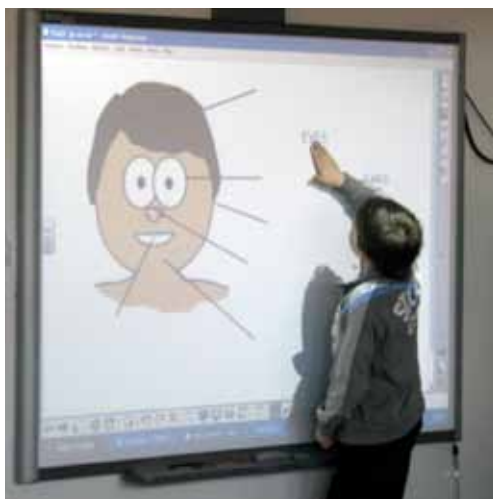


National Plan for Educational Use of Information and Communications Technology



To the Ubiquitous Information Society Advisory Board

On 21st June 2007, the Finnish Government issued a Resolution on the Objectives of the National Information Society Policy for 2007–2011. One of the objectives was to carry out a pilot project on educational use of information and communications technology (ICT) and to use it as a basis to estimate the opportunities to increase the use of computers and information networks in teaching.

The Ubiquitous Information Society Advisory Board deemed it best to focus the project so as to cover utilisation of information and communications technology in education and in development of education in broad terms. On 25th April 2008, the Ministry of Transport and Communications set up an Advisory Board to support the project. In the autumn of 2008, 20 schools were selected to participate in the project from different parts of Finland. Based on the results of the project, the Advisory Board was assigned the task of assessing and presenting proposals and further actions concerning how to develop the learning environments of Finnish educational institutions to meet the needs of an information society more effectively.

This National Plan for Educational Use of Information and Communications Technology lays out the strategic policies and actions formulated as a result of the project's activities.

The actions focus on the following topics:

- national objectives and systemic change
- learner's future skills
- pedagogical models and practices
- e-learning materials and applications
- school infrastructure and support services
- teacher identity, teacher training and pedagogical expertise
- operational culture and leadership at school
- business and network co-operation.

Composition of the Advisory Board

Mr. Timo Lankinen, Director General of the Finnish National Board of Education, was appointed to chair the Advisory Board. The following individual members were appointed: Mr. Elias Aarnio, Specialist, Technology Centre Innopark; Ms. Eppie Eloranta, Managing Director, TIEKE (Finnish Information Society Development Centre); Professor Päivi Häkkinen, University of Jyväskylä; Mr. Ari Ketola, CEO, Context Learning Oy; Mr. Ari Koskinen, Director, Hewlett Packard Oy; Mr. Jyrki Koskinen, University Relations Manager, Oy IBM Ab; Mr. Tapio Kujala, Head of Learning and Science Department, Finnish Broadcasting Company YLE; Ms. Hannele Mattila, Pub-

lishing Director, Sanoma-WSOY; Professor Kirsti Lonka, University of Helsinki; Ms. Merja Lehtonen, Counsellor of Education, Ministry of Education and Culture; Ms. Marianna Nieminen, Partners in Learning Manager, Microsoft Oy; Mr. Aulis Pitkälä, Director of Education and Culture, City of Espoo; Mr. Eric Rousselle, CEO, Discendum Oy; Mr. Pekka Ollikainen, Senior Adviser, TEKES (Finnish Funding Agency for Technology and Innovation); Mr. Aimo Maanavilja, Research Fellow, Elisa Corporation; Ms. Riitta Sarras, Special Advisor, OAJ (Trade Union of Education in Finland); Mr. Kurt Torsell, Senior Adviser, Association of Finnish Local and Regional Authorities; Mr. Arto Tuominen, CEO, Täsmätelevisio Oy; and Ms. Riitta Vänskä, Senior Manager, Nokia Corporation.

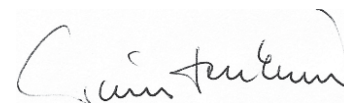
Helsinki, 1st December 2010



Suvi Lindén
Minister of Communications

Professor Marja Kankaanranta from the University of Jyväskylä was appointed a permanent expert member and Ms. Sanna Vahtivuori-Hänninen, Project Manager for the University of Helsinki, was appointed a specialist. Ms. Aleksandra Partanen, Senior Specialist at the Ministry of Transport and Communications, and Ms. Kaisa Vähähyypä, Counsellor of Education for the Finnish National Board of Education, were appointed specialist secretaries.

The Advisory Board submitted its interim report on 29th January 2010. As per its commission, the Advisory Board is hereby submitting its final report to the Ubiquitous Information Society Advisory Board.



Timo Lankinen
Director General,
Chair of the Advisory Board

Contents

Preface.....	6
1 Summary and key conclusions.....	12
1.1 Why is change necessary? Challenges and problems.....	12
1.2 Policies for action	14
2 Background.....	16
3 Vision and values.....	17
4 Strategic policies and proposals for action.....	18
4.1 National objectives and systemic change.....	20
4.2 Learners' future skills	22
4.3 Pedagogical models and practices.....	24
4.4 E-learning materials and applications.....	26
4.5 School infrastructure, learning facilities, purchases and support services	28
4.6 Teacher identity, teacher training and pedagogical expertise.....	30
4.7 Operational culture and leadership at school.....	32
4.8 Business and network co-operation	34
5. Summary and implementation	36
Literature and sources.....	38
 APPENDIX 1: The ICT in Everyday School Life project	41
APPENDIX 2: Future citizenship skills	42
APPENDIX 3: Cost estimate	43

Additional materials relating to the plan available at:

www.arjentietoyhteiskunta.fi; blogs.helsinki.fi/oppiailoakouluun



Preface

Development of schools and learning calls for understanding of the new conception of learning and active citizenship. Information is more readily available – information is diverse, uncertain, conflicting. It is created in networks, jointly modified and in a state of flux. Information is seen as being the more valuable, the better it works as a tool for participating in society and as a foundation for building well-being and competitiveness within society. This highlights the significance of know-how and information acquisition and management skills.

Change challenges the way in which information is processed at school. Currently, school education is still too focused on contents and knowledge based on command of facts, split into different branches. Education does not give enough room for solving authentic problems, multidisciplinary analysis, skills and the processes of doing things.

Not enough emphasis is placed on development of skills, especially the extensive skills required in society. Reform of education requires a vision of future education and of those branches of knowledge that build a foundation for a world-view and thinking. This makes it possible to include more diverse skills in education. In terms of the curriculum, it is necessary to consider how much room is given to isolated facts vis-à-vis skills, processes and actions.

The shift in the conception of knowledge influences learning. When knowledge is seen as being changing and dynamic, information acquisition, thinking and learning skills become important. As the amount of information increases and becomes more easily available thanks to development of information networks, people need skills in selecting, structuring, analysing, synthesising and critically assessing information. This conception of knowledge highlights competence spanning across traditional branches of knowledge that is required in society, as well as the ability to make use of information and knowledge.

The key issue on the educational agenda is how to safeguard high-quality and encouraging basic education nationwide for all pupils in the future. We need forward-looking investment in basic education and in development of it. We need an inspiring and challenging agenda that sets ambitious objectives for basic education that encourage learning and competence. Change creates the need to reinforce national steering of basic education as a whole. We need a strong programme aiming to consolidate competence among teaching staff and principals. At their best, reforms connect research-based educational innovations and development of education, so as to allow education to create new types of abilities to use information and knowledge

in line with the requirements of a changing society.

At schools today, ICT is an untapped opportunity – an opportunity to consolidate learning motivation and meaningful learning, or learning by understanding, at school and in learning contexts outside school. All comprehensive school pupils were born in the digital age. Work, learning and ways of learning change as society changes. ICT and multimedia-based ways of functioning, communicating and working form part of children's and young people's lives. A significant proportion of learning takes place in informal activities outside school.

ICT offers opportunities for learning that differ radically from books or still images. ICT represents the most significant change in the prerequisites for learning since books. Learning, and meaningful learning in particular, requires learners to take an active role – not passive reception. Schools should create experiences through learning and provide teaching and learning opportunities that support the latest conceptions of learning.

This document outlines the actions that need to be carried out in order for all pupils in basic education to have equal opportunities to study using up-to-date methods and tools. Educational equality requires equitable prerequisites for learning across the nation and attending to the needs of all learners. ICT offers opportunities to pay better attention to pupils as individuals in terms of learning styles, needs and other individual differences: acknowledgement of individuality is a prerequisite for educational equality.

What kind of a school are we pursuing?

A well-educated individual needs to be able to make decisions on the basis of informed discretion and ethical reflection. The future will highlight competence spanning across traditional branches of knowledge that is required in society, as well as the ability to make use of information and knowledge. The role of schools is to support development of a learner's identity and consolidate learning – citizenship skills function as tools that support in-depth, meaningful and creative use of what has been learnt. Education must be able to meet the need to strengthen these tools more effectively.

School operations emphasise the skills required of citizens: thinking skills, work and interaction skills, manual and expression skills, participation and influencing skills, as well as self-knowledge and responsibility skills. These skills need to be developed gradually during school years and their development requires all subjects and various schoolwork situations. Subject studies cannot be isolated from each other. These skills describe competence spanning across traditional branches of knowledge that is required in society. For individuals, they are tools that support in-depth, meaningful and creative use of what they have learnt and that people need in their studies, working lives, as citizens and in other areas of life.

In a changing operating environment, this objective requires integration of the subject matter addressed at school and concentration on the essentials. This leaves room for

more in-depth practice in these skills. Subject modules that are also assigned joint objectives integrate education. Focus on the essentials means a challenge for curriculum design and better structuring of the subject matter included in the curriculum.

The premise is to give due consideration to pupils' age and abilities, differences in individual growth and development, and their different needs. The starting point for education is to identify any possible difficulties at the earliest possible stage and to support all pupils in a socially empowering way. Schools are expected to motivate and support pupils more clearly, so as to provide them with opportunities to reach as high as possible as individuals and make the most of their potential.

School operations should place emphasis on collaboration, individual support for learning, creative working methods and internationality.

- Schools need to have up-to-date ICT equipment suitable for educational use, in order to allow utilisation of the wide range of innovative e-learning materials and various opportunities provided by technology in teaching and learning.
- When teachers team up with pupils, this creates new operating methods that support learning.

- Individual learning pathways are created for pupils to accommodate their different learning styles. Pupils' individual needs are taken into account, learning difficulties are identified at the earliest possible stage and all pupils receive support in developing to their full stature as individuals.
- Administrative information systems work seamlessly with systems used in other administrative branches and nationally.
- There is close co-operation between home and school and opportunities provided by ICT are utilised effectively in communication.

ICT support in learning

In terms of learning and learning environments, any technology geared towards supporting meaningful learning and pupils' motivation should promote:

- interaction
- diverse forms of narration and expression
- adjustment of teaching and learning to individual learning styles
- provision of feedback
- metacognitive and meaningful learning
- co-operation and development of collaboration.

The prerequisite of preserving Finnish competitiveness and well-being is for Finnish basic education to produce the best learning in the world. In order to promote and support the best learning, we need to develop, introduce and apply state-of-the-art technologies as part of everyday teaching and learning. We need considerable investment in ICT in basic education and its use in teaching and learning.

The role of technology is:

- to improve pupils' learning and assessment of learning
- to accelerate introduction and dissemination of new practices
- to produce information for continuous improvement and reform
- to boost the productivity of education and its administration.

Learning and assessment

Information and communications technology allows education to become positive, motivating, encouraging and to support understanding – so as to create learning experiences. Technology makes it possible to support different learning styles at school and in

learning environments away from school. The learning process is geared towards consolidating citizenship skills and the ability to use information and knowledge, in particular – the tools that support in-depth, meaningful and creative use of what has been learnt.

Pupil assessment and its criteria steer teaching and learning. Developing pupil assessment so as to support learning is key – it is possible to shift from assessment of individual educational contents to assessing more extensive modules and, in particular, citizenship skills. Technology brings new opportunities to assessment that support creativity and co-operation. It is possible to support, develop and assess the learning process more effectively from the perspective of developing pupils, pupil groups and the school.

New methods of teaching

Incorporating ICT as part of teaching and learning requires introduction of new pedagogical methods. Research into learning from the perspectives of different disciplines plays a key role in promoting informed development of education and solutions based on this. Pupil-centred working methods combined with the change in the teacher's role will create the foundation for new ways of learning. Children's and young people's ways of learning will change and be based on co-operation between several media – video narration may be a considerably more natural way of learning than reading a text. Continuous learning will be made possible for teachers by means of an extensive professional development programme. Through this training, new innovative methods need to be introduced for student teachers to use in their initial training.

Teachers' personal development opportunities will increase, as will their obligations to make use of their competence along with the challenges of a new age. Teachers' innovations and development work will be disseminated and they will be provided with opportunities for sharing these.

IT equipment and user support as vital prerequisites

The prerequisite for everything is for schools to have a sufficient standard of IT equipment

and IT support. This is the one absolute prerequisite. The investment is vital for educational equality and future needs. Everyone in the school community needs hardware and software suitable for their own work. Each teacher needs access to a personal computer. An adequate number of age-appropriate equipment must be made available to pupils. Classrooms need to be kitted out with interactive presentation equipment and fast data communications.

When purchasing ICT products, education places special requirements in terms of equipment and, in particular, the necessary user support. Technical and pedagogical support is necessary and it is needed urgently due to timetables. ICT consolidates pupils' co-operation and expands learning environments to cover external settings, such as businesses, museums and libraries.

Change in the school's operational culture

Working methods have changed in the world of work. Forms of and skills in working will also have to be renewed at schools. The opportunities provided by social media offer new tools for leadership and co-operation between teachers and for home/school co-operation. Development of distance learning methods will improve access to and supply of education in different parts of the country. Collaboration and working together need to be part of everyday schoolwork.

Opportunities for use of technology catering for the general public and educational administration will be expanded so as to provide strong support for information production and informed leadership and development of education. Education and its administration will become open. Information technology will be used to increase awareness of learning, teaching processes and the prerequisites of education among the general public, decision-makers and educational administrators.

E-learning materials

Learning materials have a significant effect in terms of steering education. We need more e-learning materials that support learning and new requirements and make genuine use of web-based opportunities. Simulations, structures supporting visual and multisensory approaches and various forms of show and tell will motivate and encourage pupils and allow teachers more time to concentrate on relating to and supporting pupils at an individual level. The proportion of e-learning materials will quickly overtake the proportion of printed materials in terms of the learning materials on offer. In addition to commercial materials, all materials produced with public funds and suitable for educational use should be put to effective use in education.

It is vital to implement the actions proposed in order for us to keep teaching and learning opportunities up-to-date and of high quality standard in the future as well. Finland has been at the top of international comparative assessments of learning outcomes for almost ten years now. The factors that have led to this success are not the same ones that will keep us at the top for the next ten years. School is the single most important factor in reforming society. Society changes and school needs to change with it. ICT is the single most significant change factor in learning. It needs to be harnessed in active support of teaching and learning – to promote the best learning in the world and to provide the keys to success for future Finns.

Timo Lankinen, Director General
Chair of the Advisory Board for the ICT in
Everyday School Life project

1 Summary and key conclusions

This National Plan for Educational Use of Information and Communications Technology was produced as a result of the *ICT in Everyday School Life* project that operated for just under three years. The project was assigned the tasks of describing operating models geared towards establishing the use of ICT in education and drawing up a national plan. The project was co-ordinated by the Ministry of Transport and Communications and it was carried out in co-operation with the Ministry of Education and Culture, the Finnish National Board of Education and representatives of business and industry.

1.1 Why is change necessary? Challenges and problems

The project's Interim Report, published in January 2010, captured details of obstacles to establishing educational use of ICT as follows:

- 1 Varying and inadequate standard of technological infrastructure at different schools**
- 2 Lack of technical and pedagogical support**
- 3 Low usage of pedagogical models and practices geared towards supporting learners' active involvement and collaborative learning**
- 4 Availability, quality and dissemination of e-learning materials**
- 5 Challenges for the school's operational culture**
- 6 Development of school management practices and change management**
- 7 Partnerships between businesses and schools in order to organise services**
- 8 Bringing teacher training up-to-date**

This plan lays out concrete proposals for action to develop educational use of information and communications technology and learning environments. The proposals are based on experiences from 20 project schools and recent research, in particular the results produced by the 13 research units involved in the Educational Technology in Everyday School Life (OPTEK) research project.

In addition, the plan includes a preliminary estimate of the types of costs that will be

accrued if the proposed actions are expanded to cover Finnish basic education as a whole. Implementation of the proposals for action should be initiated in 2011 and carried through within a period of five years.

The purpose of this national plan is to encourage and stimulate all those involved in school communities to make use of the opportunities provided by ICT and media as part of education. The common objective is to ensure pupils' future knowledge, skills and competences. Finnish schools must not lose touch with children's and young people's everyday lives. ICT and media form a ubiquitous part of society as well as children's and young people's everyday lives.

The premises for using ICT are: 1) pupils' 21st century skills and development of related competences; 2) support for pupils' growth; 3) teachers' needs; and 4) requirements of society and the world of work. By means of educational use of ICT and media education, children and young people will be inspired towards meaningful and experiential learning.

Carrying through this change calls for close co-operation between ministries, education providers, information administration, businesses, as well as pupils, teachers and principals. The role of homes and families must not be overlooked either. By working together, we can maintain and develop the Finnish comprehensive school as a world-class innovation and Finland as a country of high-quality education. When implementing changes, it is necessary to prepare for the costs resulting from the actions. Costs should be agreed between central government and education providers.

1.2 Policies for action

We need a systemic change, where the entire education system and schools' operational cultures are reformed to conform to the current conception of learning. Changes will be carried through making use of existing structures, such as the National Core Curriculum. Implementation and achievement of results require ministries to show strong strategic leadership. In addition, this calls for seamless co-operation between public administration, business and industry, education providers and schools.

New operating models will make teachers' and pupils' everyday lives easier and increase the flexibility of studies. These solutions require doing things in new ways and reinforcing tried and tested teaching practices. Reform of operating methods may also result in savings.

There are plenty of inspiring examples of educational use of ICT in Finland. The aim is for all schools to make diverse use of ICT in education and in support of learning. This is how every pupil can gain experiences of learning environments and new working methods enabled by technology.

Change requires schools to update their infrastructure and equipment. The technical solutions selected must be cost-efficient, of high quality and chosen with due consideration for the perspective of sustainability. In addition to an effective infrastructure and equipment, all schools also need to be provided with adequate technical and pedagogical support services.

Change management and consolidation of co-operation play a key role in developing a school's operational culture. User-oriented training in educational use of ICT will be offered to all teachers. Accessibility of e-learning materials and solving copyright issues will contribute to achieving the objectives. Teacher training will be brought up-to-date in terms of educational use of ICT. This change should be carried through within five years, in order for Finland to become one of the leading countries in the world in terms of educational use of ICT as well.



2 Background

Finland started to develop the information society very rapidly in the 1990's and was at the forefront of development in international comparisons (e.g. Pelgrum & Anderson 1999; Kankaaranta, Puhakka & Linnakylä 2000; Kozma 2003; Law et al. 2005). Considerable financial resources were allocated to development of the information society in terms of education.

At present, Finland is at around the European average and the last of the Nordic countries in terms of educational use of information and communications technology (e.g. CICERO Learning study 2008; OECD Nordic; European Schoolnet 2009; OECD/CERI 2010). The international SITES 2006 study indicated that the use of ICT in education was no longer at the level made possible by new operating methods (Kankaaranta & Puhakka 2008). Pedagogically innovative ways of using ICT have declined. In addition, the study revealed a certain lack of trust in the role of ICT in promotion of learning.

In recent years, differences between regions, schools and stages of schooling have increased in terms of educational use of ICT (Ärje et al. 2010). In 2010, Finnish schools are no longer on an equal footing: some education providers have progressed fast and their schools are leaders in the field in both pedagogical and technical terms, while others have fallen behind.

Individual teachers and small teacher groups are still integrating ICT into education in resourceful and creative ways (Kankaaranta & Norrena 2010). However, effective pedagogical practices have failed to spread. The deceleration of development has been influenced by the absence of a clear-cut national action programme. Financial investments in infrastructure have not been enough on their own.

Finland has good basic capabilities and competent teachers. Our education system has excelled in international comparisons. In addition, inspiring examples of educational use of ICT can still be constantly found in different parts of Finland (e.g. Korhonen 2010; Kotilainen 2010; Palmgren-Neuvonen et al. 2010; Tuomi 2010). The task is to broadly disseminate these innovative operating methods and solutions throughout the entire country.

The aim is to rebuild Finland as a leading country in terms of educational use of ICT as well. Our country now has an opportunity to show what the inspiring learning environments and learning culture of the future may be like at their best. Future learning is about doing things together, while being a teacher and managing a school are about educating learners to become part of the community and kindling their enthusiasm for learning.

3 Vision and values

Skilled pupils and inclusive schools – ICT as an enabler

VISION:
Information and communications technology as a resource for learning – the whole world within pupils' reach

The guiding values behind the vision are equality, collaboration and involvement. School is an active part of society and a global world. School supports pupils' growth as balanced, skilled and involved individuals. It is a place where children and young people learn together those skills that they need in their own everyday lives, further studies and working lives.

Information and communications technology is used to support pupils' growth and promote their citizenship skills. It is an aid for learning when pupils study together or on their own. In order for Finland to retain its position as a top country in education, schools need to make diverse use of the opportunities provided by ICT and media.

4 Strategic policies and proposals for action

New learning and study environments need to enable meaningful and collaborative learning. At the same time, they should develop learning-to-learn and other skills required in the 21st century. Success requires promoting the following aspects:

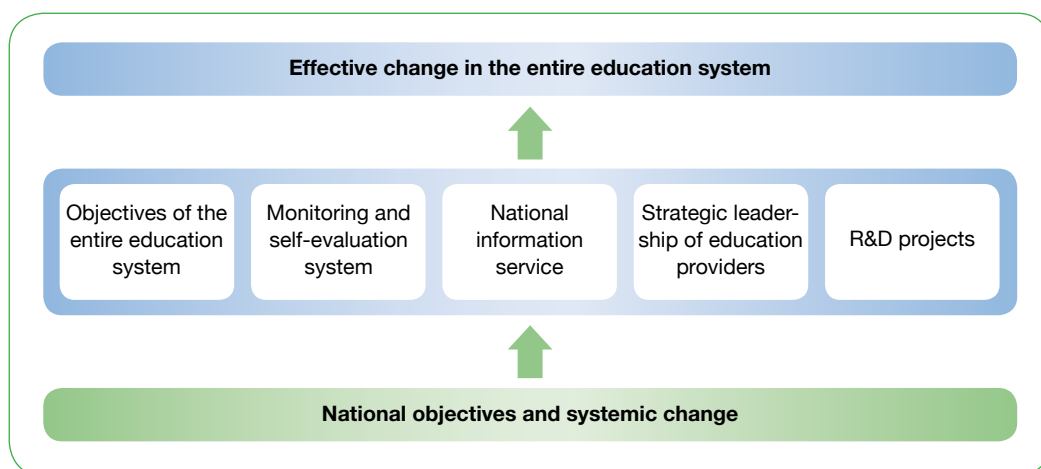
- 1 National objectives and systemic change
- 2 Pupils' future skills
- 3 Pedagogical models and practices
- 4 E-learning materials and applications
- 5 Infrastructure and support services
- 6 Teacher identity, teacher training and pedagogical expertise
- 7 Operational culture and leadership at school
- 8 Business and network co-operation



4.1 National objectives and systemic change

National objectives create the foundation for educational use of information and communications technology as part of all schools' operations. Systemic change provokes actions that promote development of the school system as a whole. Effective implementation of change calls for a clear vision, strategic intent and strategic leadership. Change requires an operational culture where the performance objectives for different areas are clearly defined and resources are allocated to guarantee achievement of the objectives (e.g. Leviäkangas et al. 2010). This calls for the courage to think through and implement things in a new way.

Summary of actions:



New procedures will be introduced into the entire education system to increase the flexibility of studies and make everyday school life easier. Reform of operating models requires change management from schools and education providers (e.g. Norrena, Kankaanranta & Nieminen 2010). New operating models will lead to savings in the long run, although some costs will initially be incurred.

The quality of education will be improved by enhancing existing assessment systems and building assessment frameworks (e.g. Leviäkangas et al. 2010). These will also include assessment of the quality of existing hardware, software, applications and services. Systemic change will be promoted nationally at a curricular level. It will also be taken into account in relevant research and development projects.

Proposals for action:

1 Systemic change should be reinforced and co-operation and co-ordination between central government and education providers should be intensified so as to put the national objectives into practice. It is advisable to specify concrete objectives permeating through the entire system.

2 Existing monitoring and self-evaluation systems should be developed with involvement from education providers. The ways in which ICT is to be utilised in education and its quality improvement should be assessed at all levels of operation.

3 The strategic leadership of education providers should be reinforced. Proposals for action should be communicated to education providers while also enabling their implementation at a local level.

4 A national interactive educational information service should be established online to cover various web-based open and commercial platform alternatives, web-based learning environments, tools, curricula, links to materials banks and national digital data repositories. The interactive information service should enable sharing experiences and competences, self-motivated production and working together.

5 It is advisable to continue national development projects while also launching an extensive R&D programme. These should be used to reinforce change and to make it possible to test and implement innovations developed by teachers, businesses and researchers at schools.

4.2 Learners' future skills

ICT is used at school to develop citizenship skills (see Appendix 2) and learning-to-learn skills. The aim is to develop pupils' skills in applying information in everyday school life and outside school (e.g. Tuomi et al. 2010). In addition, ICT may be used to consolidate pupils' own role in support of planning studies, identifying their own learning styles and self-assessment.

Furthermore, ICT is diversely utilised in co-operation between home and school (e.g. Korhonen & Lavonen 2010).

Schools need new types of assessment practices that support the learning process and make use of ICT. Assessment plays a major role in steering the planning and implementation of education. Development of cross-curricular assessment, focusing on new citizenship skills, will improve the quality of education.

Summary of actions:

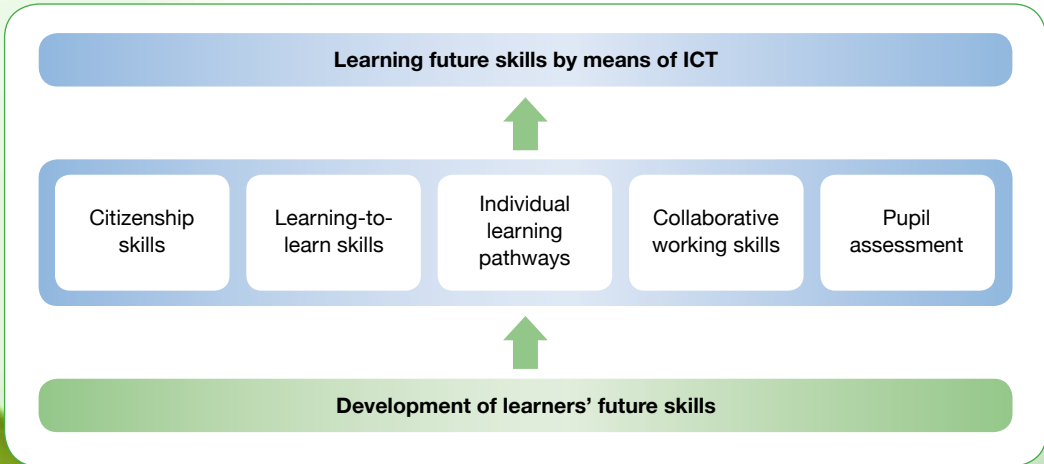


Photo: Liisa Takala

Proposals for action:

- 1** ICT should be utilised in learning citizenship skills so as to consolidate the ability to use ICT as well.
- 2** Collaborative working skills should be consolidated by means of ICT. ICT tools and applications that support collaboration should be utilised to disseminate and combine information.
- 3** It is advisable to put in place ICT tools and applications that support pupils' individual learning pathways.
- 4** Efforts should be made to ensure that pupils receive sufficient abilities to operate online socially, creatively and ethically, with due consideration for safety and the rules of society and the school.
- 5** It is advisable to introduce ICT-enabled cross-curricular assessment practices suitable for assessing citizenship skills.

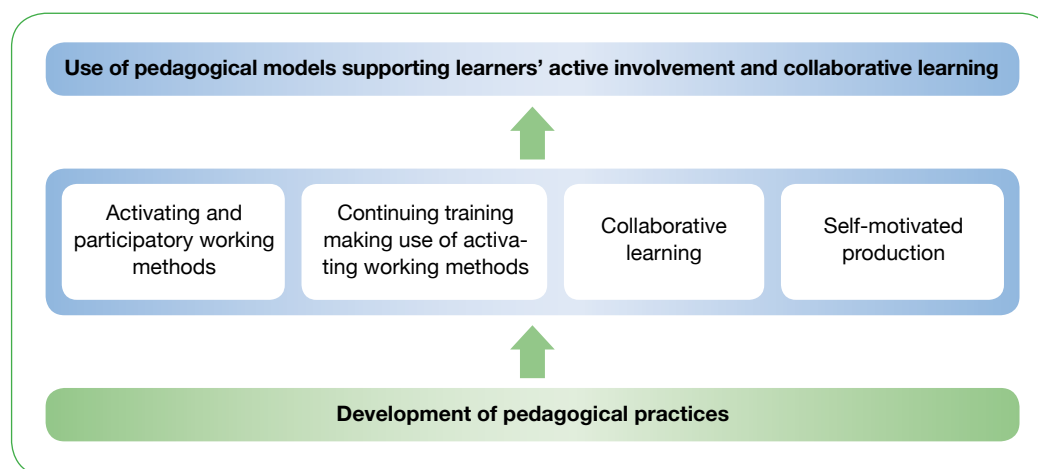
4.3 Pedagogical models and practices

According to the current conception of learning, a pupil is an active participant and explorer. The methods and pedagogical models and practices chosen by the teacher play a crucial role in terms of the quality and meaningfulness of learning. Pupils' learning objectives, collaborative knowledge-building and creativity may be promoted by means of information and communications technology. Teachers may support pupils' problem-solving skills by making use of educational games, for example. ICT is a good tool to

illustrate educational contents (Tuomi et al. 2010).

At the same time, ICT is used to support learner-centred working methods and consolidate meaningful and experiential learning. Pupils' own production becomes easier, which in turn contributes to supporting the learning process (e.g. Kotilainen 2010; Palmgren-Neuvonen et al. 2010). In addition, ICT functions as a link between learning and study environments outside school.

Summary of actions:



Proposals for action:

1 It is advisable to adopt activating and participatory working methods and pedagogical practices based on the most recent research.

2 ICT-enabled working methods should be put in place in support of collaborative learning. The focus should shift from dissemination of information to producing ideas and combining information together.

3 It is advisable to introduce ICT tools and applications that support pupils' self-motivated production.



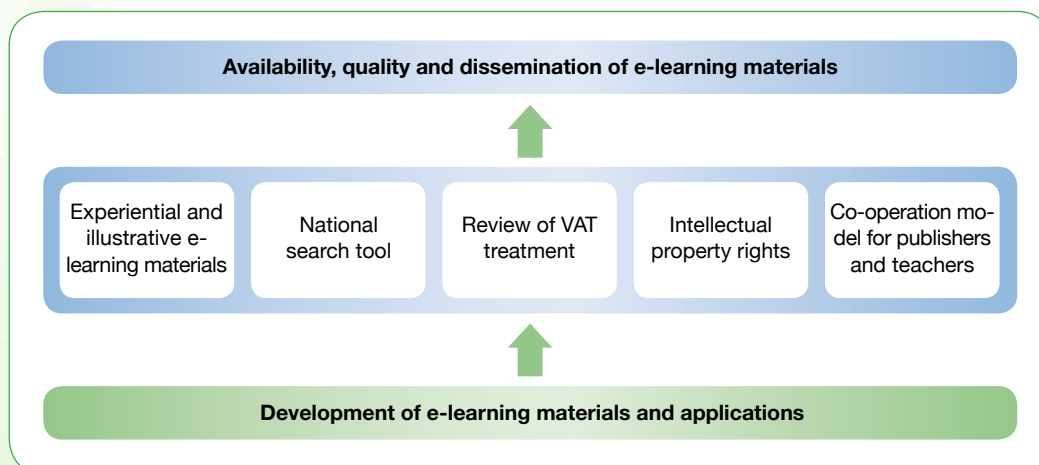
Photo: Koulumestari School

4.4 E-learning materials and applications

The availability, accessibility and innovativeness of materials play a key role in terms of using e-learning materials in education. New procedures are required for storage, modification and later utilisation of materials.

E-learning materials are developed paying special attention to the design principles of material that supports meaningful and experiential learning. The fast development of tools and applications is constantly creating new opportunities for presenting and using materials in education.

Summary of actions:



Proposals for action:

1 Production should focus on experiential e-learning materials that develop thinking skills. Teaching and learning should make use of games and opportunities offered by *augmented reality*¹. The quality criteria for e-learning materials should be reformed and utilised in planning efforts. The aim is for at least half of the materials to be in electronic format by 2015.

2 E-learning materials should be compiled so as to make them accessible through a single search tool. The Edu.fi website should be developed to create a channel where teachers and pupils can find e-learning materials. Materials developed with public funds and those available free of charge should be collected to form a single service, which should also include links to commercial materials.

3 It is necessary to ensure that all schools have access to materials offered by national digital data repositories, cultural institutions, information services and memory organisations.

4 Legislation should be reformed in terms of VAT treatment of e-learning materials. The aim is to reduce the VAT rate to the same level as the rate assigned to printed learning materials.

5 The effects of copyrights on dissemination and distribution of learning materials should be investigated with a view to finding solutions to facilitate the use, storage and modification of audiovisual materials for educational purposes.

6 It is advisable to create a co-operation model between teachers and publishers of learning materials in order to develop e-learning materials. Usage-based purchasing should be made possible and teachers and pupils should be given opportunities to modify materials.

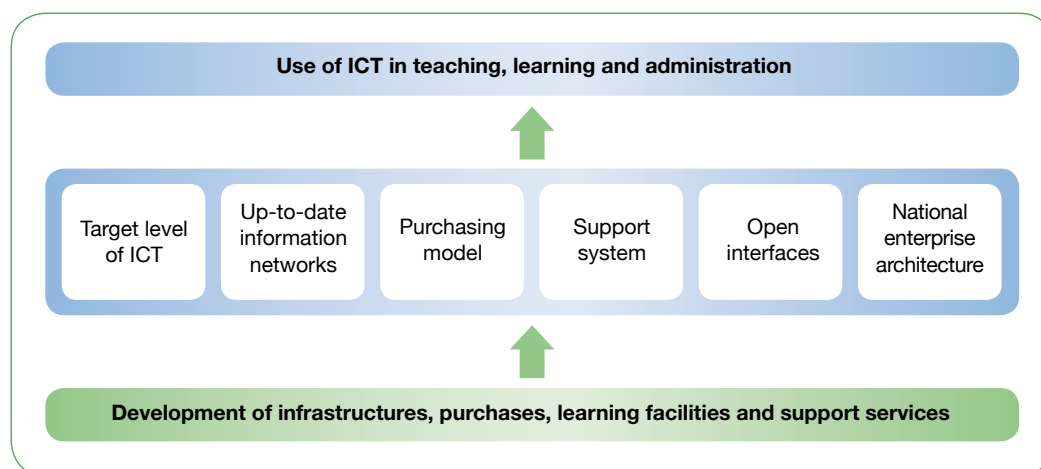
¹ Augmented reality means examining geographical information, for example, in real time by means of a movable interface.

4.5 School infrastructure, learning facilities, purchases and support services

Making use of information and communications technology requires up-to-date and user-friendly infrastructure and equipment. Up-to-date tools will be put in place at those schools where teaching equipment does not meet current standards.

Schools should have high-quality, compatible and cost-efficient technical solutions. The ICT purchasing process should be carried out as an overall process involving users and service providers (e.g. Britschgi et al. 2010; Widoors et al. 2010). In addition to infrastructures and tools, all schools need easily available technical and pedagogical support (e.g. Norrena et al. 2010).

Summary of actions:



Proposals for action:

1 It is necessary to comply with common international technical and e-learning standards approved in Finland².

2 Open interface requirements should be determined for learning applications. Open interfaces and standards enable flexible transfer and compatibility of data and material. Technical specifications of educational information systems, including interface descriptions, should be made available to everyone.

3 It is advisable to prepare a national enterprise architecture for educational services, including well-defined interfaces for systems. It is advisable to describe an enterprise architecture that is compatible with the eServices and eDemocracy project (SADe) and supports learning environments and education providers' administration.

4 It is necessary to update information networks. Teaching facilities should be equipped with fibre-optic connections in co-operation between central government, education providers and businesses. ICT usage rates and sparsely populated locations should be taken into account in implementation. Existing funding opportunities and education providers' own plans should be utilised in funding.

5 It is advisable to specify the target level for the standard of ICT equipment for teaching facilities and teachers. Teachers and pupils need to have access to necessary and up-to-date equipment and to the Internet.

6 School-specific and regional pedagogical support should be arranged. Education providers should model a support system to ensure real-time technical support for teachers in the form of remote electronic and on-site support.

7 The benefits of new service provision methods, such as distributed service provision, i.e. cloud services, should be put in place on a broad basis in education.

8 It is advisable to prepare a process description for schools and education providers in support of ICT purchases. Purchasing should make use of the purchaser/provider model, which helps schools and education providers to acquire solutions that best support their operations.

² Such as SCORM and W3C standards concerning Internet traffic.

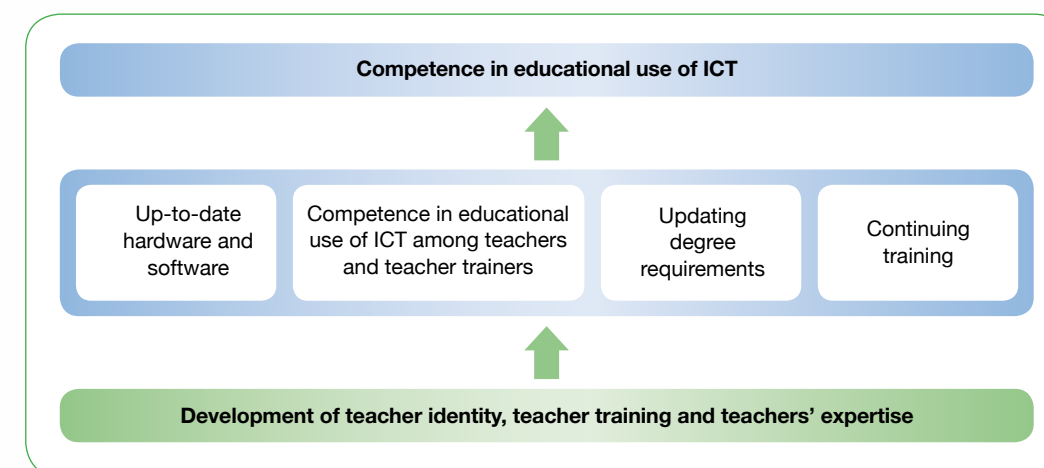


Photo: Koulumestari School

4.6 Teacher identity, teacher training and pedagogical expertise

The ICT skills of newly graduated teachers vary depending on the teacher training department. In Finland, it is possible to graduate as a teacher without being familiar with educational use of ICT and media skills. The 2010 OECD/CERI 'New Millennium Learners' report suggests that student teachers fail to obtain sufficient competence in educational use of ICT during their studies (Meisalo et al. 2010). Graduate teachers also need additional skills in terms of business and network co-operation. In addition to newly graduated teachers, those already working at schools require continuous and diverse training (e.g. Ilomäki et al. 2010; Kankaanranta & Norrena 2010).

Summary of actions:



Proposals for action:

- 1** Teacher training departments and other institutions providing teacher training should acquire up-to-date equipment. Pedagogical and technical support should be arranged for the purposes of planning and implementation of instruction.
- 2** Teacher training departments should modernise degree requirements and teaching practice in terms of educational use of ICT and media education.
- 3** Teacher trainers in initial and continuing training and student teachers should be provided with methods and models based on the latest research for educational use of ICT and utilisation of media.
- 4** Promotion of educational use of ICT should make use of professional development for educational staff and the Ministry of Education and Culture's 'Osaava' programme, geared towards improving educational staff's professional competence. It is advisable to make use of materials provided by the Finnish Teacher TV service, Opettaja.tv, for example, in order to enable provision of continuing training throughout the country.
- 5** Themes geared towards developing competences in educational use of ICT and network co-operation should be added to teachers' professional development programmes and initial training curricula.

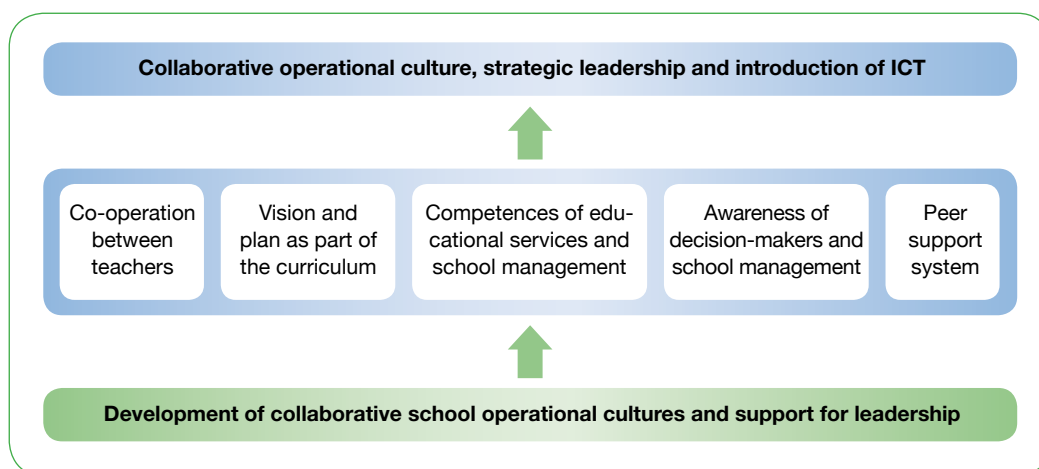
4.7 Operational culture and leadership at school

Ideally, information and communications technology makes it possible for teachers and pupils to play an active part in development of school operations. New ways of usage will change the school's operational culture and procedures. Established procedures may slow down or even hinder the introduction of new operating methods. Education providers should determine any possible barriers to change hindering introduction of new operating methods and seek solutions to

overcome these in co-operation with national and regional parties. School management plays a key role in successful introduction of ICT. School managers and their support should be a positive influence on teachers' attitudes, thus promoting dissemination of good practices as part of everyday school life (e.g. Kankaanranta & Puhakka 2008; Norrena et al. 2010).

School management must have a strong vision of the role of ICT in education, studies, administration and development of the school's operational culture. Managers need strategic policies, the will to engage in long-term development efforts and information about how to achieve the objective.

Summary of actions:



Proposals for action:

1 Co-operation between teachers should be increased. Teacher teams should be assigned responsibility for and utilised in organisation of teaching, while also developing other methods to support and enable teachers' collaboration and co-configuration.

2 Educational use of ICT should be included as part of local plans.

3 The competences of educational staff and school management should be developed and they should be diversely informed of the benefits and opportunities provided by ICT in terms of improving education, studies and communication.

4 A concrete information package should be prepared for policy-makers, education providers and school management, dealing with the opportunities of using ICT and media in education.

5 Schools' management culture should be reinforced by supporting leadership and teamwork by means of a peer support system. It is advisable to increase training in change management to support strategic leadership. Schools should be provided with support for developing their management practices, making use of the latest technologies.

4.8 Business and network co-operation

Businesses offer schools services that support school operations and development of learning environments. Services are planned, quantified and organised in accordance with the schools' own needs.

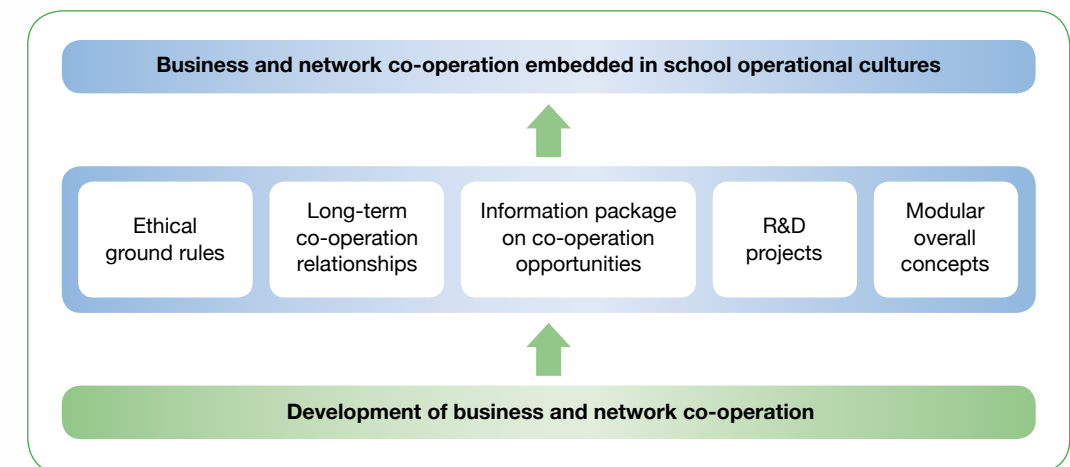
Schools' network co-operation calls for a shared will and management at all levels of the school system and educational administration. Business and network co-operation may result in new innovations and promote employment and well-being in Finland. Development of effective co-operation calls for common objectives, ground rules, networking skills and resources (e.g. Huhta & Väänänen 2010; Leviäkangas et al. 2010).

The aim is to make business and network co-operation a natural part of the strategies, curriculum, procedures and culture of the school and the education provider. All schools should have the opportunity to engage in business and network co-operation.



Photo: Koulumestari School

Summary of actions:



Proposals for action:

- 1** It is advisable to create ethical ground rules and policies for business and network co-operation. Public agreements and open interfaces should be used to ensure that co-operation makes sense for all parties.
- 2** It is necessary to allocate resources to launching network co-operation. Long-term co-operation relationships should be favoured. A number of both teachers' and corporate personnel's working hours should be allocated to promotion of business and network co-operation.
- 3** Businesses and schools should be provided with an information package about co-operation opportunities and schools' needs in terms of ICT. Schools should determine their internal and external service networks and actively search for partners.

- 4** It is advisable to increase co-operation with the world of work. Pupils and teachers should be provided with new ways and opportunities to familiarise themselves with the world of work, making use of ICT.
- 5** Schools should be provided with modular overall concepts that cover products offered by businesses, complete with orientation, training and support and maintenance services.
- 6** It is advisable to launch research and development projects focusing on networking and business co-operation. National models should be compared, searching for those applicable to Finland. New operating models should be piloted while also systematically developing schools' learning environments and infrastructures through business and network co-operation.

5. Summary and implementation

Practical implementation of a shared vision calls for strong commitment from different parties to carry out this plan. Each party plays its own significant role in development of pupils' future skills and schools' learning environments. Everyone needs to make their own contribution.

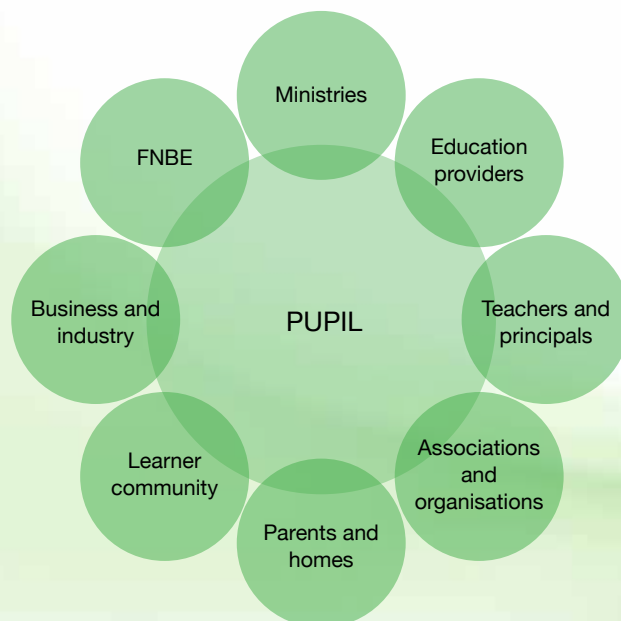
Co-operation between parties

Implementation of this plan should be initiated as soon as possible according to the prioritisation framework presented on the following page. Implementation requires co-operation between all parties and, in particu-

lar, contributions from central government and education providers.

In the future, an education provider's commitment to developing its schools' operations in line with the objectives set out in this plan should be determined as one of the conditions for award of state subsidies. Public funding improves productivity and the quality of services. In order to carry out the development programme and manage change, it is necessary to intensify co-operation between ministries, the Finnish National Board of Education (FNBE) and education providers.

Schedule: 2011–2015



Agreeing on
funding

Assigning
responsibilities

Determining
development schedule



1. National objectives and systemic change

- Joint objectives and actions
- Monitoring and self-evaluation system
- National interactive educational information service
- Education providers' strategic leadership

2. Development of teacher training and teachers' competences

- Updating degree requirements
- Modernisation of equipment available at teacher training facilities
- Briefings and online training courses

3. Basic infrastructure for all schools

- Attending to information networks and communications
- Target level recommendation
- Description of the purchasing process
- Compatibility and open interfaces
- Regional pedagogical and technical support

4. High-quality e-learning materials made available to everyone

- Materials supporting experiential and meaningful learning
- National search tool for learning and teaching
- Balancing of VAT treatment

5. Development of school operational cultures

- School management's competences and change management
- An ICT plan included in the curriculum
- A peer support network, co-operation models and ICT information packages

6. Competence development and pedagogical practices

- Support for citizenship skills and new assessment practices
- Activating and participatory working methods
- Collaborative learning and individual learning pathways

7. Business and network co-operation

- Ground rules
- Information packages on co-operation opportunities
- Modular overall concepts

Literature and sources

Arvaja, M. & Häkkinen, P. 2010. Social aspects of collaborative learning. In P. Peterson, E. Baker & B. McGaw (Eds.), International Encyclopedia of Education. Oxford: Elsevier. 685–690.

Binkeley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M. & Rumble, M. 2010. Defining 21st century skills. Draft paper. Assessment & Teaching of 21st century skills. The University of Melbourne. [http://www.atc21s.org/GetAssets.axd?FilePath=/Assets/Files/6cb2492b-f903-42c4-a408-cc6107a046ab.pdf]

Boud, D. & Feletti, G. 1999. The Challenge Of Problem Based Learning. London: Kogan Page.

Bransford, J. D., Brown, A. L. & Cocking, R. R. 2004. Miten opimme: aivot, mieli, kokemus ja koulu. Helsinki: WSOY. [Finnish translation of the English original (2001): How people learn: brain, mind, experience, and school. Washington, D.C.: National Academy Press.]

CICERO Learning -selvitysraportti. 2008. Tieto- ja viestintäteknikan hyödyntäminen opetuksessa ja opiskelussa. (http://www.cicero.fi/sivut2/documents/CICERO_TVT-selvitysraportti.pdf)

[CICERO Learning report. 2008. Information and Communications Technology in Teaching and Learning at Finnish Comprehensive Schools. English summary available at: http://www.cicero.fi/sivut2/documents/CICERO%20report%20on%20ICT%20in%20teaching%20and%20learning.pdf.]

European Schoolnet.Insight.The Study of the impact of technology in primary schools (STEPS). (http://insight.eun.org/ww/en/pub/insight/minisites/steps.htm)

Hakkarainen, K., Lonka, K. & Lipponen, L. 2004. Tutkiva oppiminen. Järki, tunteet ja kulttuuri oppimisen sytyttäjinä. WSOY.

[Progressive inquiry learning. Sense, sensibility and culture as stimuli for learning. *In Finnish.*]

Himanen, P. 2010. Kukoistuksen käsikirjoitus. Helsinki: WSOY. [http://wsoy.fi/yk/products/show/82305]. [Manuscript for Flourishing. *In Finnish.*]

Hintikka, K. & Rongas, A. 2010. E-oppimisen uusia liiketoimintamalleja. ELMA-esiselvitys. Tampere: Innopark, Digibusiness & eOppimiskeskus.

[New business models for e-learning. ELMA preliminary report. *In Finnish.*]

Joyce, B., Calhoun, E. & Hopkins, D. 1997. Models of learning – tools for teaching. Buckingham: Open University Press.

Järvelä, S., Volet, S. & Järvenoja, H. 2010. Research on Motivation in Collaborative Learning: Moving beyond the cognitive-situative divide and combining individual and social processes. Educational Psychologist, 45 (1), 15–27.

Kalliala, E. & Toikkanen, T. 2009. Sosiaalinen media opetuksessa. Helsinki: Finnlectura.

[Social media in education. *In Finnish.*]

Kankaanranta, M. & Norrena, J. 2010. Innovatiivinen opetus ja oppiminen. Kansainvälisen ITL-tutkimuksen -pilottivuoden päätulokset ja ensituloksia Suomesta. (Painossa).

[Innovative teaching and learning. Executive summary of pilot year findings of the international ITL research and preliminary results from Finland. (In press.) Finnish report

based on: Shear, L., Gabriel Novais, G., & Moorthy. S. 2010. ITL Research. Executive Summary of Pilot Year Findings. SRI International.]

Kankaanranta, M. & Puhakka, E. 2008. Kohti innovatiivista tietotekniikan opetuskäyttöä. Kansainvälisen SITES 2006 -tutkimuksen tuloksia. Jyväskylän yliopisto. Koulutuksen tutkimuslaitos.

[Towards innovative use of information technology in education. Results of the international SITES 2006 Study. University of Jyväskylä, Finnish Institute for Educational Research. In Finnish. Executive Summary of the SITES 2006 international report available in English at: http://www.sites2006.net/]

Kankaanranta, M. (toim.) Opetusteknologia koulun arjessa. Jyväskylän yliopisto. Koulutuksen tutkimuslaitos. (Painossa).

[Kankaanranta, M. (ed.). Educational technology in everyday school life. University of Jyväskylä, Institute for Educational Research. (In press.) *In Finnish.*]

Kankaanranta, M., Puhakka, E., & Linnakylä, P. 2000. Tietotekniikka koulussa. Kansainvälisen arvioinnin tuloksia. Jyväskylän yliopisto. Koulutuksen tutkimuslaitos.

[IT at school. Findings of an international assessment. University of Jyväskylä, Finnish Institute for Educational Research. *In Finnish.*]

Kiili, K. 2005. On Educational Game Design: Building Blocks of Flow Experience. Tampere University of Technology. Publications 571. Doctoral dissertation.

Kolb, D. A. 1984. Experiential learning: experience as the source of learning and development. New Jersey, Prentice Hall.

Kolb, D. A., Boyatzis, R., & Mainemelis, C. 2001. Experiential Learning Theory: Previous Research and New Directions. In Sternberg, R. & Zhang, L. (eds.). Perspectives on thinking, learning, and cognitive styles. Mahwah, NJ: Laurence Erlbaum.

Koskimaa, R., Lehtonen, M., Heinonen, U., Ruokamo, H., Tissari, V., Vahtivuori-Hänninen, S. & Tella, S. (2007.) A Cultural Approach to Network-Based Mobile Education. In Kumpulainen, K. & Renshaw, P. (Eds.) International Journal of Educational Research 46 (3–4), 204–214.

Koulutuksen ja tutkimuksen tietoyhteiskuntakehittäminen. Valmisteluryhmän väliraportti. 2010. Opetus- ja kulttuuriministeriö. Koulutus- ja tiedepolitiikan osasto. 2010.[http://www.minedu.fi/OPM/Koulutus/Liitteet/tietoyhteiskuntakehittaminen.pdf].

[Information society development of education and research. Preparatory group interim report. 2010. Ministry of Education and Culture, Department for Education and Science Policy. *In Finnish.*]

Kozma, R. (Ed.). 2003. Technology, innovation, and educational change: A global perspective. A report of the Second Information Technology in Education Study. Module 2. Amsterdam: International Association for the Evaluation of Educational Achievement.

Kynäslahti, H., Vesterinen, O., Lipponen, L., Vahtivuori-Hänninen, S. & Tella, S. 2008. Towards Volitional Media Literacy through Web 2.0. Educational Technology, Sept./Oct., 3–10.

Law, N., Kankaanranta, M. & Chow, A. 2005. Technology Supported Educational Innovations in Finland and Hong Kong: A Tale of Two Systems. Human Technology Journal 1 (2), 111–116.

Manninen, J., Burman, A., Koivunen, A., Kuittinen, E., Luukannel, S., Passi, S., et al. 2007. Oppimista tukevat ympäristöt – Johdatus oppimisympäristöajatteluun. Helsinki: OPH.

[Environments that Support Learning. Introduction to the Learning Environments Approach. Helsinki: Finnish National Board of Education. Available in English at: http://verkkokauppa.opi.fi/epages/OPH.sf/fi_FI/?ObjectPath=/Shops/OPH/Products/9789521334405]

Matikainen, J. 2008. Verkko kasvattajana. Mitä aikuisen tulisi tietää ja ajatella verkosta? Helsinki: Palmenia.

[The Internet as an educator. What should an adult know and think about the net? *In Finnish.*]

Meisalo, V., Lavonen, J., Sormunen, K. & Vesisenaho, M., 2010. ICT in Initial Teacher Training. Finland. Country report. OECD CERi, New Millenium Learners. Department of Teacher Education, University of Helsinki and School of Applied Education and Teacher Education, University of Eastern Finland.

Mumtaz, S. 2000. Factors Affecting Teachers' Use of Information and Communications Technology: A review of the literature. Journal of Information Technology for Teacher Education, 9(3), 319–341.

Mylläri, J. 2009. A Day in My Life – Multimodal knowledge representation model. Paper presented 24/11/2009 in University of California, Santa Barbara.

Mylläri, J., Kynäslahti, H., Vesterinen, O., Vahtivuori-Hänninen, S., Lipponen, L. & Tella, S. (painossa). Students' pedagogical thinking and the use of ICTs in teaching. Scandinavian Journal of Educational Technology. Routledge.

Nevgi, A. & Tirri, K. 2003. Hyvää verkko-opetusta etsimässä. Oppimista edistävät ja estävät tekijät verkko-oppimisympäristössä – opiskelijoiden kokemukset ja opettajien arviot. Suomen kasvatustieteellisen seuran julkaisuja.

[In search of good virtual teaching. The advantages and disadvantages of learning in virtual environments. Students' experiences and teachers' evaluations. Finnish Educational Research Association, Studies in Education. *In Finnish.*]

Niemi, H., Vahtivuori-Hänninen, S. & Aarnio, A. Conditions of well-functioning ICT culture in schools. (submitted). EGER 2010. "Education and Cultural Change".

Palincsar, A. & Brown, A. 1984. Reciprocal Teaching of Comprehension-Fostering and Comprehension-Monitoring Activities. Cognition and instruction, 1 (2) 117–175. Lawrence Erlbaum.

Pelgrum, W. J., & Anderson, R. E. 1999. ICT and the emerging paradigm for life long learning: A worldwide educational assessment of infrastructure, goals and practices. Amsterdam: IEA/University of Twente OCTO.

Perusopetus 2020 – yleiset valtakunnalliset tavoitteet ja tuntijako. Opetus- ja kulttuuriministeriön työryhmämuistioita ja selvityksiä 2010:1.

[Basic education 2020 – the national general objectives and distribution of lesson hours. Reports of the Ministry of Education and Culture 2010:1. In Finnish. English summary available at: http://www.minedu.fi/OPM/Julkaisut/2010/perusopetuksen_tuntijako.html?lang=fi&extra_locale=en]

Pohjola, M. 2008. Tieto- ja viestintäteknologia tuottavuuden kasvun lähteenä. Helsinki: Teknologiateollisuus. http://www.teknologiateollisuus.fi/file/.../Tuottavuusraportti_08.pdf.html.

[ICT as a source of growth in productivity. Helsinki: Federation of Finnish Technology Industries. *In Finnish.*]

Rajala, A., Hillppö, J. Kumpulainen, K. et al. 2010. Merkkejä tulevaisuuden oppimis- ympäristöistä. Opetushallitus. [Signs of future learning environments. Finnish National Board of Education. *In Finnish.*]

Sharan, S. & Sharan, Y. 1992. Expanding co-operative learning through group investigation. New York. Teachers College Press.

SITES 2006. www.sites.net

Suominen, J., Koskimaa, R., Mäyrä, F. & Sotamaa, O. (toim.) 2009. Pelitutkimuksen vuosikirja Tampere: Tampereen yliopisto.

[Suominen, J., Koskimaa, R., Mäyrä, F. & Sotamaa, O. (eds.) 2009. Finnish Yearbook of Game Studies. Tampere: University of Tampere. *In Finnish.*]

Sairanen, H., Syvänen, A. (2010). Vain vahvat selviytyvät? Mobiiliopiskelu- ja sisällöntuotantokäytännöt oppimisympäristöekosysteemin tulokaslajina. Teoksessa Jarmo Viteli ja Anneli Östman (toim.). Tuovi 8: Interaktiivinen tekniikka koulutuksessa 2010 -konferenssin tutkijatapaamisen artikkelit (2 p.). TRIM Research Reports 1. Tampereen yliopisto, Informaatiotutkimuksen ja Interaktiivisen median laitos, 112–118.

[Only the strong survive? Mobile learning and content production practices as an invasive species in the learning environment ecosystem. In: Jarmo Viteli & Anneli Östman (eds.). 2010. Tuovi 8: Articles of the Researcher Workshop at the Interactive Technology in Education Conference 2010 (2nd ed.). TRIM Research Reports 1. University of Tampere, Department of Information Studies and Interactive Media, p. 112–118. *In Finnish.*]

Tella, S., Vahtivuori, S., Vuorento, A., Wager, P. & Oksanen, U. 2001. Verkko opetuksessa – opettaja verkossa. Helsinki: Edita.

[The web in teaching – the teacher on the web. *In Finnish.*]

Tella, S., Ruokamo, H., Multisilta, J. & Smeds, R. (toim.) 2005. Opetus, opiskelu ja oppiminen. Tieto- ja viestintäteknikka tiederajat ylittävissä konteksteissa. Suomen Akatemia, Life as Learning -tutkimusohjelma. Lapin yliopiston kasvatustieteellisiä julkaisuja 12.

Rovaniemi: Lapin yliopisto.

[Tella, S., Ruokamo, H., Multisilta, J. & Smeds, R. (eds.) 2005. Teaching, studying and learning. ICT in cross-disciplinary contexts. Academy of Finland Life as Learning research programme. University of Lapland Publications in Education 12. Rovaniemi: University of Lapland. *In Finnish.*]

Tieto- ja viestintäteknikka koulun arjessa 2009. Väliraportti. Arjen tietoyhteiskunnan neuvottelukunta. (www.arjentietoyhteiskunta.fi, http://tiny.cc/tvt_valiraportti). [ICT in Everyday School Life 2009. Interim Report. Ubiquitous Information Society Advisory Board. *In Finnish. Summary of recommendations available in English at: https://wiki.helsinki.fi/download/attachments/35241728/ICT_interim+report+recommendation+summary_arjenpohja.pdf]*

Transforming American Education: Learning Powered by Technology. 2010. National Education Technology Plan. U.S. Department of Education.

Vahtivuori-Hänninen, S., Lehtonen, M. & Torkkeli, M. 2005. Yhteisöllistä opiskelua, pelejä ja sosiaalisia simulaatioita verkossa. Teoksessa Tella, S., Ruokamo, H., Multisilta, J.

Tieto- ja viestintäteknikka koulun arjessa 2009. Väliaraportti. Arjen tietoyhteiskunnan neuvottelukunta. (www.arjentietoyhteiskunta.fi, http://tiny.cc/tvt_valiraportti). [ICT in Everyday School Life 2009. Interim Report. Ubiquitous Information Society Advisory Board. *In Finnish. Summary of recommendations available in English at: https://wiki.helsinki.fi/download/attachments/35241728/ICT_interim+report+recommendation+summary_arjenpohja.pdf]*

Transforming American Education: Learning Powered by Technology. 2010. National Education Technology Plan. U.S. Department of Education.

Vahtivuori-Hänninen, S., Lehtonen, M. & Torkkeli, M. 2005. Yhteisöllistä opiskelua, pelejä ja sosiaalisia simulaatioita verkossa. Teoksessa Tella, S., Ruokamo, H., Multisilta, J.

Articles included in the preliminary results publication of the Educational Technology in Everyday School Life project:

Britschgi, V., Öörni, R., Hautala, R. & Leviäkangas, P. 2010. Opetuksen tietotekniikkapalvelut – ongelmia, haasteita ja mahdollisuuksia. [Educational IT services – problems, challenges and opportunities. *In Finnish.*]

Huhta, E. & Väänänen, M. 2010. Public-private yhteistyö ja liiketoimintamallit. [Public-private partnerships and business models. *In Finnish.*]

Ilomäki, L. & Lakkala, M. 2010. Koulun kehittäminen ja digitaalinen teknologia. [School development and digital technology. *In Finnish.*]

Korhonen, T. & Lavonen, J. 2010. "Meidän luokan juttu" – tieto- ja viestintäteknologia kodin ja koulun yhteistyön tukena.

['Our class's own thing' – ICT in support of co-operation between home and school. *In Finnish.*]

Koskinen, J. 2010. Miten edistää tieto- ja viestintäteknikan hyödyntämistä opetuksessa, oppimisessa ja koulun hallinnossa kunnan toimintamalleja ja alan markkinaa kehittämällä?

[How to promote use of ICT in teaching, learning and school administration by developing municipal operating models and the market? *In Finnish.*]

Kotilainen, M-R. 2010. Mobiiliuden mahdollisuksia oppilaslähtöisen sisällöntuotannon tukemisessa portfolioyöskentelyssä.

[Opportunities of mobility in support of pupil-centred content production in portfolio work. *In Finnish.*]

Leviäkangas, P., Hautala, R. Schneitz, A. & Lim Hock Chye. 2010. Singaporen perusopetuksen tietotekniikkavisio ja

& Smeds, R. (toim.) Opetus, opiskelu ja oppiminen. Tieto- ja viestintäteknikka tiederajat ylittävissä konteksteissa. Lapin yliopiston kasvatustieteellisiä julkaisuja 12. Rovaniemi: Lapin yliopisto, 207–229. [Collaborative learning, games and social simulations online. In: Tella, S., Ruokamo, H., Multisilta, J. & Smeds, R. (eds.). Teaching, studying, learning. ICT in cross-disciplinary contexts. University of Lapland Publications in Education 12, 207–229. Rovaniemi: University of Lapland. *In Finnish.*]

Vähähyyppä, K. (toim.) 2010. Koulu 3.0. Opetushallitus. [Vähähyyppä, K. (ed.) 2010. School 3.0. Finnish National Board of Education. *In Finnish.*]

Zhao, Y. & Frank, K. 2003. Factors affecting technology uses in schools: An Ecological Perspective. *American Educational Research Journal*, 40(4), 807–840.

-strategia – benchmarkkaus ja vertailu Suomeen. [Singapore's information technology vision and strategy for primary education – benchmarking and comparison with Finland. *In Finnish.*]

Palmgren-Neuvonen, L., Kumpulainen & K., Vehkaperä, A. 2010. Oppimisen taitoja liikkuvalla kuvalla – teknologioiden innovatiivista yhdistelyä äidinkielen opetuksessa. [Acquiring learning skills by making movies – innovative combination of technologies in mother tongue education. *In Finnish.*]

Sairanen, H., Syvänen, A., Vuorinen, M., Vainio, J & Viteli, J. 2010. Mobiilisisällöntuotanto esiopetuksessa ja perusasteen alaluokilla: Suosituksia ja havaintoja teknisestä toteutuksesta.

[Mobile content production in pre-primary and primary education: Recommendations for and observations about technical implementation. *In Finnish.*]

Sallasmaa, P., Mannila, L., Peltomäki, M., Salakoski, T. Salmela, P. & Back, R-J. 2010. Haasteet ja mahdollisuudet tietokonetuetussa matematiikan opetuksessa. [Challenges and opportunities in computer-assisted mathematics education. *In Finnish.*]

Salo, M. Kankaanranta, M & Viik-Kajander, M. 2010. Tulevaisuuden taidot ja osaaminen. [Future skills and competences. *In Finnish.*]

Tuomi, P. & Multisilta, J. 2010. Mobiilivideot oppimisen osana – Kokemuksia MoViE-palvelusta Kasavuoren koulussa.

[Mobile videos as part of learning – Experiences of the MoViE service at Kasavuori School. *In Finnish.*]

Wideroos, K., Pekkola, S. & Limnell, V-P. 2010. Pedagogiset tietotekniikkahankinnat: kokeiluista käytäntöihin.

[Pedagogical IT procurements. From testing to practices. *In Finnish.*]

Ärje, J., Kankaanranta, M., Kuuluvainen, M., Palonen & T. 2010. Tieto- ja viestintäteknikan merkitys ja käyttömahdollisuudet koulujen arjessa.

[The role and potential applications of ICT in everyday school life. *In Finnish.*]

APPENDIX 1 The ICT in Everyday School Life project

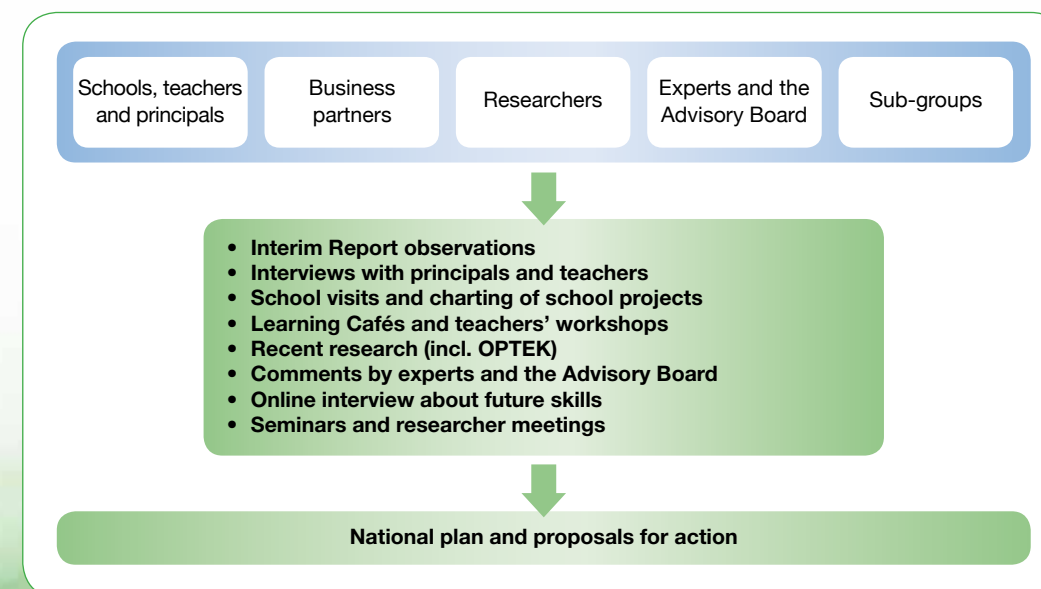
The ICT in Everyday School Life project is co-ordinated by the Ministry of Transport and Communications and is carried out in co-operation with the Ministry of Education and Culture, the Finnish National Board of Education and representatives of business and industry. The project aims to determine operating models geared towards establishing educational use of information and communications technology and to draw up a national plan for this purpose.

The project produces information for educational institutions, businesses and decision-makers about how to embed ICT as part of study and learning environments. This is how children's and young people's everyday lives and school operations can be brought closer to each other. The project co-operates with the Educational Technology in Everyday

School Life (OPTEK) research project. The OPTEK project is a consortium project funded by the Finnish Funding Agency for Technology and Innovation (TEKES), where research is carried out in broad national co-operation representing cutting-edge research. The articles included in the OPTEK project's preliminary results publication (Kankaanranta et al. 2010) present justifications for the proposed actions.

The national plan was drawn up in co-operation between the Ministry of Transport and Communications, the Ministry of Education and Culture and the Finnish National Board of Education, as well as the project's Advisory Board consisting of experts from 23 different fields. In addition, preparation of the national plan also involved 12 school projects and teachers and principals from 20 schools, education providers, planning officers responsible for municipal educational technology and media education, researchers in the field, teacher trainers and business partners involved in the project.

Progress of the strategy process:



APPENDIX 2:

Future citizenship skills

Development of future schools and skills calls for fresh new points of view and ways of thinking. Future skills and competences have been defined by many different parties in recent years (such as ATC21S 2010 – Assessment and Teaching of 21st Century Skills; Salo, Kankaanranta & Viik-Kajander 2010; TVT koulun arjessa -väliraportti [Interim Report of the ICT in Everyday School Life project] 2010). An expert group appointed by the Ministry of Education and Culture formulated a proposal for the distribution of lesson hours and the general national objectives for basic education (2010:1) and arrived at the following summary of future citizenship skills:

Thinking skills

- Problem-solving, reasoning, argumentation and drawing conclusions
- Critical, analytical and systemic thinking
- Creative and innovative thinking

Working and interaction skills

- Skills in acquisition, processing and use of information
- Communication, co-operation and negotiation skills
- Independent and persistent working skills
- Time management and flexibility
- Entrepreneurship and change management
- Skills in use of ICT and other technologies
- Study skills

Manual and expression skills

- Body co-ordination
- Diverse expression and performance skills and confidence
- Planning and production skills
- Inventiveness, experimentation and use of imagination

Participation and influencing skills

- Understanding the community and society
- Sense of initiative and management skills
- Ability to act constructively
- Acceptance of diversity and different opinions
- Media skills
- Skills in thinking ahead and constructing the future

Self-knowledge and responsibility skills

- Self-knowledge and reflection
- Attendance to health and safety
- Ethics, responsibility and functioning as a member of the community
- Good manners and empathy.

Basic education plays a key role in developing the capabilities required for working life and further studies. The National Core Curriculum states that basic education must provide an opportunity for diversified growth, learning, and development of a healthy sense of self-esteem, so that the pupils can obtain the knowledge and skills they need in life, become capable of further study, and, as involved citizens, develop a democratic society (National Core Curriculum for Basic Education 2004). The reform work of the National Core Curricula highlights the significance of citizenship skills as the foundation for pupils' equality.

APPENDIX 3:

Cost estimate

COST ESTIMATE (MEUR)	2011	2012	2013	2014	2015	Total
Equipment	10	29	29	57	57	182
Broadband	3	2	2	2	2	11
Services	7	10	25	35	35	112
Continuing training	8	10	8	6	5	37
Initial teacher training	2	2	1	0.5	0.5	6
Research and development	7	7	8	8	8	38
Assessment and monitoring	1.2	0.2	0.2	0.2	0.2	2
E-learning materials	1	2	2	2	2	9
Total expenditure	39.2	62.2	75.2	110.7	109.7	397

Equipment: Equipment and presentation technology for teachers and teaching facilities.

Services: Pupil-specific electronic desktops with relevant cloud services, for example.

Continuing training: The item covers the funding needs of the 'Osaava' programme and government-funded professional development for educational staff in terms of educational use of ICT.

Research and development projects: To be allocated to development and diversification of school learning environments.

Assessment and monitoring: Development of a monitoring system.

E-learning materials: Development of e-learning materials and production of e-learning materials with limited circulation by means of public funds.



www.arjentietoyhteiskunta.fi