production and Use

    –   Included visits to the Finnish Ministry of Education, Helsinki University, WSOY (commercial supplier), a media centre, a high school, a library and an open access learning centre

http://www.kslll.net/PeerLearningActivities/PlaDetails.cfm?id=63

3. PLA Luxembourg, 27-29 September 2006, Portals and Collaboration

    –   Building learning networks for sharing information and knowledge and boosting learners' success through collaborative learning environments

http://www.kslll.net/PeerLearningActivities/PlaDetails.cfm?id=62

4. PLA Budapest, 25-27 April 2007, ICT infrastructure and content

    –   Content (quality and relevance) and the role of teachers in developing digital educational content

    –   ICT infrastructure as an enterprise for schools. New solutions – operationally, technically and financial –discussed/identified

    –   Digital competences and digital literacy. Examples of how they are promoted in 'digital secondary schools'

5. PLA Birmingham, 4-5 October 2007, Leadership in ICT and parental engagement

    –   Learn from UK strategies and from other PLA countries how to achieve leadership and parental engagement in ICT

    –   Hosted by BECTA (British Educational Communications and Technology Agency)

http://www.kslll.net/PeerLearningActivities/PlaDetails.cfm?id=65

6. PLA Thessaloniki, 8-10 October 2008, E-skills and digital literacy and partnerships for LLL strategies

    –   In combination with the e-Skills Conference, October 2008

    –   The ICT Cluster formulated recommendations for the e-Skills Conference with regard to Digital Competences and advanced ICT skills

http://www.kslll.net/PeerLearningActivities/PlaDetails.cfm?id=76

7. PLA Vienna, 30 November 2008 – 3 December 2009, e-Inclusion and Digital Competences

   – In combination with e-Inclusion Ministerial Conference, December 2008

   – PLA contributed to conference report "Digital Literacy - European Commission Working Paper and Recommendations from Digital Literacy High-Level Expert Group"

   – Austrian experiences in e-Learning and good practices in teacher training

http://www.kslll.net/PeerLearningActivities/PlaDetails.cfm?id=78

8. Outputs from the PLA

Compendium of Good Practice Cases of e-learning, September 2008

- The Compendium was annexed to the Commission Staff Communication on 'The Use of ICT for Innovation and Lifelong Learning for All'. '

Various communications addressed to policymakers at European and national levels

- Key lessons from PLA in Birmingham on how to achieve leadership and parental involvement in eLearning, October 2007

- Recommendations from the ICT cluster members with regard to future avenues of the ICT cluster and PLA activities, January 2008

- Recommendations issued by the MST and ICT Clusters on novel pedagogies for learning and teaching maths, science and technology (MST) and how ICT can be an added value, May 2008

- Bottlenecks and enablers of innovative learning and teaching and the role of ICT, September 2008

- Recommendations on "Digital competences for lifelong learning for all" in the context of the " e-inclusion " Ministerial conference, December 2008

All documents are available at www.kslll.net

Appendix B - List of good practice cases as described in the Compendium (2008)

No	Country	Cases	Category
1	**Austria**	ePortfolios in Education	Learning Management System
2		Future Learning	Learning Management System
3	**Bulgaria**	ICT in National Education Strategy	National Strategy Reform
4	**Cyprus**	Increasing the number of personal computers (PCs) in schools	ICT Infrastructure
5		Whiteboards in all schools	ICT Infrastructure
6		Internet for all schools	ICT Infrastructure
7		Intranet between all schools	ICT Infrastructure
8		Training teachers in ICT	Teacher Training
9		Use of multimedia in teaching through developing electronic content	New Learning Environment
10		Implementation of a Learning Management System	Learning Management System
11	**Estonia**	UNIVe project — Creating a network-based e-university model for small countries in the context of e-learning in Europe	New Learning Environment
12		Hello Spring (Tere Kevad)	New Learning Environment
13		LeMill web community for teachers	New Learning Environment
14		eKool — Centralised Student Information System	ICT Infrastructure
15		Teachers' ePortfolio	Teacher Training
16	**Finland**	Netlibris	e-Skills
17		KenGuru — Virtual Teacher In-Service Training	Teacher Training
18		Avoinamk.fi eLearning Portal for the Finnish Polytechnics	ICT Infrastructure
19	**France**	PrimTICE portal of best eLearning practice	Learning Management System
20	**Germany**	Online-supported distance education for further training of teachers of German as a second language	Teacher Training
21		Arbeitsräume im Internet für Schulen (ARIMIS)	ICT Infrastructure
22	**Greece**	eLearning Platform	ICT Infrastructure
23	**Hungary**	Utilisation of the Moodle Course Management System (CMS) in Secondary Schools	Learning Management System
24		Learning with Lego-Robots	New Learning Environment
25		House of the Future — School of the Future — Digital	New Learning Environment

		Storytelling	
26		House of the Future — School of the Future — Teacher Training	Teacher Training
27	**Luxembourg**	eBac eLearning Platform	Digital Literacy
28	**Malta**	Rescue La Vallette — An Adventure in Time	New Learning Environment
29		Euro Changeover	New Learning Environment
30		One2one In-Class Teacher Training Programme	Teacher Training
31		Online Community for Teachers	Learning Management System
32		Automated Testing System (SSr) in ICT	ICT Infrastructure
33		Malta National eLearning Strategy	National Strategy/Reform
34	**Norway**	Learning Networks	New Learning Environment
35		Knowledge Promotion	National Strategy/Reform
36		Federated Electronic Identity (FEIDE)	National Strategy/Reform
37	**Poland**	Scholaris — Online Educational Resource Centre	New Learning Environment
38		EuroProf	New Learning Environment
39		Virtual Textbook	New Learning Environment
40	**Slovakia**	Fluency in Information Technology — Application of ICT in Subjects (FIT)	e-Skills
41	**Slovenia**	Teachers Train Other Teachers	Teacher Training
42		New ways of teaching and learning with new educational e-content	New Learning Environment
43	**Turkey**	**Microsoft Cooperation in Education**	**Teacher Training**

The compendium is available online

www.kslll.net/PoliciesAndAchievements/ExampleList.cfm?clusterid=8

Appendix C - Member country overview of developments in 'ICT for learning'

Austria

After some years of investing only in ICT infrastructure, Austria has begun a new approach in order to implement ICT in education by facilitating networking to especially selected schools. Networks have been created in lower secondary schools[28] and upper secondary schools[29]. The main goal has been to devise school development to ensure e-learning is being implemented by the whole school, not only a few enthusiasts. In parallel, the eLSA network has also developed an 'advanced' version, which is dedicated to piloting state-of-the art innovations in a few experienced schools (such as game based learning) while still catering for schools and teachers that are relatively new to e-learning.

A subproject of the eLSA network, "regional clusters" is connecting all schools in a region, from primary schools up to the level of the school-leaving exam "Matura"[30]. Students are offered the opportunity to develop their competences in digital media without interrupting their school career, and regardless of the focus they wish to apply to their educational development. Two such clusters are currently in operation in Austria.

Networking among teachers is also encouraged through collaborative online seminars[31]. This teacher training initiative – accompanied by other opportunities to meet face-to-face and exchange ideas and experiences – offers a base for a growing "community of practice" of e-learning teachers in Austria. As a result, it has become more and more common for teachers to communicate through online communities, to exchange ideas and offer support. Networks are nowadays being created spontaneously by various participants in school development in Austria. One of the latest examples is the formation of a network of innovative primary school teachers actively enforcing the sensible use of ICT from the early ages onwards using the social software NING[32].

The Austrian Federal Ministry for Education, Arts and Culture has been facilitating the use of the Moodle learning management system to Austrian schools and teachers for more than three years now[33]. The costs required for hosting Moodle are covered by the Ministry. All schools have to do is to apply for a user account which is opened within one working day. Technical difficulties are taken care of by a helpdesk. About 1,700 schools are so far using this service. In addition to providing new perspectives for the design of lessons and actual teaching, the use of a learning management system such as Moodle may also contribute to school development by offering an opportunity to restructure and redesign the communication processes within a school.

As a result, the "e" in e-learning is becoming better at offering adequate classroom activities. ICT – per se – is not the focus, but didactics is the key and e-didactics is becoming more and more prominent. The "e" was initially the driving force in order to implement innovative learning environments, however e-didactics should now become the focus. Successful implementation of e-learning initiatives was able to stop teacher centred teaching, as it is not suitable in laptop classes. More and more teachers are now able to see this and offer alternatives, such as learner centred

Developments in schools

Government policy and initiatives

---

[28] http://elsa.schule.at
[29] www.elearningcluster.com
[30] http://elsa20.schule.at/schulen/elsa-regionalcluster.html
[31] www.e-lisa-academy.at
[32] http://itatvs.ning.com
[33] www.edumoodle.at

learning. Teachers can see the potential that students bring with them and they value this in classroom activities.

At the moment, Austria is implementing a new type of school ("New Middle School") dedicated to all pupils of lower secondary level, who in the past were usually offered two different kinds of branches (?) – one working towards the school-leaving exam "Matura", to be followed by studies at university level, and one working towards apprenticeship. From the beginning, the latest didactic findings are taken into account in the creation, including e-learning and new media.

One of Austria's latest offers for teacher training aims to ensure widespread training of teachers working in a "New Middle School", as well as of teachers working in other types of schools. Austria has adapted the Danish model for teacher training, EPICT, and is currently piloting the course with teachers from various types of schools. The Austrian model puts great emphasis on the actual realisation of the developed lesson plans in class. The concept of EPICT, involving self-responsible learning and teamwork, is fairly new to Austrian teachers, so further marketing will be necessary to achieve widespread dissemination.

Although these initiatives are not able to ensure widespread development in all Austrian schools, the steadily growing teacher community and the upcoming change of teachers (about 40% of today's teachers will be retired within the next five years), it is quite possible that ICT will be a greater part of a teacher's life and therefore for all pupils.

Bulgaria

In 2005, Bulgaria launched a national educational portal providing e-content tools, e-lessons and many other resources[34].

In 2006, obligatory ICT training was introduced at primary and low secondary education level. In this way, computer and Internet literacy has been added to the set of skills acquired by Bulgarian students at school. A new ICT curriculum was developed which included knowledge, skills and attitudes related to digital competence.

In 2008-2009, the National Institute for Training School Managers (a unit of the Ministry of Education and Science) in partnership with the British Council in Bulgaria in framework of the project "ICT and School Leadership" developed online modules for performance evaluation and school management based on the BECTA Self-review framework.

In 2009, the Ministry of Education and Science launched a national programme called "ICT in schools" with the aim to provide Internet access to all Bulgarian schools.

The Ministry of Education, Youth and Science has launched many other initiatives in the field of ICT in education. Free home Internet access for teachers, e-lessons for secondary education, an "Innovative teachers portal[35]" in partnership with Microsoft in framework of the programme "Partnership in Education", interactive Internet portal Virtual Bulgaria[36] in partnership with Trud Publishing House and Senzor-S Ltd etc.

Cyprus

In the last five years, Cyprus has spent €40M on implementing ICT in the teaching process. Last year (2009), the government funded students of the second grade of the lower secondary education to buy a portable computer, and 85% of students used the measure. There is also a process of developing new digital content for all subjects of

Sidenotes:
- Government policy and initiatives
- e-learning partnerships
- Government policy and initiatives

---

[34] start.e-edu.bg
[35] www.teacher.bg
[36] www.bulgaria-vr.com

lower secondary education, and 20 new educational software titles are now under the process of installation to all public primary schools and lower secondary schools.

Seventeen subjects of Lyceums and the Technical schools are enriched with e-content – 25% of the curriculum is now digitalised – and all school computers are connected to the Internet through a broadband connection. Where establishing an ADSL connection was impossible, a satellite connection was accommodated for. Approximately 90% of teachers of all levels have had basic ICT skills training. Teachers are also advised on how to implement ICT in their subjects.

Other developments in Cyprus include:

- A data centre has been established for the running of all applications of the Ministry of Education and Culture.

- The electronic school (DIA.S) is used in a pilot programme in eight schools.

- An educational platform for primary education has been in use for the last few years: www.schools.ac.cy/klimakio

Finland

There are many upcoming changes in Finland in terms of use of ICT in innovation, learning and education in general. Information Society policies in education are being reshaped between 2009 and 2010. Also, the government (as a whole) is currently putting in place a new Information society strategy with objectives stretching beyond 2015. The strategy also includes general issues and policies revolving around e-learning education.

The latest e-learning programme, by Ministry of Education ended in 2006, leaving the current Finnish administration and educational institutions in a transition period. However, several pilots have been launched since, in order to find a new focus for the current developments and use of ICT in daily educational practises.

The year 2010 will hence be an important year for many reforms. These follow on from major Finnish government reforms in higher education in general, vocational education and in adult education. Also, reforms will be made to the financing system of and design new learning environments beyond 'school and institution walls'.

In August 2009, the Minister of Education hosted a roundtable for stakeholders where key messages were drawn out. It is a conscious decision by Finland to continue to push in the field of (e-)learning as they believe that initiatives are more efficient if policy is sharpened, certain new e-services and other initiatives are carried out centrally, and decentralised reforms are carried out in the light of clear vision and framework.

Finland is currently focusing on media education, open and innovative learning spaces, and is keen to extend informal learning beyond the traditional mediums of schools and universities. A qualification framework for this is being designed. Current challenge is also on ensuring compatibility of different ICT systems (SADe) in all municipalities and government.

The National Board of Education is providing funding towards the continuous professional development of teachers (in-service training) and school leaders and e-learning networks.

The i2010 e-Inclusion Subgroup National Reports (Dec 2007) pointed out that beyond the education sphere, libraries and civic organisations are important institutions for individuals learning information society skills. Funding (ESF) has been provided to civic and educational organisations and libraries for this specific purpose.

A challenge in the Ministry of Education's Education Strategy for 2020 is to re-define the concept of new learning/future learning. Also, pupils themselves are invited to

Developments in schools

Government policy and initiatives

Future developments

Digital literacy and competences

invent and suggest new subject areas for national curriculum, which will be renewed in the coming years.

Estonia

For Estonia, two prominent activities have been highlighted: 1) a next generation teachers' portal, and 2) policy actions of Estonian Development Fund.

A next generation – based on the Web 2.0 paradigm – educational portal[37] for Estonian basic and secondary school teachers was opened in September 2009. The portal has social software functionalities and is connected to educational networks: the users can design personal desktops, decide on services they need, create personal collections of learning materials, form communities etc. The portal contains a LRE LOM compliant (Learning Objects Metadata allowing Europe wide exchange of learning resources) learning object repository[38] as well allowing easy handling of the learning content. The portal was developed in the Centre for Educational Technology of Tallinn University.

Development in schools

The Estonian Development Fund has launched the EST_IT@2018 foresight project with the objective of identifying the areas in which ICT could most contribute to the development of Estonia's economy and society during the next 10 years. Education was identified as the most significant area; a group of decision makers and experts was composed, charged with compiling scenarios and roadmap for the effective use of IT in learning and teaching. The focus has been set on the use of up-to-date, equally accessible and individuality enhancing IT-tools in mathematics and sciences in secondary school. The results have been available since the end of 2009.

Government policy and initiatives

France

The development of ICT is a priority for the French government, and a global plan targeting infrastructure, services, content, uses and training, both at school and in society at large, has been developed. The objective is to make the Internet and ICT available to everyone in France.

Government policy and initiatives

The SDTICE (Department of Information and Communication Technologies for Education) is working on many projects, grouped into programmes:

- Infrastructures and services. The objective is to provide the educational community with the equipment and services (e.g. virtual learning environments) adapted to their needs.

- ICT use in education. The objectives are to:

  – Develop ICT use which is adapted to needs – in all school subjects – at all educational levels, through action at national level

  – Encourage the production and sharing of educational uses of ICT: pedagogical scenarios written by teachers and validated by the inspectorate are published online[39]

  – Organise the transformation of French digital campuses into "areas of excellence" – the Thematic Digital Universities (UNT)[40]

- Digital resources for teaching and learning in schools and higher education institutions programme. The objectives of this programme are to:

  – Define a digital publication Action Plan that meets the expectations of pupils, students and teachers. This is a joint initiative between the Ministry of

---

[37] www.koolielu.ee
[38] lreforschools.eun.org
[39] educnet.education.fr/en/secondary/icte-french-resources-banks
[40] educnet.education.fr/en/higher-educatio/tdus

Education and the publishing industry, and aims to meet the demand by publishing an Action Plan for producing the digital content requested by teachers

– Assist the development of quality educational multimedia content (publishers)

– Support the production and distribution of quality digital educational content for pupils, students, and for teachers

– Support the distribution of the digital resources most suitable for educational use. An example of this project is the USB key for teachers. This initiative provides teachers in their first year of work with a USB key. Its aim is to encourage new teachers to use digital resources while teaching. The key is strictly personal and contains many free and paying digital resources. The Ministry offers all new teachers online access to these resources for two years. The key includes also institutional links (with information from local education authorities' websites), examples of use, a personal space and a toolbox[41].

- ICTE training programme. This programme implements IT and Internet certificates at primary and secondary levels (B2i) and higher education level (C2i). It also implements the "Pairform@nce scheme" that is aimed both at primary and secondary teachers. It is based on the collaborative production of teaching sequences and activities to promote the development of the use of ICT in schools[42].

Germany[43]

In Germany, developments in e-learning are Länder specific.

Thüringen is continuing to run a "Medienkunde" course. Since 2002 it has been taught in all school classes 5-7, and in 2009 this was expanded to class 10, and included a new course plan and training for teachers.

There are several work groups at the Teachers Training Centre (ThILLM) in Bad Berka dealing with e-learning activities. One group is developing concepts for working with learning management systems like Moodle.

Another work group is developing and proving didactical scenarios for the use of learning objects in class. Learning is done through short videos with didactical material like worksheets, teachers manual etc. The material can also be found online – "Thüringer Schulportal" – where it can be downloaded and used in class.

The three sports schools are collaborating in a project, which is using e-learning activities to encourage students who are frequently absent through training or competitions to keep in touch with the other students and teachers. Tools used include interactive whiteboards, notebooks and Moodle.

Some schools have notebook-classes. In March, a first major meeting took part and included individuals interested in establishing notebook-classes at their schools. There is also a cooperation agreement between the Thüringen Teacher Training Centre and the Technical University of Ilmenau involving notebook-classes.

Thüringen aims to establish a concept of the interactive classroom in the schools, and have done so, along with the Ministry of Education and several partners, through the organisation of a road show.

---

[41] educnet.education.fr/en/resources/usb-key
[42] national.pairformance.education.fr/
[43] Contributions by Simone Geil, Michael Kaden, and Heike Laude

Brandenburg e-learning initiatives have evolved in the last five years. The spectrum currently encompasses basic education of inmates, training for teachers and e-learning courses for students of secondary schools in the subjects Law and Latin (starting 2010).

The overall number of public schools in Brandenburg being active in e-learning is nevertheless still limited: in April 2008 some 27 public schools (out of 784) were active using learning management systems. The next evaluation will take place in April 2010, with the numbers expected to rise.

The policy of the Ministry of Education is to – within the next years – standardise the use of e-learning in the education sector, with one starting point being the widespread use of the open-source platform Moodle.

In Hessen, strategies to embed e-learning in the schools involve replacing older curricula with new 'interdisciplinary education standards', which includes media literacy. Similarly, teacher training curricula encompass media training and education through the three phases: studies, practical training and teaching. The project, School @ future, which also aims to increase media literacy, has been in operation since 2001.

Hessen is running a number of ongoing projects. For example:

- Hessen Education: a central site for everyone who works in education. Lessons plans, and other information can be accessed from here

- Weasel: In portal developed for primary schools to learn independently

- Hessen.eEducation: this pilot PPP project has been implemented in 100 schools to promote independent learning in secondary schools

- edunite: a pilot project involving 20 schools to test and develop an educational management software for teachers colleges

- Digital schoolbag: software that enables students to work anywhere portably, using a USB stick

- Teaching @ mt: a multi-phase collaborative project between the Office of Teacher Education Teacher Education and the universities in Hessen. Student teachers and teachers in the profession are expected to acquire media literacy.

Greece

In Greece, ICT[44] is included in primary and secondary school curricula. In primary schools, the curriculum follows the "holistic model" of learning, according to which educational aims are achieved through the infusion of ICT into the other subjects. For example, in lower secondary school, ICT is taught in all three grades. Pupils during the first two years get to know the basic operations of a computer, its peripheral devices and the operating system. At the same time, they develop software abilities and skills, covering painting, word processing, spreadsheets, presentations and databases. In the third year, pupils are introduced to programming through the use of the LOGO language and they undertake composite assignments in groups, using the office productivity tools they were taught in the previous years.

Information science and computer applications are taught in higher secondary school. In particular, during the last year, all pupils who wish to be accepted into Information or Technical Universities have to study "Development of Applications in Computer Environment".

In Vocational Lyceum (Epagelmatiko Lykeio or EPAL in Greek), attendance will last three years for students who have successfully completed lower secondary school (Gymnasio). During the first year of vocational education there are three separate

---

[44] Pliroforiki in Greek, or Nees Texnologies = New Technologies

fields; technology, services, and maritime shipping. During the other two grades, there are eight fields, including "information services".

Almost every school in Greece have got access to the Internet (69% broadband and 31% ISDN) as well as computer classroom laboratories equipped with a server and LAN (13.2 computers per school)[45].

Since 2007-2008, pupils attending compulsory education have been using new school books, which have been based on the new curricula[46]. These, along with supporting software, can be downloaded[47] by pupils, teachers or others involved.

A teacher training programme involving ICT basic skills, implemented 2002-2005, have involved 90% of the total number of Greek teachers, with 75% of teachers having been awarded a title of ICT competence. During the years 2005–2008 a similar teacher training programme involving ICT utilisation in class have been held. A total number of 2,821 teachers have successfully been awarded a title of ICT competence. The programme is continuing 2009-2013, with the aim that all teachers will be trained successfully.

Further, in 2009-2010 the following measures have been taken in order to support the implementation of ICT in class:

- 126,000 students attending the first grade of lower secondary school have been given a coupon worth €450 to buy their own school-netbook in which school books and supporting software, produced by the Pedagogical Institute, have been installed

- Modern Greek language, mathematics, geography and biology will be taught using ICT in class in lower secondary school.

For 2010-2011, the Ministry of Education, Life Long Learning and Religion Affairs is planning to equip every second grade classroom in lower secondary school (Gymnasio) with an interactive whiteboard, a video projector etc, so that teaching procedures will be applied in a well-equipped classroom environment and will enforce the use of students' netbooks in class.

The Greek Educational system offers some specific ICT support structures:

- Twenty-five ICT school advisors are responsible for the scientific and pedagogical guidance of ICT teachers

- There are 54 ICT centres situated in the capital city of each prefecture that provide: technical support to school computer laboratories, a helpline to school advisors and teachers, information about ICT issues concerning their prefecture to the Ministry of Education and the Pedagogical Institute, etc.

There is a Greek School Network[48], which interlinks all schools and provides basic and advanced telematic services as well as an educational portal of the Ministry of Education[49], which provides educational and training material, suggestions for lesson planning, informative articles etc to school teachers and students.

---

[45] Source: www.observatory.gr

[46] Gov. gaz. 303 A and B/13-03-03-www:
www.pi-schools.gr/programs/depps/index_eng.php

[47] www.pi-schools.gr/books/dimotiko/
www.pi-schools.gr/software/dimotiko/
www.pi-schools.gr/books/gymnasio/
www.pi-schools.gr/software/gymnasio/

[48] www.sch.gr

[49] www.e-yliko.gr

Key Lessons learned by the ICT cluster

Hungary

In Hungary, one key scheme is the "Second National Development Plan" (2007-2013). This aims to support competency-based education with digital education programme packages. It covers the whole syllabus and has a central service system for support. The programme also includes the OKJ (National Training Register) exam qualification module for e-learning and a database for all e-learning material, thus making accessible the digital assets on topics such as cultural heritage.

A second part of the programme focuses on the provision of ICT infrastructure through the "Intelligent School Programme". Approximately 35,000 (out of a total of about 62,000) classrooms will be equipped with interactive whiteboards, projectors and computers. In 2009, €24M will be spent on these packs of classroom equipment.

Schools will receive a classroom response system. Under this programme approximately, 40,000 computers, 20,000 notebooks, and 20,000 interactive whiteboards will be allocated to educational institutions. Wi-Fi access will be provided to one third of school classrooms and communal areas, giving students the possibility to use their private laptops to access the network. Institutional web services will also be provided. To support the use of interactive whiteboards, accredited in-service training for teachers has been provided over the recent period, focusing on individual digital content development.

Further included in the second Hungarian Development Plan is the:

- Development of the digital skills of 40,000 teachers through training aiming to help integrate ICT-skills in teaching

- Development of digital equipment. That is, the development of infrastructure for electronic measurement and evaluations of public education, including the development of an electronic administration system, part of the public education information system.

- Development of digital content. The aim is to promote the use of digital content – SDT, Sunflower, Realika, Apertus, Mythware – in lessons.

- Implementation of a student laptop programme, and accompanying teaching methodology training.

"Creating the school of the 21st century" is a wide-ranging programme for the renewal of the entire public education system to prepare young people for lifelong learning through competency-based education. The "Intelligent School Programme", a sub programme of this initiative, provides a framework for the development of up-to-date public education infrastructure, necessary for gaining and developing the competencies required for lifelong learning, and on the labour market.

Malta

In Malta, e-learning activities are generally implemented with the help of the Curriculum Management and e-Learning Department (CMeLD). CMeLD is promoting and introducing innovative technologies in all state schools.

Interactive whiteboards – and the training of teachers who used them – were among the first technologies to be disseminated across all 10 colleges. Other technologies such as robotics, game consoles, the use of digital cameras and video are also being introduced in a limited number of state schools as tools for learning.

CMeLD is also tackling the way teachers approach their teaching. Participants were shown how certain methodologies – such as WebQuest, Cyberhunts, Project-Based learning, and the advanced use of PowerPoint – could lead to a constructivist approach. CMeLD's strategy was to train a small number of teachers in a train-the-trainer approach. These teachers in turn, held one-to-one training and hands-on practice for a small number of teachers in all primary and secondary state schools.

This approach proved to be successful and was subsequently shown during a three-day workshop and exhibition held in May 2009.

Train the trainer – training sessions started early in October 2008. Trainers from CMeLD lectured about WebQuest, blogs and wikis, moviemaker and audacity to a small number of primary and secondary school teachers.

CMeLD has encouraged teachers and made it possible for them to read for a certificate in e-learning. Twenty peripatetic and support teachers successfully finished a 10-week online course in May 2009 and are now set to deliver a number of blended courses (face-to-face and online). One such blended course has already been successfully delivered during the summer months.

The e-learning professional development delivered by CMeLD staff to all state schoolteachers, targeted ICT gaps that became evident after research was conducted on teachers' e-readiness.

Last year, state schoolteachers were given a laptop to enable them to carry out lessons through the use of technology. Training was accordingly given to teachers. At the start of this scholastic year state Kindergartens were given a computer for use in every classroom.

CMeLD has motivated all teachers to embed ICT in their work and set up the Embed 2009: Best use of ICT award in collaboration with eTwinning National Support Services and Microsoft. 'EMBED 2009: Best Use of ICT', was the name of a three-day event at the Grand Hotel Excelsior, Floriana, held 27-29 May 2009. The event brought to a close a very intensive scholastic year in terms of ICT-related educational projects related to the theme of Creativity and Innovation. The event showcased the latest technologies and approaches towards the use of ICT in education and also teachers' best practice in ICT. Apart from the showcasing of work carried out during the year there were a number of workshops for students.

e-learning partnerships

Northern Ireland

In Northern Ireland, the main points in ICT in education could be summarised as follows:

Classroom 2000 (C2k) is a managed, regional, ICT service for all grant-aided schools. It was established in 2000 to deliver the infrastructure needed to ensure teachers and pupils could access the equipment and services necessary to support ICT in schools. Since then C2k has worked successfully with a wide range of private and public sector partners to deliver a stable, reliable and technically well-supported service, in all grant-aided schools. As well as common local area and wide area network platforms, the schools have also benefited from a range of other key services such as connectivity and security, management information and administration, and local and online curriculum content. C2k continues to provide a managed service, including computer refresh (the replacement of all primary school equipment was completed in January 2008), updating software and developing Learning NI (LNI), and most recently, procuring 20,000 laptops which were distributed across all school types with an additional 5,000 laptops to support assessment in primary schools.

Government policy and initiatives

The emPowering Schools Strategy 2003. The emPowering Schools Strategy, "Strategy for Transforming Learning, Teaching and Leadership through Education and Technology Change", set out a framework and milestones up to 2008 relating to many aspects of the life and work of the school. It aimed to build on the progress made over the previous five years. The strategic priorities established were:

- enhancing practice for learners;
- enhancing professional practice for teachers and leaders;
- enhancing professional support services for schools;

- innovating with the infrastructure, the connectivity and the school estate; and

- home-school links.

"Empowering Schools", which ended in 2006, is currently being revised. Northern Ireland is especially keen to (1) encourage further the use of online learning (2) increase the uptake, and more efficient use of, ICT by leaders, managers and teachers alike.

Norway

Norway is about to establish a new national Centre for ICT and Education. The centre should be in operation by January 2010, with the budget still being finalised.

The centre will be aiming to

- Provide training to access information, services and knowledge for the use of ICT in teaching and learning

- Provide the Ministry of Education with the necessary basis for policy development and help to implement and mainstream the Ministry's objectives in the area of ICT in education

- Become a bridge builder and a hub for cooperation in ICT in and for education.

The new centre will have as its main target group kindergarten, primary and secondary education, as well as teacher education. It will have about 40-45 employees. The centre is a merger of three current agencies (ITU, utdanning.no and UNINETT ABC), and it will have tasks ranging from infrastructure and Service Oriented Architecture to Digital Learning Resources.

Norway is also considering implementing a national test for digital competency for primary and lower secondary school pupils. Trials are currently being run in two major municipalities.

Thirdly, there are plans of establishing an identity management system for the entire sector. A system has been put in place for all upper secondary schools in 2009, with lower secondary and primary schools to follow suit.

Featured in the i2010 e-Inclusion Subgroup National Reports from Dec 2007 is VOX, a government agency under the Ministry of Education and Research, which aims to promote adult learning. Its primary aim is to contribute to the development of competence in the workplace. VOX works with local authorities, companies, education providers, organisations and individuals.

Slovakia

Several initiatives have been started which aim at integrating ICT into education. Some of them include the private or third sectors: Microsoft, Cisco Net Academic Program, Deutsche Telecom, and the Open Society Fund (formerly the Soros Foundation).

Slovakia has implemented an ICT policy document – "Strategy of implementing ICT into Primary and Secondary Schools" – for the period 2008-2011. This aims to bring Slovakia to medium level (from the bottom) in the EU.

In general, Slovakia still has a problem with infrastructure. There are teacher champions who are able to implement innovative uses of ICT in classes, but overall the utilisation of ICT is rather low. However, the number of computers is increasing – with a computer-student ratio averaging 1:10 – and so is the speed of the Internet. Nearly all schools are connected to the Internet, with broadband (more than 2Mbps) being available in 66% of all schools.

ICT is included in the curriculum of primary and secondary schools. It offers content from computer literacy for every student to content of computer science as elective subject in academic studies. Pilot trials running from 2000-2006 have led to a new curriculum for primary and lower secondary schools.

Several national projects are being implemented on teacher education with ICT including, the modernisation of teaching/learning processes in primary and secondary schools, and in-teacher-training for teachers of informatics in primary and secondary schools.

The Ministry of Education is also implementing several bids for projects where individual schools can bid for funding for ICT equipment, teacher education or development of learning resources. Approximately 40% of teachers are using computers regularly. Teachers in general have positive attitude to ICT use in education in Slovakia.

Slovakia has outstanding results in the International Olympiad in Informatics. With more than 20 gold medals this has placed Slovakia amongst the top countries in the world with China, USA, Russian Federation.

Slovenia

In 2008, the Ministry of Education and Sport established a Center for e-Education, which provides training, new content and services for schools.

Three projects aimed to help schools reach higher levels of e-competence have been developed:

- The e-competent teacher project will upgrade and set standard for teachers. The project will improve competences for teachers, school ICT organisers and, ICT school leading teams. Activities include face-to-face and online training, and an annual international conference. Teacher and others can also take an e-competence test without participating in the seminars

- Services for schools. This project will include an advisory service for ICT school leading teams, pedagogical support for teachers, technical help for all (schools, teachers, learners etc), and e-networks of teachers

- Investment in new, and upgrade of, existing e-content to enable new ways of teaching and learning, new/upgraded content, the implementation of e-content, and online support. This project will run between 2009-2013 and spend €22M from the European Social Fund (85%) and the Ministry of Education and Sport (15%).

Turkey

The Directorate of Educational Technologies in Turkey states three main aims in terms of e-learning (1) developing ICT infrastructure and integrating it into education (2) creating electronic content and producing educational material (3) open university organisation and examination services.

According to a report from Brown University, Turkey has made significant progress in the provision of Internet services by public institutions, and was ranked 8th in the world (2007).

With specific regards to ICT infrastructure, Turkey has recently completed the implementation and planning of ICT classes in all schools. There is one computer, one projector, one printer and one scanner available for every 15 students. The country is aiming to finish its ICT equipment project by the end of 2009. Currently 94% of primary education students and 100% of secondary education students have Internet access.

Turkey is also encouraging teachers and students to join a number of e-learning related programmes provided by companies like CISCO, Intel, Linux and Microsoft. It is simultaneously promoting distant learning at educational levels ranging from primary school to vocational and technical higher education.

Thirdly, Turkey is promoting the use of ICT in management, through, for example, aiming to make all student processes electronic.

As reported by the i2010 e-Inclusion Subgroup National Reports (Dec 2007), Turkey has been implementing activities as decided by its Information Society Strategy and Action Plan. At least 227 public Internet access centres have so far been established in military units in 81 provinces, supplying computers, projectors and other IT equipment. Tendering processes for establishing more centres for public access, vocational training centres, and public libraries were to be accomplished before December 2007. Further, over a thousand free Internet centres for low-income groups were being planned (2007) in Turkish residential areas. Over 700 centres have already been established in partnership with Turk Telekomunikasyon A.S.

<div style="color:red">e-learning partnerships</div>

<div style="color:red">Digital literacy and competences</div>