



United Nations
Educational, Scientific and
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UNESCO Institute
for Information Technologies
in Education



European Agency for Development in Special Needs Education

ICTs in Education for People with Disabilities





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ICTs IN EDUCATION FOR PEOPLE WITH DISABILITIES

Review of innovative practice

UNESCO Institute for Information Technologies in Education

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FOREWORD

How Information and Communication Technology (ICT) can be used in the most effective ways for education of people with disabilities is currently high on the political agendas of all countries, particularly those who have ratified the United Nations Convention on the Rights of Person with Disabilities (CRPD, 2006). A number of the general principles included in the CRPD are directly linked to UNESCO's mandate. As the United Nations' leading agency for education, UNESCO is at the forefront of activities aimed at promoting quality education and lifelong learning for all society members, including disabled persons.

The educational needs of people with disabilities are extremely diverse. As with all other members of society, people with disabilities must acquire the knowledge and skills required for the community in which they live. However, they face additional demands (often referred to as special educational needs) caused by functional limitations that impact in different ways upon their ability as learners to access standard educational methods of instruction. These limitations often prevent educational progress and achievement.

In this context, the application of ICT is very important as it plays an essential role in supporting high quality education for learners with disabilities. The advantages of ICT usage in the teaching and learning process are based on the possibilities it offers for alternative means of communication, providing access to educational resources in a more convenient way and to enhancing learning motivation. By overcoming obstacles of time and space, supplementing vital human functioning and supporting the development of crucial skills, these technologies contribute to the increased effectiveness of educational processes by enabling people with disabilities to actively participate in meaningful learning experiences.

With this in mind, the UNESCO Institute for Information Technology in Education (UNESCO IITE) and the European Agency for Development in Special Needs Education (the Agency) agreed in 2010 to combine their expertise in this field and collaborate on the development of a *Review of innovative practice*. The intention for the review was to build on findings from past work – notably UNESCO IITE's activities in this area and in particular *ICTs in Education for People with Special Needs: Specialized Training Course* (2006) and the Agency's ICT in Special Needs Education project related work.

The goal of this Review therefore is to present concrete examples of the use of ICT in different educational settings in order to show the real possibilities of ICT as a tool for supporting learning and ultimately inclusion for people with disabilities.

The development of this review has been guided to a large degree by the UN Convention on the Rights of Persons with Disabilities (2006). The use of the term 'people with disabilities' is understood in this Review within the terms of the Convention:

Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others. (p. 5)

The principles and requirements impacting upon the use of ICT that are outlined within the Convention have been used as the basis for exploring a range of policy documents and literature in this area. In addition, the examples collected for this Review have been selected to illustrate how ICT in education for people with disabilities can be used effectively and in innovative ways in relation to four thematic areas that emerge from a consideration of the key messages within the UN Convention. These relate to ICT to support: personal access to information and knowledge, learning and teaching situations, personal communication and interaction, and finally, access to educational administrative procedures for people with disabilities.

This Review presents 12 Case Studies and over 20 Vignettes (short focussed illustrations of practice) linked to the four themes. These examples come from 18 different countries, covering Arabic speaking countries, Latin America, Commonwealth of Independent States (CIS) and European Countries.

On behalf of our respective organisations we wish to gratefully acknowledge the input of the many professionals from across the globe that submitted example information used as the basis for the Case Studies and Vignettes presented in Chapters 3 to 6 of this report. Without their contributions this Review would not have been possible and we wish to thank them for their contributions to this work.

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1. INTRODUCTION

The UNESCO Institute for Information Technologies in Education (UNESCO IITE) and the European Agency for Development in Special Needs Education agreed in 2010 to collaborate on a joint project to develop a Review of Innovative Practice – a report presenting concrete examples of practice of the use of Information and Communication Technology (ICT) with people with disabilities in different educational contexts and settings. In particular, the Review was targeted at considering examples of practice that can be considered to be ‘innovative’ within the specific educational setting and wider societal context they were situated within.

The agreed goal of presenting different examples of practice was not to describe or examine the technological aspects of ICT usage in education. Rather the goal was to highlight the different possibilities and potential benefits of applying ICT in varied and potentially innovative ways in very different global educational contexts and settings for people with disabilities.

In order to achieve this goal, it was important that examples from a range of geographical and educational situations were considered. It was also necessary to ensure that examples from ‘non-traditional’ educational settings were collected as far as possible. Within the consideration of possible examples, innovation was considered as the use of ‘everyday’ technology in unexpected or untried ways within a particular educational setting or context, as well as the use of newly developed technologies for education.

In order to collect such potentially wide-ranging information, the international networks of contacts of UNESCO-IITE and the Agency were engaged to gather information on examples that may not usually be disseminated or published in such a widespread way. A very clear intention in framing the work was to use the Review of Innovative Practice – referred to from now on as the ‘Practice Review’ – as an opportunity for sharing messages from different stakeholders working in the field of ICT in education for people with disabilities who may not usually have the possibility to share their work internationally.

The aims of this Practice Review therefore are to use the collected examples in order to:

- Highlight a range of different purposes for using ICT in education for people with disabilities;
- Identify possible key messages for policy and practice in this area.

In addition, the presentation of different types of examples of ICT being applied in new, or unexpected ways in this field is also intended to act as a source of inspiration to practitioners and policy makers in considering possible innovative ways ICT can be used in education for people with disabilities.

The Practice Review does not aim to present highly technical information relating to ICT and its application in education. Decision makers and educators working in different educational situations with people with disabilities are considered to be the main target audience for this Practice Review. They are the professionals who are considered most likely to find concrete information on the effective utilisation of ICT most useful to their own work.

So as to put the Practice Review report into a clear context, the next section will provide a rationale for the approach taken as well as an outline of the methodology used for collecting examples and then an overview of the structure of the Practice Review itself.

1.1 Rationale for the approach taken

The Practice Review is a project initiated by UNESCO IITE under its programme of work examining the use of ICT in education of people with disabilities:

http://iite.unesco.org/policy_and_research/icts_in_special_needs/

This programme of various activities works within the UNESCO broad view of the concept of inclusive education, and aims to support policy dialogue and the development of national e-inclusive strategies aimed at:

- Increasing the access of disadvantaged and excluded groups to ICT infrastructure;
- Promoting basic ICT literacy and vocational training programmes targeted specifically at the most vulnerable segments of society;
- Supporting regional, sub-regional and inter-country co-operation and good practice exchange on the extension of ICT usage to excluded groups.

UNESCO IITE identifies the target group for its activities as *'policy and decision-makers who are responsible for, or involved in the development of educational policies and plans; experts in teacher training and vocational development; and last but not least teachers themselves.'*

In line with UNESCO IITE's general target audiences, the main target group for the Practice Review are policy and decision-makers, teacher educators and teaching staff involved in the education of people with disabilities in all educational sectors: schools, vocational education, higher and adult education.

The current Practice Review builds upon past UNESCO IITE activities in this area most notably: ICTs in Education for People with Special Needs – Specialized Training Course (2006). In this document it is stated that: 'The key ways in which ICTs can support educational opportunities for people with SEN are as follows:

- Identifying the preliminary level of personal development (experiences and skills), that is to say the starting point of a student;
- Assisting in personal development by shaping new skills or updating existing ones;
- Improving the access to information;
- Overcoming geographical or social isolation via communication support and networks;
- Improving the image/perception of an area by enhancing motivation and awareness regarding the ICT benefits in SNE.' (p. 29)

The Practice Review builds upon this previous work and is focussed upon developing a conceptual overview for understanding the potential application of ICT as a tool in education for learners with disabilities. As a framework for exploring relevant concepts, four possible areas of application of ICT were identified from within the United Nations Convention on the Rights of Persons with Disabilities (2006) by UNESCO IITE to be covered in the Practice Review:

(i) Supporting personal access to information and knowledge – ICT as a tool for improving a learner's access to information and knowledge in formal and non-formal learning situations.

(ii) Supporting learning and teaching situations – ICT for pedagogical, didactic uses, assisting in personal, learning development and shaping new skills; ICT as a tool for teachers to support learning.

(iii) Supporting personal communication and interaction – ICT as a tool for alternative/augmentative communication to replace or supplement personal communication barriers; ICT as a tool for overcoming social and/or geographical isolation.

(iv) Supporting access to educational administrative procedures – ICT as a tool for accessing administrative procedures in organisations; ICT as a tool for administrators to improve their services for learners with disabilities.

It should be pointed out here that the four thematic areas of this Practice Review were identified in order to provide overall messages about use of ICT in education for people with disabilities. These thematic areas should not in reality be viewed in isolation, but rather be seen as interacting and mutually supportive. It can be argued that at times an example presented in one thematic area could have been used to illustrate other areas as well. In effect, the four thematic areas indicate a framework of suggested purposes of using ICT in education for people with disabilities that is a useful starting point for illustrating key messages for policy makers and practitioners.

UNESCO IITE and the European Agency for Development in Special Needs Education (the Agency) agreed upon a collaborative approach to collecting and then analysing examples of practice in these four areas in order to highlight conclusions and recommendations for policy and practice in the area. This approach is described in the next section.

1.2 Identifying relevant examples of practice

There is a substantial body of literature exploring the usefulness of examples of practice, or Case Studies to inform further practice and/or policy (for example, see Yin, 1994). Benbasat et al. (1987) suggest that case approaches are particularly appropriate for practice based problems where the experiences of the actors are important and the context of the action is critical. There are also many exemplars of Case Study or 'practice review' approaches being used by international organisations; one such exemplar is the OECD Improving School Leadership activity (2006–2008), which includes an innovative case study strand. Within this project write up it is suggested that case study methodology can *inform debate, guide innovative practice, provide reference and help frame school leadership policies in OECD countries.* (p. 16)

However, far fewer pieces of research work discuss the criteria used to select examples subsequently presented in projects. One exception to this is a study conducted by UNESCO, Paris and the European Agency for Development in Special Needs Education called Inclusive Education in Action (IEA).

The IEA (<http://www.inclusive-education-in-action.org/iea/>) project aimed to provide a resource for international and European policy makers working to develop equity and equal opportunities within education systems globally. The ultimate goal of the IEA project was to bridge the 'policy to practice gap' by exemplifying the suggested actions.

Within the project a comprehensive literature review was undertaken to provide background information on the development of a framework of criteria to support the selection of examples (Donnelly, 2010, available from: <http://www.inclusion-in-action.org/iea/>).

A consideration of the literature found relating to possible criteria for selecting examples resulted in a compilation of the most commonly used criteria in the studies reviewed, three of which are of particular relevance within the context of this current Practice Review:

1. Relevance and usefulness: information is provided about what key issues for consideration the material exemplifies.
2. Diversity: of geographic location, policy contexts, settings and learners is addressed.
3. Clarity of information: the following are clearly described: rationale (supported by theory) to explain significance of work (in context); issue to be addressed, aims and planned outcomes; methods, procedures and management of change; outcomes, feedback and reflections; sufficient information must be included for readers to know if/how the content of the study might apply to their own situation.

These criteria are underpinned by a number of key concepts that were important in conducting the Practice Review work:

- The criteria are essentially *content free and are applicable to any study using examples of practice*;
- The criteria are *focussed upon the 'meta' issue of quality of information being made available* about the example being presented and not the perceived quality of the example being discussed within that information;
- The criteria can be used for *the purpose of selecting examples that clearly illustrate specific topics* and not used to select examples based on their perceived quality per se.

In summary, the criteria for selecting examples of practice have been used in order to find 'good examples of practice' with the emphasis on the quality of information provided, rather than examples of 'good practice' where judgements regarding the quality of the practice being described have to be made.

The final 'meta' criteria used for selecting the Case Studies focussed upon the availability of clear information relating to the following aspects of the initiative being described:

- A description of the initiative including the aims and objectives of the initiative;
- Information on the learners and educators involved;
- Contextual information indicating the importance of using ICT within the context of the initiative;
- Participants' reflections and evaluation of the initiative.

The application of 'meta', information related criteria can be seen to remove unhelpful 'comparisons' between examples of work as crucially, judgements were made regarding the selection or rejection of an example for the Practice Review based upon the relevance and quality of the information made available to the reviewers and not on any perceptions of quality of the work presented in example itself.

Within the Practice Review the examples sought and collected were considered 'innovative examples of ICT practice' relating to one of the four thematic areas for the Practice Review and not examples of 'good' practice. Such an approach was considered to be more appropriate and balanced in nature and also less open to question from third parties.

In taking such an approach, it was clear that the most appropriate title for the collaborative work on the Practice Review was Review of Innovative Practice and not the more subjective title of *Best Practice Review*.

1.3 Methodology

In order to collect relevant examples of practice relating to these four thematic areas, a two-stage approach to information collection was used within the Practice Review. Each phase is outlined in the following sections.

1.3.1 Phase 1 work

In Phase 1, key professionals working in the field were asked to send outline information briefly describing an example they would like to be considered for the Practice Review. This outline information was collected via a short survey.

The survey was developed using the rationale outlined in section 1.1 collaboratively by staff from UNESCO IITE and the Agency.

The survey was circulated as widely as possible via the UNESCO IITE and Agency websites and also via direct mailings to a broad range of Agency and UNESCO IITE key contacts working in the field.

The coverage of this initial call for examples included: the Arabic speaking countries; Asia, Australasia and the Pacific Rim countries; Commonwealth of Independent States (CIS) countries and the Baltic States; European countries; North and Latin America.

In total there were over 40 replies to the Phase 1 survey covering:

- 7 examples from CIS countries (including Belarus, Moldova, Russia and Ukraine);
- 1 example from an Arab State (Syria);
- 3 examples from Latin America and the Caribbean (Brazil, Grenada and Uruguay);
- 33 examples from Europe including Austria, Belgium (specifically the Flemish speaking community), Denmark, Estonia, Finland, France, Germany, Ireland, Portugal, Slovenia, Spain, Sweden, United Kingdom (specifically England).
- 2 international examples covering different countries and even continents.

All the outline examples received were then considered for balance in terms of focus, illustrating the four thematic areas, geographical spread and coverage of different educational situations.

12 of the most relevant examples were then identified and agreed upon as the focus for the more detailed information collection in Phase 2 work.

1.3.2 Phase 2 work

In Phase 2, more detailed information relating to the 12 selected practice examples was collected via a detailed questionnaire.

Again, staff from UNESCO IITE and the Agency developed the questionnaire collaboratively. Four different versions of the questionnaire were produced – each containing general information required in order to draft Case Study Overviews, but each also focussing upon specific questions relating to one of the four thematic areas for the overall Practice Review.

In addition, a decision was taken to collate the brief information provided in a number of the phase 1 replies relating to other interesting examples of practice as a further source of information within the final Practice Review. Such focussed and specific information is presented in the form of 'Vignettes' to further illustrate the four thematic areas of the Practice Review alongside the Selected Case Studies.

The contributions of the educational professionals submitting both Case Study and Vignette information for the Practice Review must be gratefully acknowledged. These professionals from across the globe (see section *Contributors*) provided the necessary information and were also engaged in a thorough procedure of checking drafts of material to be used in the Review.

1.3.3 Case Studies and Vignettes

It is not possible within the remit of this Practice Review for the selected examples to cover all potential applications of ICT in education for people with disabilities. However, as far as possible, the examples of practice cover different parameters of ICT application:

- *Countries and geographical regions* in order to show that ICT can be applied effectively in very different economic and ICT infrastructure situations;
- *Sectors of education* covering school, vocational, higher and even adult education;
- *Types of ICT equipment* and their application in educational settings, from simple multimedia tools (such as CDs or DVDs) to the development of new research based software or applications.

The Case Studies and Vignettes listed below were agreed upon for the different thematic areas of the Practice Review. In some cases there are multiple examples from the same country where the specific examples were considered to be useful in illustrating the thematic areas for the Practice Review.

- (i) *Supporting personal access to information and knowledge* – Case Studies from Estonia, Finland and Grenada and Vignettes from Belgium, Estonia, Germany, Spain, United Kingdom and Uruguay.
- (ii) *Supporting learning and teaching situations* – Case Studies from Belgium, Portugal and Syria and Vignettes from Belarus, Belgium, Denmark, Estonia, Russia and Sweden.
- (iii) *Supporting personal communication and interaction* – Case Studies from France, Ireland, United Kingdom and Vignettes from Belarus, Belgium, Finland, Portugal, Slovenia and an international example.
- (iv) *Supporting access to educational administrative procedures* – Case Studies from Belarus, Moldova and an international example, Vignettes from Austria, Belgium, Estonia and Ireland.

Essentially the information presented in the examples is descriptive; it covers what has been done in the initiative concerned, why and possible reflections on the impact of the work. This information is in line with the aim of the Practice Review to present information demonstrating different possibilities of using ICT in education for people with disabilities in different ways and contexts.

1.4 Structure of the Practice Review

The Practice Review report is organised as follows:

Chapter 2 provides an overview of information on international policy for ICT and people with disabilities. This review of policy literature puts the Case Studies and Vignettes presented in the Practice Review into a clear policy context. The information covered is structured around the four thematic areas of the Practice Review.

Chapters 3, 4, 5 and 6 each cover one of the four thematic areas of the Practice Review. Each chapter presents three detailed Case Studies as well as various Vignettes as further exemplars of key issues emerging within the thematic area. The Case Study and Vignette write-ups are essentially descriptive – they have a consistent format, with the same structure and key information being presented – the aim being to illustrate different practice rather than analyse it.

The examples are linked via a narrative that attempts to highlight emerging issues and themes in relation to the thematic area of each of the chapters.

Chapter 7 presents an analysis of the critical factors apparent across the various examples. The aim of this chapter is to outline a conceptual framework for using ICT in education for people with disabilities by outlining the key messages and recommendations for policy makers and practitioners. These recommendations identify possible areas of development work for the use of ICT in education for people with disabilities.

The Conclusions consist of final messages emerging from the Practice Review in the form of a series of underpinning principles for policy and practice.

The Practice Review also includes full contact details of Contributors of the Case Study and Vignette information, as well as a Glossary of key terms and References for all citations given in the texts.

2. ICT AND PEOPLE WITH DISABILITIES – INTERNATIONAL POLICY CONTEXT

The aim of this chapter is to provide a focussed review of some of the key policy documents – statements, guidelines and resolutions – at international level that impact upon the use of ICT in education for people with disabilities. This review of policy information has been conducted in order to give an overview of the international policy context in which the Case Studies and Vignettes presented in Chapter 3 of the Practice Review operate. Presenting such an overview of the wider policy context for the use of ICT in education of people with disabilities is necessary for identifying the key policy factors that need to be accounted for in further analysing the practice presented in the final chapters of Practice Review.

Within this policy review, the four thematic areas for the overall Practice Review (see section 1.1) were used as a framework for considering international policies and research and structuring the presentation of general information on policy relating to ICT and people with disabilities.

The methodology used for this policy literature review was to systematically search online databases (including the University Library of Ludwig Maximilian University and the University Kaiserslautern, Germany). Searches were also made of relevant websites of the United Nations, UNESCO and the World Bank and also the European Union. International online reports as well as conference proceedings were taken into consideration. These general searches were followed up with more specific citation searches.

The search terms used included: **access to ICT, accessibility, ICT in education, ICT and disability/special needs** and **assistive technologies in education**. Findings and research from 2000 onwards have been taken into account. The focus was on ICT for people with disabilities, with particular focus on access to information and knowledge, learning and teaching, personal communication and interaction and access to educational and administrative processes.

This review begins with a consideration of international policy for education of people with disabilities, before moving to a consideration of international policy relating to ICT application in education.

2.1 International education policy regarding people with disabilities

At the international level, the main guiding documents impacting on education for people with disabilities begin with the *Universal Declaration of Human Rights* (1948), moving to the *Convention against Discrimination in Education* (1960), the *Convention on the Rights of the Child* (1989), the *Convention on the Protection and Promotion of Diversity in Cultural Expressions* (2005). Most recently, the *Convention on the Rights of Persons with Disabilities* (2006), specifically Article 24, should be highlighted as being crucial as it advocates inclusive education. The UNESCO *Policy Guidelines on Inclusion in Education* (2009) argues that these and other international documents:

... set out the central elements that need to be addressed in order to ensure the right to access to education, the right to quality education and the right to respect in the learning environment. (p. 10)

The World Declaration on Education for All, adopted in Jomtien, Thailand (1990), sets out an overall vision: universalising access to education for all children, youth and adults, and promoting equity. This means being proactive in identifying the barriers that many encounter in accessing educational opportunities and identifying the resources needed to overcome those barriers.

This vision was reaffirmed by the World Education Forum meeting in Dakar, April 2000. The Forum declared that Education for All (EFA) must take account of the needs of the poor and

the disadvantaged, including working children, remote rural dwellers and nomads, ethnic and linguistic minorities, children, young people and adults affected by conflict, HIV and AIDS, hunger and poor health, and those with disabilities or special learning needs. It also emphasised the special focus on girls and women.

Inclusive education is a process of strengthening the capacity of the education system to reach out to all learners and can thus be understood as a key strategy to achieve EFA. As an overall principle, it should guide all education policies and practices, starting from the fact that education is a basic human right and the foundation for a more just and equal society. The major impetus for inclusive education was given at the World Conference on Special Needs Education: Access and Quality, held in Salamanca, Spain, June 1994. Globally, many countries have signed the UNESCO Salamanca Statement and Framework for Action in Special Needs Education and this collective statement is a major focal point for special needs education work. Countries agree that the principles encompassed in the Salamanca Statement should underpin all education policies – not just those specifically dealing with special needs education. These principles relate to equal opportunities in terms of genuine access to learning experiences, respect for individual differences and quality education for all focussed upon personal strengths rather than weaknesses.

The Conclusions and Recommendations of the 48th session of the International Conference on Education (ICE) (2008) called Inclusive Education: The Way of the Future, presented a number of key recommendations including:

- Policy makers should acknowledge that inclusive education is an ongoing process aimed at offering quality education for all;
- Education policy and provision should aim to promote school cultures and environments that are child-friendly, conducive to effective learning and inclusive of all children (UNESCO, 2008).

The UNESCO Policy Guidelines (2009) document suggests that:

Inclusive education is a process of strengthening the capacity of the education system to reach out to all learners ... An 'inclusive' education system can only be created if ordinary schools become more inclusive – in other words, if they become better at educating all children in their communities. (p. 8)

This document goes further by saying that:

Inclusion is thus seen as a process of addressing and responding to the diversity of needs of all children, youth and adults through increasing participation in learning, cultures and communities, and reducing and eliminating exclusion within and from education ... Promoting inclusion means stimulating discussion, encouraging positive attitudes and improving educational and social frameworks to cope with new demands in education structures and governance. It involves improving inputs, processes and environments to foster learning both at the level of the learner in his/her learning environment and at the system level to support the entire learning experience. (UNESCO, 2009, p. 7–9)

The Policy Guidelines highlight the following propositions regarding inclusive education:

- Inclusion and quality are reciprocal;
- Access and quality are linked and are mutually reinforcing;
- Quality and equity are central to ensuring inclusive education.

A Declaration following the Ninth Meeting of the High-Level Group on Education for All (EFA) held in Addis Ababa, Ethiopia in February 2010, confirmed the key role played by education in building equitable and peaceful societies and in sustainable social and

economic development. The recommendations of the meeting state that evidence-based, inclusive education policies are indispensable for reaching the marginalised and meeting the educational needs of all children, youth and adults, regardless of age, nationality, race, gender, ethnicity, disability, religion, low social status and other markers of disadvantage. They also highlight the importance of documenting and disseminating best practices in addressing key elements of quality education such as adequately-qualified teachers, appropriate pedagogy, relevant curricula and materials, language of instruction, the promotion of tolerance and peace, and the appropriate use of technologies and open education resources.

Inclusive education can, therefore, be understood as the presence (access to education and school attendance), participation (quality of the learning experience from the learners' perspective) and achievement (learning processes and outcomes across the curriculum) of all learners. The UNESCO (2008) definition states that inclusive education is:

... an ongoing process aimed at offering quality education for all while respecting diversity and the different needs and abilities, characteristics and learning expectations of the students and communities, eliminating all forms of discrimination. (p. 3)

Opertti et al. (2009) discuss some of the challenges associated with this broad definition including:

- a. achieving a balance between universal and targeted social policies, which may positively discriminate towards certain social groups; such targeted policies may be seen as 'second class' or may increase fragmentation and segregation;
- b. supporting childhood care and education as the foundation for positive outcomes;
- c. the expansion of basic education to a minimum of nine or ten years, with a smooth transition between primary and lower secondary education;
- d. promoting a comprehensive and integrated life-long education system (instead of a vertical and static divided system of formal, non-formal and informal education);
- e. ensuring relevant curricular frameworks and learning tools to meet learners' diverse needs and achieve learning outcomes.

The ideology of inclusive education, as outlined above, is implemented in different ways across different contexts and varies with national policies and priorities, which are in turn influenced by a whole range of social, cultural, historical and political issues. Despite differences in national contexts, it has been possible to highlight the key principles of inclusive policies agreed upon by Agency member countries. The report *Key Principles for Promoting Quality in Inclusive Education* (2009) aims to encourage debate among mainstream policy makers across different sectors and phases of education about the necessary systemic changes in policy and provision to further develop inclusive mainstream provision. These key principles acknowledge that inclusive education is concerned with a far wider range of learners vulnerable to exclusion than those identified as having special educational needs.

The inter-related and mutually supporting key principles, which summarise the perspective, are as follows:

- Widening participation to increase educational opportunity for all learners;
- Education and training in inclusive education for all teachers;
- Organisational culture and ethos that promotes inclusion;
- Support structures organised so as to promote inclusion;

- Flexible resourcing systems that promote inclusion;
- Policies that promote inclusion;
- Legislation that promotes inclusion.

It can be argued that inclusive education provides an important foundation for ensuring equality of opportunity for *all* learners in every aspect of their lives, including education, vocational training, employment and social life. This principle is stressed by Meijer (2010) when he argued that inclusive education is

... in principle of a normative nature and not necessarily subject to scientific proof ... For me, the discussion about the relevance and necessity of social cohesion as well as inclusive education and the influence of inclusive education on social cohesion are purely normative issues. And we should keep them there! (p. 8)

2.2 International ICT policy and people with disabilities

There are numerous international policies that touch upon ICT and people with disabilities. However, there is one major policy that nearly all others relate and refer to – the UN Convention on the Rights of Persons with Disabilities (CRPD), adopted by the UN General Assembly on December 13, 2006. Along with non-discrimination, equal opportunity, full and effective participation and other issues, accessibility is one of the 8 general principles of the CRPD. All of the above mentioned principles have direct implications on the issue of accessibility.

The key statement within the CRPD (2006) relevant for ICT and people with disabilities is within Article 9:

To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, on equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and other facilities and services open or provided to the public, both in urban and rural areas. (p. 9)

Another international policy that has indirect implications for the use of ICT by people with disabilities are the Millennium Development Goals (MDGs). Although these do not specifically mention the right to access ICT for people with disabilities, two key elements within the MDGs are to reduce the number of people in poverty and to reach out to the marginalised groups without access to ICT (Kahn, 2007). Considering that 80% of all people with a disability in the developing world live in what can be considered poor living conditions any programmes or strategies in this area using ICT should aim to include disability and accessibility issues.

The UNESCO Information for All Programme (IFAP) (2009) was established to: *provide a framework for international co-operation and partnerships in building an Information society for all*. Within its programme IFAP has developed a template for National Information Society policy for its member states. The World Summit on the Information Society (WSIS) has also established a Declaration of Principles for Building the Information Society (2003) which has been taken on board by several regional summits such as:

- The Tokyo Declaration of the World Summit on the Information Society Asia-Pacific Regional Conference 2003);
- Accra Commitment of the Africa Regional Conference (2005) and
- The San Salvador Commitment of the Second Ministerial Conference on the Information Society of Latin America and the Caribbean (2008).

Although these declarations differ in their focus, the removal of barriers to reduce the digital divide and enabling access to ICTs for all is echoed through all of the above-mentioned documents.

Not all international policies focus on accessibility for people with disabilities. Regarding ICT, the priority, especially for the developing world, is still to establish an infrastructure for ICT and realise other MDG goals such as ending poverty and general school attendance. However, although access to technology for people with disabilities may not be central at this stage for these countries, including this aspect in national policies and striving for universal design will give them an accessible foundation that will allow them to achieve the CRPD goals of accessibility more easily and in a more cost effective way in the future.

The next section of this chapter will give more details on international policy on the use of ICT for people with disabilities regarding the four thematic areas of the Practice Review: access to information and knowledge, learning and teaching situations, personal communication, access to educational and administrative procedures.

2.3 ICT to support access to information and knowledge

The freedom and ability to access and share information is a basic human right, which was affirmed by the UN General Assembly as early as 1948 in the Universal Declaration of Human Rights.

Building on this right, accessibility is also an underlying premise throughout the Convention on the Rights of People with Disabilities (CPRD). Article 3 and 4 state the obligation to: *provide accessible information to persons with disabilities*. Article 9 also calls for the need for: *the design, development, production and distribution of accessible information and communications technologies and systems*.

Article 24 emphasises that people with disabilities have a right to education *without discrimination and on the basis of equal opportunity*. This clearly implies that accessible information is vital for education and learning. The barriers presented by inaccessible information potentially impacts on 6.5 billion people with disabilities worldwide (WHO, 2005). It is vital that information relevant for learning is accessible to ensure equal learning opportunities for all.

Effective participation in lifelong learning requires learning to learn skills that lead to independence in learning activities and decision-making. The ability to access relevant information for and about education is a crucial skill for learning. When learners have restricted access to information they have restricted access to learning opportunities and it requires active solutions on the part of all stakeholders in lifelong learning to remove these restrictions.

Those countries who have signed and ratified the CRPD commit themselves to amend their national legislation conform to the provisions set out in the CRPD. As of January 2011 the overview of ratifications and signatories was:

- 147 Signatories to the Convention;
- 90 Signatories to the Optional Protocol;
- 97 Ratifications of the Convention;
- 60 Ratification of the Optional Protocol.

(<http://www.un.org/disabilities/countries.asp?navid=12&pid=166>)

Regarding access to information, countries have agreed to eliminate barriers to information, communication and other services. This includes an agreement to support people with disabilities to access information, to develop information communication technologies

(including the Internet) and support the design of accessible ICT from early production stages to reduce the costs. The CRPD goes a step further, promoting access to not only receiving information, but also the right to share information:

States parties shall take all appropriate measures to ensure that persons with disabilities can exercise the right to freedom of expression and opinion, including the freedom to seek, receive and impart information and ideas on an equal basis with others through all forms of communication of their choice ... (p. 14)

The WSIS Declaration of Principles Building the Knowledge Society (2003) also includes the idea of not only accessing the information society, but also the right to be able to share information, which becomes ever more relevant for Web 2.0 based developments. This makes the Internet a forum for not only receiving, but also for sharing information. The common vision of the Information society is:

... to build a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilise and share information and knowledge, enabling individuals, communities and people to achieve their full potential ... (p. 1)

... to also ensure the sharing of knowledge coincides with the demand of allowing people with disabilities full participation in all aspects of social, economic and political life especially to allow them to have a voice in all discussions and policies that touch upon people with disabilities. (p. 3)

The Declaration was reaffirmed in the Tunis Commitment (2005) where it is further clarified that particular attention should be paid to:

... the special needs of the marginalised and vulnerable groups of society including migrants, internally displaced persons and refugees, unemployed and underprivileged people, minorities and nomadic people, older persons and people with disabilities. (p. 3)

On the basis of both the WSIS Declaration and the Tunis Commitment (2003) it was agreed that the Information Society could be supported best: *when ICT related efforts and programmes are fully integrated in national and regional development strategies*. As a result the National Information Society Policy (NISP) was developed, which is not a policy in itself, but a guideline to the creation on National policy compiled and agreed through an international reiterative process. The purpose of the NISP is to provide a guideline to establishing national or regional policy relevant to the information society.

Within NISP a distinction is made between the Information Society and the Knowledge Society. The NISP describes the Information Society as being focussed on technical innovation and considered a stepping-stone towards a knowledge society, which extends to social, ethical and political dimensions (UNESCO Assistant Director General, Abdul Waheed Khan quoted by Burch et al. (2005)). The Information Society alone is not considered sufficient for the developing of knowledge societies; therefore the NISP extends beyond the concept of an Information Society.

The fundamental goals of a NISP are to democratise access, to develop capacities and to achieve an adequate and legal framework.

Despite all these efforts the reality is still behind what policies aim to achieve. The main barriers appear to be the speed in which technology changes in today's world and the mandate of the CRPD to make accessible and assistive ICT available and – most importantly – affordable.

Although limited access to information and knowledge impacts on all people, the consequences are more strongly felt by people with disabilities, who require information to be provided in accessible formats.

In general it can be argued that access to ICT is no longer considered only a right and entitlement of people with disabilities, but that access to ICT is a vehicle towards the societal goals of a knowledge society and growing economy. The concept of accessibility has also extended far beyond just considering accessible web design, but now extends to all areas of daily life. It should be pointed out that the argument for accessible ICT is developing from a consideration of mainly social aspects to a focus on economic aspects of a person's life. This results in not only a call for establishing accessible ICT for all, but also enhancing the skills of people with disabilities for the using ICT to contribute to what the European Council Conclusions (2009a) describe as *progress towards an open, green and competitive knowledge society*.

2.4 ICT to support learning and teaching situations

Regarding education generally the CRPD (2006) states that, among other requirements, State Parties shall ensure:

- People with disabilities are not excluded from the general education system;
- Reasonable accommodation of the individual's requirements is provided;
- People with disabilities receive the support required to facilitate their effective education;
- People with disabilities learn life and social development skills to facilitate their full and equal participation in education;
- The learning of Braille, alternative script, augmentative and alternative modes, means and formats of communication and orientation and mobility skills, and facilitating peer support and mentoring;
- The education of persons, and in particular children, who are blind, deaf or deaf-blind, is delivered in the most appropriate languages and modes and means of communication for the individual;
- Training of Education staff should include disability awareness and the use of augmentative and alternative modes or formats of communication, educational techniques and materials to support people with disabilities.

In relation to the key principles for building an Information Society, the WSIS (2003) recognises the need to empower young people for the information society as: *learners, developers, contributors, entrepreneurs and decision-makers*. In addition, every person should have the possibility of acquiring the skills needed to understand and participate in the information society. Therefore the use of ICTs should be fostered at all levels of lifelong learning, taking into account the special needs of people with disabilities and other disadvantaged or vulnerable groups.

The Tokyo Declaration (2003), a regional follow up of the WSIS, emphasises that:

... Teachers act as a gateway to the Information Society, and their skills development and curriculum resources need increased support. (p. 7)

This was followed by a call to improve *basic and advanced education in science and technology* to ensure the availability of competitive ICT services in the future.

The San Salvador Commitment (2008) – also a follow up of WSIS 2003 – was more specific in identifying targets within education, which is listed as its top priority for the Information Society. The stated goals of the San Salvador Commitment are to:

- Develop school curricula that cover data, information and knowledge management and that strengthen teamwork, learning capacity and problem-solving ability;
- Conduct annual studies on the impact of ICT use in the educational system, which, inter alia, address the following: the impact of technologies on teaching-learning processes in public and private educational centres, the level of use of ICTs by teachers as a complement in their classes and the state of development of educational software;
- Connect 70% of the public educational institutions to the Internet;
- Ensure that, by the time they complete school, 90% of learners have used computers for educational purposes for at least 100 hours;
- Train 70% of teachers in the use of ICTs;
- Train 70% of teachers and civil servants in the education sector in the use of ICTs for the development of school curricula.

No specific reference to assistive technology and its role in education is given within the WSIS and related documents. However, as it is in alignment with the UN Declaration on Human Rights (1948) as well as the Millennium Development Goals, the necessity to include people with disabilities in all capacity building activities is indirectly implied.

To ensure equal learning opportunities it is vital that learners with disabilities in particular can find and access relevant information. Access to information about – as well as for – education is a mechanism that supports participation in lifelong learning. Inaccessible information excludes groups of learners with special needs from finding out about educational opportunities that may be open to them and possible support they can access to effectively participate in education. This inequality can only be addressed by ensuring information about all aspects of education is accessible for everyone.

An example of international policy focussing upon this area is the Digital Agenda for Europe, agreed in May 2010, which endorses the promotion of:

... take-up and use of the Internet in order to ensure inclusion in the digital society, namely through the extensive use of equipment and digital content and tools in education and learning, by enhancing digital literacy and skills and by improving accessibility for all especially for persons with disabilities. (p. 3)

Digital competence is one of the eight key competences referred to in European Council Conclusions on New Skills for New Jobs (2009), which focuses on ensuring that skills needed for future jobs are promoted and taught to match the demands of the labour market.

Such action aims to support Europe's recovery from the economic crisis short term and its growth and competitiveness long term. New Skills for New Jobs states that:

Investment in education and training is key for building future capacities and meeting economic and social targets. This includes the closing of skills gaps in the longer term to achieve social cohesion. All citizens should be equipped with the key competences necessary to adapt and respond to changing labour market demands. (p. 3)

2.5 ICT to support personal communication and interaction

A concrete reference to accessibility for personal communication and interaction can be found in the CRPD (2006). The CRPD states that the learning of Braille, alternative script, augmentative and alternative modes of communication, as well as orientation and mobility skills should be fostered.

ICT as a tool to overcome geographical and social isolation is more prominent in the various policies. The Declaration of Principles for Building an Information Society of the WSIS (2003) suggests that: *Communication is a fundamental social process, a basic human need and the foundation of all social organisations*. The Declaration also recognises that accessible ICTs are tools and not an end themselves. It is the responsibility of States to create favourable conditions to allow vulnerable groups to fully participate. These groups include women, migrants and nomadic people, to name a few, but also include people living in rural areas or areas with limited infrastructure to allow full access to the information society. This is particularly visible in the ACCRA Commitment (2005); here the main focus of the policy is on building an adequate ICT infrastructure to: *advance the geographical and political unity of the African continent and strengthen, expand and facilitate growth of the African economy* for the improvement of the lives of the people of Africa.

Access to ICT as a key factor in overcoming geographical and mainly social isolation is a theme that runs through most policies related to accessibility and the growing knowledge and information society.

2.6 ICT to support access to educational and administrative procedures

Most international policies refer to e-Government, justice or Health Services that can benefit from accessible ICT. Very little reference is made to the importance of access to educational or administrative procedures on a policy level. When access to education or more specifically schools is mentioned, this refers more to physical access to buildings. As in previous sections the right to access educational and administrative procedures is implied as the CRPD asks all State Parties to enable people with disabilities to access full and equal participation in education and in the community (Article 24).

The need for administrative procedures and services to be accessible is highlighted in some European Union policies. While they mostly refer to 'administrative' services, education is considered as one form of administrative procedure amongst many. For example, the European Council Conclusions on the Accessible Information Society (2009) calls for the promotion of:

... the accessibility and usability of online services, public and commercial, particularly relevant to social participation, such as social care and healthcare, social assistance, emergency services, education, transport and banking. (p. 5)

The Conclusions also state:

Everyone should have the possibility of accessing services provided by public administrations. This includes users with disabilities and elderly users as well as all those who have particular difficulties in becoming part of the digital society. The possibility of accessing services provided by public administrations should exist regardless of the software, communication channel, or technological device used. (p. 2)

These documents underline the necessity of clearly outlining access to relevant information and services related to education as an entitlement supported by policy and even legislation.

2.7 Key policy messages

The International Conference on Education, organised by UNESCO-IBE (2008) stressed the need to:

... strengthen the use of ICTs in order to ensure greater access to learning opportunities, in particular in rural, remote and disadvantaged areas. (p. 4)

The work of UNESCO IITE (2006) clearly argues that:

ICT application is very important as it plays an essential role in providing high quality education for students with disabilities. ICTs have been introduced into the teaching-learning process in order to improve quality, support curricular changes and new learning experiences. In this way it is possible to meet the specific learning needs of different learner groups, including students with disabilities. (p. 27)

The European Council of Ministers' Conclusions on Accessible Information Society (2009) also pick up the issue of ICT in learning and teaching requesting all stakeholders to:

Improve the accessibility and usability of ICT-supported education material and methods, thus ameliorating the learning chances of persons less familiar with ICT as well as persons with disabilities. (p. 5)

UNESCO IITE (2006) suggests that:

... although specific applications of ICTs are extremely diverse and varied, they may be grouped into the following main categories: Compensation uses; Didactic uses; Communication uses. (p. 27)

In different ways, it can be seen that international policy influencing the use of ICT in education for people with disabilities considers each of these potential areas albeit indirectly.

However, as is evident from the information reviewed in the preceding sections, the international policy document which has the most potential impact upon ICT in education for people with disabilities is the United Nations Convention on the Rights of People with Disabilities (2006).

The potential importance of ICT for people with disabilities is first highlighted with the Convention's Preamble in section (v):

Recognising the importance of accessibility to the physical, social, economic and cultural environment, to health and education and to information and communication, in enabling persons with disabilities to fully enjoy all human rights and fundamental freedoms.

Two definitions within Article 2 specifically impact upon the field of ICT:

- 'Communication' includes languages, display of text, Braille, tactile communication, large print, accessible multimedia as well as written, audio, plain-language, human-reader and augmentative and alternative modes, means and formats of communication, including accessible information and communication technology;
- 'Universal design' means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design. 'Universal design' shall not exclude assistive devices for particular groups of people with disabilities where this is needed.

Similarly, two of the three General Obligations outlined in Article 4 relate specifically to ICT:

(g) To undertake or promote research and development of, and to promote the availability and use of new technologies, including information and communications technologies, mobility aids, devices and assistive technologies, suitable for people with disabilities, giving priority to technologies at an affordable cost;

(h) To provide accessible information to people with disabilities about mobility aids, devices and assistive technologies, including new technologies, as well as other forms of assistance, support services and facilities.

Within the General Principles outlined in Article 3, (e) Equality of opportunity and (f) Accessibility are crucial within the context of the Practice Review. These two General Principles underpin all of the elements within:

Article 9 – dealing with Accessibility;

Article 21 – dealing with Freedom of expression and opinion, and access to information;

Article 24 – dealing with Education.

Across these as well as other articles of the CRPD, a number of recurring main principles for ICT for people with disabilities in education can be identified:

1. Promotion of equity in educational opportunities at all levels of lifelong learning;
2. Access to appropriate ICTs, including assistive technologies to allow learners to reach their full potential;
3. The training of educational staff to make use of ICTs in educational settings;
4. The promotion of research and development into the availability and use of new ICTs;
5. Systematic data collection to identify and then monitor the implementation of minimum standards for ICT in education for people with disabilities.

In the following chapters practical examples of how ICT is currently being used to support the learning of people with disabilities in different educational contexts will be considered via the Case Studies and Vignettes presented in relation to the four thematic areas of this Practice Review.

How the policy principles outlined in this chapter can then be linked to the practical examples will be specifically considered in the final sections of this report.

3. ICT TO SUPPORT PERSONAL ACCESS TO INFORMATION AND KNOWLEDGE

In this chapter the examples of practice will be used to show how various ICT tools can be used in different educational contexts to improve access to information and knowledge for learners with a range of disabilities and particular needs.

The first example describes ***a nationally co-ordinated initiative to support e-learning in post compulsory education.***

Case Study – Supporting the development of e-learning for learners with disabilities in Estonia

Overview

The Estonian e-Learning Development Centre is a unit within the Estonian Information Technology Foundation. The work of the Estonian e-Learning Development Centre (ELDC) began in 2000 and focuses upon developing more accessible and flexible ways for learning and teaching by increasing the ICT competence of teachers and students. It also supports the selection of e-courses and co-ordinating web-based teaching and e-learning resources in all education vocational and higher educational institutions.

The ELDC works alongside Primus, a programme on higher education quality development, supported by European Social Fund and implemented in 2008–2013 by the Foundation Archimedes (www.archimedes.ee).

One activity of Primus is to develop and run a support system for students with special needs. This is done by: developing different support services (e.g. digitalising and recording teaching material for students with visual impairments, creating training courses); improving learning environments (assessing physical accessibility of buildings); running a scholarship scheme for students with special needs to support their full participation in studies.

Umbrella organisations of disabled people were thoroughly consulted during the planning phase of the ELDC activities (2004–2005), in order to ensure that the needs of students with disabilities and universal accessibility requirements were taken into account in all priority areas of the Centre, especially in infrastructure (web based learning environments and equipment) and e-learning content development (e-courses).

In the vocational and higher education sector, the e-Learning Development Centre (see <http://www.e-ope.ee/en/>) has been founded to disseminate information on best practice and promote co-operation between educational institutions and professionals. However, there is no special focus on ICT education for people with disabilities.

In co-operation with the Estonian Union of People with Mobility Impairment and Estonian Union of Blind, new ICT resources and e-learning facilities are being tested by students with disabilities to ensure hardware and software accessibility and to improve the inclusion of students with disabilities.

The Centre offers educational institutions the opportunity to use several central services (e-learning environments):

- Most of the universities use Blackboard Vista with more than 39,000 users and 1,800 courses. Approximately 55% of e-courses at university level are in Blackboard.
- Half of the vocational schools and two universities use Moodle with more than 30,000 users and 1,700 courses. Some vocational schools also have Moodle installed on their own servers.

- The Interactive Virtual Academy (IVA) was developed at Tallinn University (Estonia) and is based on social-constructivist pedagogy. The other half of the vocational schools as well as Tallinn University use IVA with 1,800 courses and around 10,000 users.

Additionally the Centre allows access to a lecture recording system ECHO 360 which automatically creates a recording in appropriate formats for students with visual or hearing impairments.

The knowledge level of teaching staff in using ICT in the learning process is very uneven. In order for them to be more aware of their existing skills and make right choices in choosing the most appropriate training courses, the ELDC has developed competences for teachers and lecturers and since 2006 the ICT competences model for teachers, lecturers, and educational technologists (also for schools) has been available. Every competence in this model describes a skill that is known in teachers' regular work and it can be used as a self-assessment tool to map individual ICT competences.

The overall training offered by the ELDC is closely related to these ICT competences and is built up across different levels: basic, intermediate, expert and tutor training. Today the training programme is known as the e-learning programme and consists of 24 e-courses.

The Centre also offers a special training course on the principles for creating e-courses for students with disabilities. This provides information on: an overview of special educational needs; ICT and people with special needs; specialist communication on the web; support technology; web standards; language and attitudes; methodological advice.

Learners and educators involved

The ELDC is a national initiative and the biggest advantage of this type of initiative is its scope: it comprises the whole of the VET and HE sector. In a small country like Estonia it is more effective to concentrate the fundamental activities within a single agency and to develop a common framework of activities and quality criteria, instead of scattering resources between different institutions.

On average, 250 VET teachers and 450 HE teachers participate in ELDC training courses annually (these numbers are based on the work of the last 7 years). New training courses are developed according to the ICT competence model, in order to provide teachers with diverse professional development opportunities. Each year 6 new in-service training courses are developed.

The team of ELDC has experience with projects concentrating on various aspects of e-learning, especially areas concerned with building and sustaining networks, training teaching staff and providing technical solutions for e-learning providers. ELDC employs 6 full time employees and 4 contractors (as of November 2010).

Reflections and evaluation

The work of ELDC has shown that ICT creates opportunities to learn for everyone and everywhere. E-learning environments enable a wide range of learners to participate in learning processes irrespective of their special needs or possibilities: learners with disabilities, adult learners, mothers of small children and other target groups for distant learning.

The number of e-courses reached 4,500 by 2010 and the number of users is near 100,000 (all levels of education). As the percentage of students with special needs from the total student body is quite small (0.1%) and they study very different subjects, there is seldom the need for a course designed especially for this target group. It is more important that all the e-courses meet basic accessibility standards.

Through the improvement of e-learning solutions, the overall accessibility of VET and HE has been increased. E-learning opportunities are especially important for students with disabilities, as there still are barriers to physical accessibility and e-learning adds necessary flexibility to the learning process. Physical accessibility of learning environments constitutes a bigger barrier to learning than the lack of e-learning competence or opportunities. Development of ICT education and the improvement of physical accessibility to education are of equal importance.

The ELDC initiative has the potential to support all learners with disabilities. No specific and/or adaptive ICT needs have been taken into account; rather, all the decisions and choices have been made bearing in mind the principle of universal access. Ensuring universal access in terms of e-learning environments, hardware and software is the best approach to ensure that different all learners can benefit from the use of ICT.

Universal access to ICT and e-learning environments, as well as possibilities for taking an individualised approach with adaptations is crucial. All learners are different, whether they have disabilities or not. The ultimate goal for ICT solutions should be flexibility to meet all learners' needs.

Importance of using ICT to support personal access to information and knowledge

In Estonia, educational policy follows the principles of inclusive education. The development of e-learning opportunities and environments, as well as improving the ICT skills of teachers, learners and e-learning coordinators are general priorities. As such it is difficult to separate ICT education for people with disabilities from overall developments.

The use of ICT in learning processes has become customary, as has the participation of learners with disabilities in various learning opportunities. In higher education, where most of the students with special needs are in fact students with physical impairments and different health problems, accessibility of learning is a of key factor and e-learning can add the necessary flexibility to the learning process. By improving e-learning solutions the overall accessibility of information and knowledge within VET and HE in Estonia has been increased.

A number of key messages can be highlighted from this Case Study from Estonia; the first of these relates to the need for dedicated training in order to **ensure all teachers have the necessary knowledge and skills in using ICT in the learning process.**

A second message is the **importance of involving different disability stakeholder groups in consultations on improving accessibility.** As the authors, state: *People with disabilities are the best 'testers' of new soft and hardware.* Involving people with disabilities at the design stage supports the principle of design for all and universal access. Such an approach has the goal of **ensuring all courses meet basic accessibility standards** which in the wider, longer term view can be considered to be more beneficial and important than the development of specialist courses for people with specific needs.

A clear conclusion from this Case Study is that **all learners are different – whether they have disabilities or not – and the ultimate goal for ICT solutions should be flexibility to meet all learners' needs.**

The value of providing on-line and/or **e-learning opportunities to students with disabilities** is also recognised. This is echoed in the work conducted by the national Open University in Spain.

Developing accessible and adapted e-learning courses for students with disabilities in Higher Education in Spain

This work centres on a project called: *European Unified Approach for Assisted Lifelong Learning (EU4ALL)*. The aim of this initiative is to create an accessible and adapted course addressed to students with different disabilities – cognitive, physical and sensory. The course was designed through an Instructional Learning Design. The learner is given access to a course with activities and resources personalised according to the student's needs profile.

This is an open course offered by the university after the student has completed a questionnaire about his/her accessibility and educational needs. The course is implemented through an e-learning platform (DotLrn). In addition to the students with disabilities themselves, the key partners are university teachers; technicians; educational psychologists and learning support services.

The course contents and the resources offered have been designed according to the reusability criterion, which is meant to support learning needs that may arise in different types of disabilities. In this sense the learner's educational and accessibility needs have been analysed and grouped. Learners who share some learning difficulties when they are accessing both learning content and services (e.g. information processing, memory, reasoning, attention, language and understanding problems) are given access to a specific adapted version (i.e. with easy reading format for students with dyslexia, auditory impairment or cognitive difficulties like poor reading comprehension).

In general the learners receive the following resources: work schedule/organiser, study register, adapted learning materials (e.g. shorter lessons, content in video and/or audio format, material enriched with icons, easy reading), glossary of the services/resources available at the platform, glossary of specific terms related with content, forum for comprehension/writing support, conceptual maps, adapted assessments (true-false, matching, multiple choice, short answer tests, etc.). The support design includes both face to face from learning support service professionals and Virtual Learning Environment (VLE) mediated support.

The prototype was finalised at the end of 2009 and a small scale evaluation has preliminary results that show the approach can potentially: help students learn without additional effort; improve their academic results; provide them with access to knowledge according with their educational needs; increase their social and communication skills using forum, chat tools, etc.

According to the small-scale evaluation results, there is a need to improve the course contents, to enrich the design adding different support resources and finally in the next phase to evaluate the initiative in more depth.

The Case Study from Estonia also highlights the need to have **clearly articulated strategies for learners with disabilities within national ICT plans**. These strategies need to involve learners with disabilities in testing and trialling new accessibility initiatives and tools. This is reflected in the work being developed in Uruguay.

Improving ICT accessibility for learners with special needs in Uruguay

Plan Ceibal aims to promote digital inclusion in order to reduce the digital gap with other countries, as well as among the citizens of Uruguay. In order to support better access to education and culture, every pupil in the public education system is being given a laptop.

Within Plan Ceibal an initiative began at the end of 2008 to provide tools to improve accessibility of the laptop for learners with special needs, using particular assistive technology aids in classes equipped with these machines. This initiative involves from the

educational community students and teachers and from Plan Ceibal developers and teachers.

During 2009, developers checked the necessary requirements with users, teachers and learners from special classes. After implementing the hardware and software developments these were given to the users in order to verify their functionality and identify if changes were needed. At the beginning of 2010, a kit of hardware devices as well as a resource bank of software applications that allowed learners with special needs to use the machines they received was developed. These kits were sent to schools so teachers could test them with their learners and identify which elements were needed to meet for each learner's specific ICT accessibility needs.

In addition new educational material (manuals and courses) is now being distributed in the educational community and schools using the accessibility materials are involved in evaluating their usefulness.

The initial challenge faced by the developers was to understand the exact needs of the users, or, as described by Plan Ceibal's Research and Development manager: ... *get in touch with a new reality, unknown for most of us.*

After that, one of the biggest challenges was the range and variety of problems that exist within schools and the combination of difficulties that meant that every learner might need different ICT responses according to his/her special needs. In order to manage this, the objective was to develop general ICT accessibility solutions that can be used by a number of learners with different problems.

The Plan Ceibal team is now working on the design of accessibility devices already available so they can be developed en masse at reduced costs. Dialogue teachers and organisations will continue in order to identify new elements to work on and training opportunities including on-line courses on this subject are currently being extended.

More information about Plan Ceibal can be accessed from: <http://www.ceibal.org.uy>



The work presented in the Case Study from Estonia highlights the need for **specific ICT tools for learners with particular disabilities in order to support their access to post compulsory education and training and ultimately employment opportunities**. Work currently underway in Belgium also reflects this important area.

Supporting students with autism in their transition to work in Belgium

Leren en werken met autisme (Learning and working with Autism) is a DVD with several tools aimed at helping students with autism or autistic spectrum disorders in their transition from education to work, or workplace training settings.

One of the tools is the wai-pass – www.wai-pass.be – specific e-portfolio software. This e-portfolio not only provides information about the skills and competences of a particular student, but also about his/her behaviour in particular settings and situations. This type of very relevant information is gathered by teachers throughout the student's school career and often vanishes when a student leaves school. Through this e-portfolio tool, the information can be easily disclosed to (potential) employers.

There is also a Toolkit for workplace learning and traineeship and Autiwerkt, a movie and a website with roadmaps, tips and tricks on traineeship and preparation for regular employment of students: www.autiwerkt.be

The DVD was developed by the Flemish Ministry of Education, educational providers networks and seven partner schools for special education. The tools were developed mainly in the partner schools with support from the School Pedagogical Advisory Services. Dissemination was organised by the Ministry; the tools were presented during a conference in June 2010 and disseminated on DVD (in Dutch only) to all Flemish secondary schools.



A clear reminder of the ultimate purpose of providing ICT to support access to information and knowledge is presented in a Case Study from Grenada. The work focuses upon the ***provision of ICT in a mainstream school context so students with visual disabilities could access formal education and subsequently public examinations*** that in the long term increased their life chances.

Case Study – ICT supporting the inclusion of students with visual impairments in mainstream schools in Grenada

Overview

In September 2004, a group of visually impaired students were transferred from a school for blind students to two mainstream secondary schools in Grenada. Two students were sent to St Joseph's Convent Grenville and three were sent to the Westerhall Secondary school. The initiative attempted to demonstrate that students with visually impairments could attain a level of education that was comparable with their sighted peers, once they were placed in a mainstream school. The tradition of placing such students in special education schools had not allowed those students to excel.

A small survey was completed on the need for the provision of assistive technology to assist some of the students with disabilities. Students were then transferred from their special school for the blind into a mainstream school and provided with assistive technology to aid learning. For example hardware such as Braille printers, specialised keyboards, magnifiers, audio player/recorders and software such as screen readers and text to audio converters.

There were many challenges in getting the students to adapt to their new school situations, as navigating their way was very problematic at first. However, the biggest challenge was to convince the teachers in the mainstream school that it was possible. The strategy used to address this challenge was to conduct staff development training for teachers in the participating schools. Support was provided for teachers and students during the early phase and there were specialist instructors from the school for the blind provide support to the teachers and students on a regular basis.

The Ministry of education provided all the assistive tools necessary for the study. The Ministry also provided a trained instructor who visited the schools and assisted with the training of the students. The parents of the students were very supportive and indeed so were the staff and the student population. Screen readers proved useful, but they have different strengths and finding the ideal one was also difficult. However, the students were happy to use them.

The students remained in the mainstream schools for just over two years before they had to take the Caribbean Secondary Education Certificate examinations. They received an examination that was prepared in Braille and someone was available to read the printed instructions to the students. Five students did very well with four of them attaining a pass rate of 80% and above. Today, two of the students are practising teachers. One of them teaches at the same school he attended! It was the first time in the history of Grenada that blind students were able to take and pass an examination of this level.

The Ministry monitored the project and documented several outcomes including the increased number of students entering mainstream schools and the increased number of blind students taking CSEC Exams, but also the greater appreciation for technology in education among students and teachers. A conclusion of this initiative was that students with visual impairments are often better off in mainstream schools and the correct assistive tools can be used to enhance how visually they learn as well as improve their self-concept and self-esteem.

As a result of this initiative, students with other types of disabilities were later admitted to the mainstream schools involved.

Learners and educators involved

There were eight learners (4 boys and 4 girls) from rural areas. 5 students had severe visual problems; 3 had 5% visual acuity. They all had with varying ICT skills. They all needed to be taught how to use the screen reader and the magnifier. They all operated at different levels of Braille Mastery so the requirements were quite wide. The staff of the school for the blind, staff from the two participating schools and parents were all very much involved.

There were two professionals who were trained to teach students with disabilities so they worked along with the other staff members in the mainstream school. The basic organisation was handled by the trained professionals – for example, every student who was using the ICT tools was required to be very proficient with Braille, so Braille was the first tool that they all mastered. Then they were taught to use the special keyboards followed by the screen readers.

The initiative was supported by the Ministry of Education who provided administrative and technical support. The Organisation of American States provided funding for equipment and training.

Reflections and evaluation

As well as the formal evaluation from the Ministry of education, there are more anecdotal reflections on the possibilities ICT offers students with visual disabilities in education. For example, several families have purchased some assistive tools to be used at home. One former student said to the project team: *'Thanks for helping us. I was the student who had no chance in the world and today I am employed as a teacher.'*

A member of the specialist ICT support staff remarked: *'I worked with [the students] but never anticipated that they will do so well'*. The fact that blind students were able to sit external examinations for the first time and that they were able to do so well, remains the project's biggest success story. The stakeholders believed that it could happen and the students believed in themselves.

Overall it is considered that technology can really bridge the digital divide between the students with and without disabilities. The Head of ICT support in the Ministry writes: *'Technology when applied, used and supported properly can really remove some of the barriers, which restrict the contribution that people with disabilities can make to society.'*

Importance of using ICT to support personal access to information and knowledge

It is considered that there is potential for ICT usage to be more widespread in supporting access to information and knowledge for people with different disabilities in Grenada. For this to happen there is a need for early intervention introducing ICT that will make adapting and developing skills easier. There is also a need for more public awareness raising on the importance of this topic.

The small-scale study in Grenada had good results, but it is argued that without a policy in place: *'people are likely to do what they feel comfortable with not necessarily what's best for the students.'* ICT and special education policies need to be clear and have shared goals. The policy must map out the educational path and the required assistive tools that each learner should be exposed to from birth to age 17.

The support structure that surrounded this initiative had people who are knowledgeable in the area of ICT in education; there was a technical support unit and specially trained teachers to deliver the service. The main weakness of the system was the failure to put the infrastructure in place for initiatives like this to be sustained in the long term and a main factor in sustaining initiatives is funding.

ICT remains the best vehicle for accessing the wealth of knowledge and information now available to learners and since there is so much that can be gleaned on the Internet, ICT tools accessible for people with different types of needs remain critical. The Head of ICT support in the Ministry writes: *'The possibilities are real. We have seen what happened with visually impaired students and their assistive tools. There is technology to help deaf, speech impaired and academically challenged students in our society so the possibilities are real. What is needed is a firm policy and financial support.'*

The small-scale study in Grenada **demonstrated the possibilities of using ICT as a tool to support the inclusion for visually impaired students** – specialist ICT was able to bridge the digital divide between the students with and without disabilities. There appears to be clear potential for ICT usage to be more widespread in supporting access to information and knowledge for people with different disabilities. However, for this to happen, there is **a need for ICTs to be made available as early as possible in a learner's education** so that developing the necessary skills happens as soon as possible.

The importance of **clear policy leading to an established ICT Infrastructure** that allows small-scale initiatives to be maintained, developed and exploited needs to be in place for initiatives such as the one in this Case Study to be sustained in the long term.

The Case Study from Grenada indicates that a real challenge was to '*convince the teachers in the mainstream school that it was going to work*'. **Positive attitudes of all stakeholders are crucial** if the potential of ICT in education for people with disabilities is to be achieved.

A central issue highlighted by the work in Grenada is **the need for awareness raising regarding the potential of ICT in education of different learners with disabilities and special needs**. An initiative in Belgium aims to also address this need.

Raising awareness of the potential of ICTs for learners with special needs in Belgium

In 2008, the Flemish government launched an initiative to raise awareness of the potential possibilities of using ICT with learners with special needs. The campaign was targeted at mainstream and special primary and secondary education as well as the Centres for Pupil Guidance.

The campaign was prepared in 2008–2009 and launched in June 2009 at a conference for teachers. The specific aims were:

- Awareness raising about the use of ICT in learning and teaching for learners with disabilities and learning problems;
- Information provision and 'collation' of information about the use of ICT in learning and teaching for pupils with disabilities and learning problems;
- Supporting schools with the development of a vision and a policy at school level on the use of ICT for special needs education;
- Providing digital learning materials and ICT tools for use in learning contexts for learners with special needs.

Two tools were produced:

- A printed publication covering: context of ICT use in special education; a vision of ICT use (tips and tricks); educational possibilities of ICT (applications and software); tools for teachers; specific topics (digital visualisation tools, distance learning tools, e-portfolio for learners with SEN, Internet use for pupils with learning disabilities); accessibility issues; health and e-safety issues.
- A CD with learning materials and additional information. For this campaign a set of specific learning materials was developed: a digital movie based method for maths learning by pupils with hearing impairments, a set of pictograms about specific education settings and a manual on using digital whiteboards in SEN-contexts.

In order for learners with disabilities – such as those with visual impairment as described in the Case Study from Grenada – to reach their full potential, **specific ICT tools and aids need to be made available in post-compulsory educational settings** as well as schools. The example from Germany illustrates such work.

Supporting visually impaired students in their University studies using specialist ICTs in Germany

In 1986 the model project 'Informatics for the Blind' started with the mission to open new study and professional possibilities for visually impaired students in mathematics, informatics, sciences, engineering and economics by the means of using information and communication technology. This holistic approach was developed into the 'Study Centre for

Visually Impaired Students' (SZS) as an institute at the Karlsruhe Institute of Technology (KIT) in southern Germany.

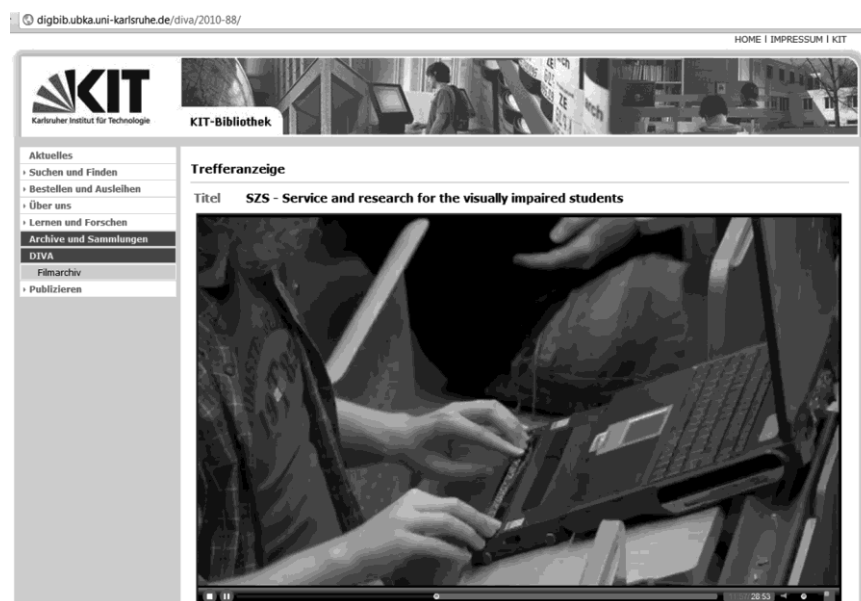
As a service and research institute the SZS supports blind and partially sighted students in all courses offered at the university. The SZS service offers counselling, guidance and special support in pedagogical and technical fields, when entering higher education, during studies and in transition into the labour market. The aim is to realise the comprehensive inclusion of the students with visual impairment into everyday life.

There are nearly 20,000 students at KIT and about 60 visually impaired students.

To achieve the SZS aims it was necessary to involve university academics and administration staff, the student service organisation, mobility and orientation trainers as well as companies developing assistive technology. The ICT focussed work of the SZS has led to blind and partially sighted university graduates, qualified in latest IT, mobility and orientation, with international experience and excellent grades. This has ultimately led to the inclusion of visually impaired in the labour market and them working in appropriate academic or professional posts.

More information can be found on the SZS web page: www.szs.kit.edu

A video of the SZS is available from: <http://digbib.ubka.uni-karlsruhe.de/diva/2010-88/>



The **need for ICT tools to be simple and capable of 'everyday use'** if they are to be useful for learners with disabilities and their families is also indicated in the Case Study from Grenada.

For some learners with different types of special needs this means **involving a range of stakeholders in designing new, personalised ICT tools** as is very clearly described in a Case Study from Finland.

Case Study – Ev-Tech: designing and developing research based technologies for everyday use with children with disabilities and their families in Finland

Overview

Everyday Technologies for Children with Special Needs (EvTech) is a collaborative initiative aiming to increase the possibilities of children with special needs to make choices and

influence their environments in everyday life by developing individualised technical environments and tools for children and their families.

In addition, the project is expected to support the interaction and the participation of children with special needs and their families in everyday life.

A first project on ICT in education for people with disabilities was carried out in 2005–2007 at University of Joensuu (now the University of Eastern Finland). The findings of the project were promising and encouraged the project team to continue the work.

The focus of the current project is to develop new software and user interfaces for children with special needs. The aims of the project are:

- To empower children with special needs and their families as collaborative design and research partners of technology;
- To develop open-access, low-cost everyday technologies for and with children with special needs and their families;
- To conduct research on the usability of the technologies, as well as on the experiences of children and their families' the technologies are developed for.

The intention is for these to be low-cost, usable technologies for everyday use (for example, easily modifiable Lego games, easy-access social including the possibility to use means of augmentative and alternative communication).

The project runs two technology clubs for 4–13 year old children with a variety of special needs and their families. Families attend club meetings weekly, 10 times each semester. In club meetings children and their families work jointly with researchers in several technology settings according to the child's choice. The club meetings start and end with a session where children, parents, and group leaders are all together. Pictures, sign language and other augmentative and alternative communication methods are used according to the children's needs. The basic technologies of the club consist of six laptops, two Lego Mindstorm NXT robots and one touch screen.

The children have also made control units themselves (using usb game-pads or keyboards) that can be used to control computer programmes. Materials for these input devices are affordable and common, like wood, aluminium tape and cardboard.



The software the project uses contains several self-made and third party free programmes, for example the dancing game Stepmania, input emulator GlovePie (to map input

commands to other input devices) and several online programmes from websites. Tailored programmes are also developed in the project for the clubs, which are constantly further developed.

The technology is constantly modified and further developed according to the feedback and user experiences from children and their families and data collected from the club meetings. The technologies that are developed in the club meetings be used also at homes and schools in the future.

The project increases the social inclusion of the children with special needs in their community by providing meaningful leisure activities that children can engage in with their parents. In addition the activities in the clubs help the children and their parents to maintain and develop the ICT skills.

Learners and educators involved

The main groups involved in the project are children with variety of special needs, their families, rehabilitation professionals and teachers working with children and families. Within the EvTech project children and their parents are included as genuine design partners.

The key partners of EvTech-project are Honkalampi Foundation and University of Eastern Finland, Department of Special Education and School of Computing. The Honkalampi Foundation is a natural partner as they already had services for children with special needs and their families.

At the moment there are twelve children with special needs attending the project, all with a variety of ICT skills. The requirements of ICT in relation to their difficulties are taken into account by developing technologies based on their strengths and interests.

In the club meetings, there are six children their parents, three tutors (student teachers), and two people from the project working together. In addition students who are doing their research (thesis for example in special education or computer science) related to the project might be collecting data for their thesis during the meetings. There are no ICT skill requirements for parents, students and teachers.

The project is funded by the Finnish Slot Machine Association.

Reflections and evaluation

The outcomes and the process of the project are continuously evaluated by the participants through their feedback. In addition the process and the outcomes are being evaluated via multi-scientific research approaches integrated into the project design.

The project will continue until the end to 2012.

The biggest success so far has been to get children and parents actively participating in the process. A child from the EvTech project said: *'This is the best club'*. A mother attending EvTech with her child said: *'I never thought that you would be interested in my opinions on technology'*.

One of the EvTech researchers suggests: *'Collaboration with families has been rewarding. Children and their families have great potential as designers and development partners. It is important to find more ways to get them truly involved'*.

The outcomes of the EvTech project will be utilised in new projects aiming to generate outcomes that could be used with a variety of users and in different contexts. For example, a new project 'Children with autism spectrum disorders as creative actors in a strength-based technology-enhanced learning environment' that is funded by the Academy of Finland, will be launched by the University of Eastern Finland in January 2011. The project will utilise and further develop the ideas and experiences from EvTech project.

Importance of using ICT to support personal access to information and knowledge

People with disabilities have relatively good access to assistive technologies in Finland and those technologies are used to some extent in everyday contexts at home and school. In addition, the use of ICT is a cross-cutting theme in the Finnish national curriculum and the potential for ICT as a tool for supporting access to information and knowledge is recognised in education.

The basic infrastructure concerning ICT in schools is quite good. There is also one person, usually one of the teachers, in each school who is in charge of technical support. Some basic knowledge and skills in the use of ICT are provided for students during their teacher training and there is also some support provided by in-service training.

However, it can be argued that a challenge is to change attitudes towards ICT and technology as in some educational settings ICT is still not always seen as a useful means of learning. Training in the use of ICT in teaching and learning provided to teachers and student teachers could be more multi-faceted.

ICT is used in education for people with disabilities to some extent, but the use could be more active and systematic, particularly with people with severe developmental disabilities. In order to expand the use of ICT in education there is a need to develop more adaptable technologies for the whole spectrum of people with disabilities. Professionals do not always have sufficient skills to use ICT – and ICT is not adaptable enough for the variety of special needs that students have.

For the EvTech project, a short-term goal is to develop more adaptable technologies and to train people working in education for people with disabilities. However, a long-term goal is to establish a forum for collecting information on ICT in education for people with disabilities. It is also a challenge for the project to find ways how to truly include children with special needs and their families within the design and development process.

A number of key messages emerging from the Case Study from Finland need to be highlighted here; the first repeats a message evident in the Case Study from Grenada, that is the importance of positive attitudes towards ICT. ***Developing positive attitudes so that educators see ICT as a useful means of supporting learning*** is a factor evident in very different environments and situations with varied ICT histories and infrastructures.

A further message relates to the huge ***potential learners with disabilities and their families have as design and development partners***. The need for these stakeholders to be more actively involved in designing new ICT tools is indicated within the Case Study when it is argued that '*ICT is not adaptable enough for the variety of special needs students have*'. There is still ***the need to develop more adaptable technology for a wider spectrum of people with disabilities***.

Again, echoing previous Case Studies, the work in Finland emphasises that ***teachers and other professionals do not always have sufficient skills to use ICT in the best, most systematic ways***. This appears to be ***particularly the situation with regards to people with severe developmental disabilities***.

A main goal for the project described in the Case Study was to support the interaction and the participation of the children with special needs and their families in everyday life. ***Flexible tools for everyday usage by different stakeholders in education*** is also the focus of an example of a school based initiative from Estonia.

ICT as a flexible tool for all teachers and students in a specialist school in Estonia

Hiie is a State school for students with hearing and speech special needs – there are 320 students from all over the country and 75 teachers and assistants.

The school has been working since 1997 to develop the school wide use of ICT in order to: provide ICT tools in all students' and teachers' daily work; improve students' and teachers' ICT competences and skills and to develop and improve innovative teaching methods, particularly project and research-based learning.

Overall, the school wants to exchange experiences, good practices and materials both within the school team as well as with colleagues in other schools in Estonia and even beyond.

There is school intranet where all the personnel can share material, questionnaires and documents that all the students can access. Additionally, every teacher has a personal space on the school server that is protected with a password. The intranet can be accessed from outside the school as well.

All teaching materials are available in the Internet:

<http://www.hiie.tartu.ee/?id=133&lang=est>

In addition, the school has an established Internet community: <http://grou.ps/uptothenines>

The work at the school has been developmental and has involved support from different sources – such as the Tiger Leap Foundation (www.tiigrihype.ee) – as well as input from training courses on ICT, the creation of Internet based teaching materials, etc.

The school head teacher says: *'At first, it was not popular among teachers to share good practice and teaching materials, now it is a normal way to work. Thanks to the remote desktop connection our teachers can work with their materials outside the school building. Floppies, CDs and memory sticks are almost forgotten.'*

Involving families of learners with disabilities in order to further support **possibilities for home based learning using ICT** is also the focus of a very different type of initiative in the United Kingdom.

Adapted access to learning at home through ICT in the United Kingdom

The Home Access Programme is a nationwide initiative that aims to provide access to learning at home for all pupils via a computer connected to the Internet. In addition, assistive technology and specialist software to support learning for all, including special adaptive technology for those learners with particular needs is provided.

This is a government-funded programme co-ordinated by Becta (the government agency leading the national drive to ensure the effective and innovative use of technology throughout learning.) It involved industry, local education authorities in the pilot stages and a wide range of stakeholders in the design stage. The programme was designed during 2006–8, piloted in 2009 and became national at the start of 2010.

The initiative was implemented through a 'business model' where families were provided with a credit card enabling them to obtain ICT equipment from a retail outlet. Special software could also be accessed for those choosing to do so. In addition a special service for those learners with more complex access technology needs was available so they could access the specialist ICT equipment they needed (but at no cost to the family).

The biggest challenges faced were to initially design the programme in order to deliver in a restricted time period the relevant ICT equipment to such a large number of learners. Ensuring inclusion and equity was crucial and this was considered during a pilot stage that identified a better way of meeting the needs of a significant majority of learners with special needs.

The programme is still in operation, but the initial indications are that this home access to ICT is empowering and is providing equality of opportunity and access, as well as involving parents and the family more in the learning process.

No future funding is available although the government is taking on the management of a research programme (already initiated by Becta) that will look at the impact of this programme.

More information on the work of Becta is available from: <http://www.becta.org.uk/>

Specific information on the Home Access Programme can be found at:

<http://www.homeaccess.org.uk/>

A number of general themes can be identified across these examples relating to how ICT can be used to support access to information and knowledge. The first and possibility most important is ***the need for learners with disabilities – and often their families – to be supported so they are active decision makers*** and as far as possible autonomous in their choices about ICT and then its actual usage.

For this to be made possible, it is ***necessary for a range of stakeholders in education and ICT to be involved in developing simple ICT solutions*** that can be personalised in different ways for everyday usage by learners with disabilities.

Making different stakeholders in education aware of the possibilities ICT can offer requires systematic approaches. The personal knowledge and attitudes of policy makers and practitioners ***need to be influenced through awareness raising exercises that make clear the potential benefits of using ICT in education for people with disabilities***. Just as important is ***the need to develop positive attitudes towards ICT amongst teachers and other educational professionals*** in order that ICT is still understood to be a valuable tool for supporting of learning and teaching.

One critical factor in fostering positive attitudes towards ICT is the ***provision of multi-faceted training in the use of ICT in teaching and learning for all teachers and educators***. This is one critical issue explored in the next chapter.

4. ICT TO SUPPORT LEARNING AND TEACHING SITUATIONS

The possible use of ICT to support different aspects of learning and teaching is potentially a huge field and there are various resources presenting examples of ICT being used for pedagogical and didactic purposes so as to assist in personal learning and development (please refer to the UNESCO IITE website for such exemplars: <http://iite.unesco.org>).

The various examples presented here have been selected in order to illustrate different dimensions to the **concept of access to different types of learning and teaching situations**. The **first of these dimensions is supporting physical access to learning situations**; the Case Study from Belgium presents an initiative designed to overcome physical barriers to attending school.

Case Study – Bednet: supporting pupils with long-term illness to join their mainstream class activities through ICT in Belgium

Overview

Bednet is a non-profit making organisation that supports learners from 6 to 18 years in the Flemish region of Belgium who suffer from long-term and/or chronic illness. Using computers and specially selected peripherals, connected through broadband Internet and a dedicated interface, the Bednet system enables learners to take part in classes and their mainstream school activities.

The goal is to include the learner (who may be at home or in a hospital) in a normal class environment. The Bednet system makes it possible to act as in a normal class situation: anything that can be done in the classroom is also possible for the learner at home. The service wants to avoid or at least reduce educational delay caused by the illness and to re-establish / maintain social contact of ill learners with the 'outside world', in particular their schoolmates and teacher(s) by means of ICT. The system is easily accessible and user-friendly. All the functionalities that are necessary for the teaching/learning process and communication between actors are included in the system.

Bednet developed for this purpose the 'Bednet system', a dedicated environment with an intuitive interface that mirrors the learner's classroom situation on a laptop desktop at home. It facilitates the use of IT-based learning resources, video conferencing tools and remote access by the teacher and learner to scanners and printers at the school and the learner's site for the exchange of documents, assignments and exercises.



The technical set up of Bednet include a broadband Internet connection from classroom to the learner's room at home.

It connects:

- At the learner's site a laptop, webcam and printer/scanner;
- At the classroom site a desktop, printer/scanner and digital camera.

Through the webcam the learner has visual contact with the teacher and classmates. The child can take snapshots of the school's blackboard with the digital camera. The printer and scanner are used to exchange documents (notes, exercises, illustrations, etc.) The system can be used during classes but also outside classes to interact with teacher and peers, enabling social contact and collaboration that replaces physical interactions. Bednet's interface is very intuitive and to use and learners and school have permanent access to the helpdesk in case of technical problems.

Learners and educators involved

The Bednet system started in the school year 2007–2008 with a pilot project involving 39 students. In the school year 2008–2009 the total number of participants was 75. In school year 2009–2010 158 children were using the system. In addition to these students, the main educational partners are the head teacher and teachers of the home school; parents and families; classmates. Bednet partners are the regional Bednet employee and an ICT staff member.

It is the ambition to enlarge the number of learners involved in the future to about 500, as this is the estimate of the yearly need, i.e. the number of sick children that cannot go to their mainstream school for a long period of time and could benefit from Bednet.

The users of the Bednet system do not need specific ICT skills, as it is the aim of the Bednet system to be as simple as possible.

To ensure that the teacher can concentrate on the class management, classmates of the ill learner operate the infrastructure at the school site. For this purpose they receive specific training and a simple manual and are instructed to contact the helpdesk in case of more important technical problems, to avoid that the system distracts them from properly joining the class activities.

The case of Laura illustrates the Bednet system ... Laura is a 6-year-old girl living in a rural town. She started her first year of primary education in the school year 2010–2011. Since the age of 3 she went to kindergarten in the same school, but then got seriously ill, which meant that she had a series of hospital and recovery periods at home. There she received instruction from her kindergarten teacher and from a teacher for temporary education at home (4 lessons per week). During her illness in the last year of kindergarten, the school management team applied to the Bednet service. The regional Bednet staff member organised consultations with the school head teachers and school care coordinator, her teacher and Laura's parents. After considering the pros and cons they jointly decided to initiate the project at the start of Laura's first year of primary education, in combination with teaching at home.

The necessary equipment and broadband connection were installed in Laura's home and classroom; Laura, her parents, teachers and classmates were trained in the use of the Bednet system and Laura started joining classes from home. The Bednet system not only allowed her to observe the teaching, but also to read and print the content of the blackboard and to participate in the teaching and learning process, as well as chatting online with her school friends after class time.



Reflections and evaluation

Laura's situation reflects other Bednet users' experiences. All parties (school, teachers, parents and Laura herself) have evaluated the Bednet case positively. They all felt involved and the well being of Laura has increased. Laura's parents feel that Laura's learning to handle ICT is a major advantage, as Laura is now well ahead of her peers in ICT usage. Laura feels happy according to her parents; she is very involved and motivated in her learning. The only thing she still misses is the classroom atmosphere, its 'cosy corners and moments'. A computer is not a complete replacement for that, and 'her school bag is always within reach'.

Laura herself is pleased she is 'present' in class each morning. She maintains strict discipline, following the same routine her classmates follow. It is demanding, but she wants it that way, motivated as she is. She is very glad that she is able to join classes and the ties with school are strengthened by the teacher's daily visit to her. Laura's classmates are very involved in the project. They welcome Laura at login and help her interact with the class, asking for the teacher's help when Laura sends documents to the classroom's printer and when she signals that she has a question or communication to make. In the project's start-

up phase, they often looked to the computer, but now that they got used to Laura's join they focus again on the teacher and the teaching. They say they are glad that Laura can attend classes and that the teacher invites them when something has to be communicated or done for Laura.



Importance of using ICT to support learning and teaching situations

As long term and chronically ill children have to stay in hospital or at home, their education becomes endangered. In some cases they can continue their education through the hospital school (if there is any in their hospital of residence) or receive education at home (if available), but education in their regular school is usually interrupted. The ICT used in the Bednet set-up enables learners to continue engaging in learning and teaching and be virtually present in the class and interact with the teacher and classmates. This means there is the possibility to avoid or reduce school delay by providing ICT devices that enables learners to join classes in their mainstream school through broadband Internet connection;

The use of the ICT set-up also combats the risk of isolation and social exclusion by offering the ill learner an easy way to collaborate with schoolmates and in general stay in contact with the friends in class. This can contribute to the learner's healing by supporting a goal-oriented motivation and diverting the learner's focus away from illness and its consequences, to a more 'normal' life.

The Case Study from Belgium clearly illustrates ***the importance of ICT in enabling learners with special needs to take part in mainstream class activities***. This Case Study shows how a ***specific application of ICT can combat the risk of isolation and social exclusion*** by replacing physical access with virtual access to learning experiences.

To achieve this aim, it was necessary for the ***ICT set-up to be as simple as possible*** so it was – echoing a message from chapter 3 – suitable for 'everyday use'. Once again, ***the issue of fostering positive attitudes towards the possible uses of ICT in education appears to be crucial***. The success of the Case Study from Belgium was dependant upon all partners in the initiative being positive about the possibilities of using the ICT system and then being supported in its actual use in such a way that they were all able to use it effectively and negative experiences were avoided as far as possible.

A second possible dimension within the concept of access to learning and teaching via ICT is access to inclusive education opportunities. Work in Portugal at the national level illustrates this.

Case Study – National network of ICT Resource Centres for special needs education in Portugal

Overview

In Portugal, a national network of 25 ICT Resource Centres for Special Needs was launched by the Ministry of Education in the school year of 2007–2008. These Centres are located in mainstream schools and cover schools from a neighbouring district area. The initiative was launched at central level by the Ministry of Education, which was jointly responsible for the implementation of the National Plan for the Integration of People with Disabilities (2006–2009).

The main task of the Centres is to recommend assistive technology for pupils, including: tactile screens, hearing-microphone sets, switches, adapted mouse/joysticks, lenses, talkers/communicators, special keyboards (Intellikeys), Brailers, Braille printers, embossers, pointers, OCR, robots, projectors, scanners (audio readers), didactic embossed materials, adapted toys, AAC software, authoring software, screen readers, speech synthesisers, virtual keyboards, sign language resources, cause-effect software, amplifiers, didactic resources.

The Resource Centres also play other complementary roles: training teachers in the use of ICT and assistive technology; raising awareness on the benefits of these media among parents and school staff; looking for partnerships with Higher Education Units (devoted to assistive technology and Special Needs research), with Special Needs private associations, with health services, with companies specialised in assistive technology.

A virtual community – using the Moodle platform of the central department – connects the teams working in the 25 Centres, the respective school directors and the special needs regional services. Through the virtual platform frequent messages and resources are exchanged and various activities worked upon, namely: (i) repository of special needs resources; (ii) case studies; (iii) video casts; (iv) online training courses on augmentative communication.

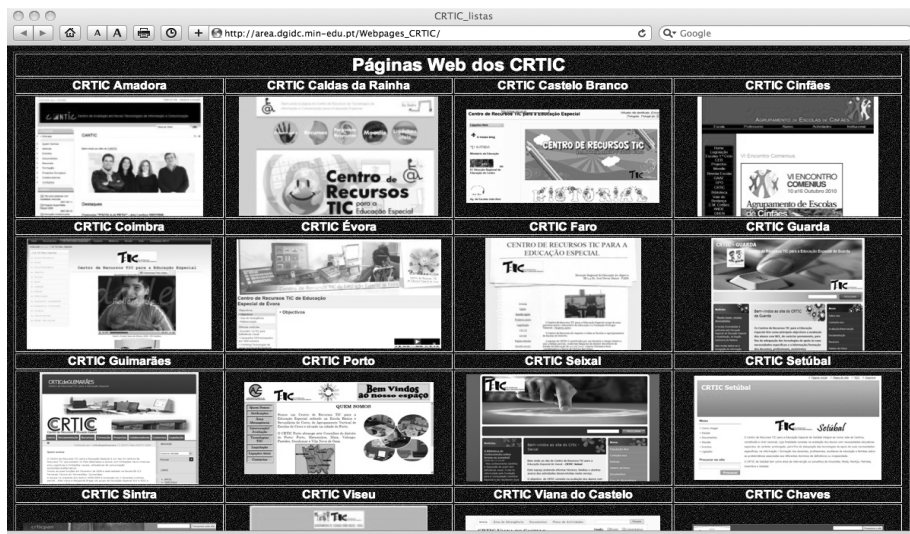
The innovation and originality of the Centres results from the fact that there was no such structure before in Portugal. Assistive technology was known and accessible only to a few. This initiative has made it possible for SEN teachers to exchange practice and resources through a virtual platform. In the near future, this network will be a focus of expertise in the field of assistive technology and will be the main disseminator of information to schools.

The network of Centres is now established and its activity has been evolving year after year. More teachers are getting motivated towards the benefits of ICT and assistive technology so that their pupils/students may attain increased levels of functionality and participation towards autonomy. More teachers are peer-trained in the integration of ICT and assistive technology used by the pupils in schools. In the last two years, the Ministry of Education has provided the finance for the assistive devices recommended by the network for the pupils evaluated. Some progress has been achieved, but it will be necessary to maintain the network as a continuous support to teachers and pupils/students with disabilities in the future. *Learners and educators involved*

This national initiative started in 2007–2008 with 14 centres, the following year 10 more centres were created with the last one opening in 2009–2010, as a subdivision of one of the centres that covered a big geographical area. ICT Resource Centres for Special Needs

teams are made up of SEN teachers (about 55 in 2010) who provide training and support to their colleagues teaching pupils/students with disabilities.

The Centre teams received initial training in AAC software in 2007–2008 and since then have participated in many other courses and public events regarding inclusive technology. Every year, the Centre teams deliver many seminars, workshops, demonstration of products regarding inclusion and technology. In 2009–2010 they have delivered 850 hours of events, covering about 5,042 teachers, 486 technical/therapeutic staff, 266 auxiliary staff, 2,620 pupils/students and 275 parents. A national study on the impact of the use of assistive technology by the pupils/students and the impact on their learning is considered necessary in the near future.



Reflections and evaluation

A number of teachers responded to a questionnaire (November 2010) on the quality of services provided by the ICT Resource Centres for Special Needs and the impact of the evaluation and recommendations of assistive technology provided to pupils/students with disabilities. One teacher remarked: *'The role of the ICT Resource Centres for Special Needs is very important, thanks to the intervention of the teams in charge. The pupils I support can now benefit from software and peripherals that facilitate communication ...'*

Another suggested: *'More information and raising awareness events on assistive technology should be organised for teachers and professionals dealing with SEN pupils. A more effective articulation between the Centre and schools would be advantageous for better quality support towards inclusion and autonomy of the pupils/students.'*

It can be considered that a national network of ICT Resource Centres for Special Needs, with a common purpose and common guidelines can have significant impact supporting schools and pupils/students.

The virtual articulation and sharing of experiences is fundamental to each Centre's activity. The promotion of local partnerships by each Centre is also very important. The concept and praxis of networking, sharing experiences and knowledge is fundamental for continual updating in the field of ICT and assistive technology. Virtual platforms are important to foster exchange and communities of practice. Partnerships with specialist institutions and NGOs, with Higher Education research units and companies specialising in assistive technology are important to gather expertise and provide a better service to pupils/students with

disabilities. ICT and assistive devices can make all the difference for the autonomy and independence of people with disabilities.

Importance of using ICT to support learning and teaching situations

The barriers that have made the use of ICT in learning and teaching situations difficult for all teachers – in spite of advances made throughout the years – are: poor connectivity in schools, shortage of computer equipment, low usage of digital educational resources, fear and insecurity in using ICT by teachers, poor quality training, poor school leadership in the field of ICT.

Concerning assistive technology, teachers are beginning to get familiar with special devices and software. However, it can be noted that very few have regular routines for using them. Positive school management can lead the change motivating teachers to make the best use of the resources available, as a benefit for the pupils/students.

ICT and assistive technology can make a real difference for the autonomy of people with disabilities. If the adequate devices are made available people can act independently. To help pupils/students to become autonomous learners and to witness such an accomplishment can be rewarding for any educator.

Partnership with organisations with expertise in the different fields of disability are very important – in cases where the Centres do not feel competent to assess certain needs and problems they are able to look for or recommend other organisations with expertise. However, in the long term, it is expected that the ICT Resource Centres for SNE will develop into being a reference point with regards to ICT accessibility and assistive technologies for learning, growing in expertise and stimulating local networking.

The Case Study for Portugal illustrates how ***teachers in mainstream, inclusive settings can be supported in using specialist technology*** in their work with pupils with different forms of special needs. However, this example highlights a number of ***possible barriers to teachers using ICT in inclusive settings***, such as limited ICT infrastructure and negative attitudes often linked to inadequate training. ***Educational leadership in initiating and supporting ICT usage is crucial***: *‘Positive school management can lead the change motivating teachers to make the best use of the resources available, as a benefit for the pupils/students.’*

The Case Study also illustrates the importance of networking with a range of actors – including research partners and industry. ***Partnerships are seen as crucial for the further development of technology and also professionals’ expertise.***

Work that is ongoing in Belarus presents another such example of a partnership between different stakeholders in ICT aimed at developing assistive ICT tools.

Software to support learning maths for students with different learning needs in Belarus

The National Institute of Education conducts research into the development of specialist teaching materials – one such project is working to develop software and methodological support in mathematics for students with severe speech disorders, learning difficulties or hearing impairments in grades 1 to 5 of special schools. The use of computer technology as a tool for learning activities is considered very important for the development of cognitive activity, as well as the formation of self-control and self-esteem of school students as it leads to increased activity of pupils in the classroom, enhances motivation and supports individualised instruction.

As well as the National Institute, the other key partners in the initiative are the Research and Production Private Enterprise INFOTRIUMF.

This project will be developed during 2010 and onwards. Future plans include the introduction of e-learning tools in the educational process in schools as well as courses for teachers on the use of the various programmes.

More details are available from the contributor.

The work described in the Case Study from Portugal takes place within an educational context that works towards inclusive education as a clear policy goal. The **role of ICT in supporting inclusive education** is seen as being positive: *ICT and assistive devices can make all the difference for the autonomy and independence of people with disabilities.*

It must be stressed here that **inclusive education opportunities need to be open at all levels of formal education.** The Vignette from Russia illustrates how students with hearing impairments can be supported via ICTs in order for them to **access essential study programmes in flexible ways.**

Using ICT as a tool to overcome study barriers for higher education students with hearing impairments in Russia

The Centre on Deafness based within Bauman Moscow State Technical University, Moscow, is the only Russian university developing and implementing special purpose training programmes for students with hearing disabilities (deafness and hard of hearing) offered within the mainstream teaching environment. Being the leading centre for training students with hearing impairments the centre co-ordinates the efforts of all the structures within the university involved in special training programmes for students with hearing impairments, the mission of the Centre being to create a favourable environment for teaching and learning, which ensures high quality professional education for people with disabilities.



The Centre offers specialist Bachelors and Masters programmes and ICT is used with around 18 students with hearing impairments in the following ways:

- As a tool for alternative communication to eliminate communication barriers in classroom settings;
- As a tool for improving a learner's access to information and knowledge in formal and non-formal learning situations;

- To support teaching English grammar and vocabulary using: a smart board with the software which goes with it; PowerPoint presentations prepared by the teacher; students' presentations; Internet resources (web sites containing grammar tests, crosswords, etc.); peripheral devices (printers, scanners, etc.).

The initiative was implemented in classroom settings teaching English for Specific Purposes (ESP) to 1st and 2nd year students with different hearing impairments during 2009 to May 2010.

One of the main outcomes of this initiative was a better understanding between the teacher and the students in the classroom settings as a result of the teacher's using the facilities of the multimedia labs. Alongside this the students' access to relevant Internet resources in order to work on their own presentations on the topics covered in the classroom was increased. Students giving their presentations in the classroom helped to raise their awareness of the English language and, more importantly, raise their self-confidence and self-esteem and develop skills of speaking in front of an audience.

However, one of the biggest challenges faced was that the majority of teachers were not confident ICT users. For this reason the project organisers are planning to continue work on improving teaching materials for use with ICTs as well as develop new software for students with hearing impairments.

The project workers suggest that: *Professionals working in the field of ICT should put more effort to designing software for the deaf and hard of hearing and that ... society should be better informed of the problems of people with disabilities.*

More information on this example is available from: <http://www.pen.ntid.rit.edu/ewc/engcr/7-Kirsanova/Kirsanova%20Lecture%20Description.pdf>

<http://guimc.bmstu.ru/> (in Russian)



The example from Russia as well as the Case Study from Portugal highlights a third possible dimension to the concept of access – **access to inclusive education opportunities requires specialist ICT tools and ICT based teaching materials** to be developed. The ICT Resource Centres in Portugal are an example of a co-ordinated and national level response to the need for individual learners' needs to be carefully assessed

and then specific assistive and/or augmentative communication technology provided for them. Similarly, work in Belgium also shows how **specific tools can be developed to support learning needs in a wide-ranging way.**

ICTs to support students with serious reading and writing disorders in Belgium

In Belgium it is estimated that between 2 to 5% of the student population – which is between 17,000 to 40,000 students – have an impairment in written communication i.e. dyslexia, dyspraxia, or visual disability.

The ADIBib project seeks to create opportunities for students with written communication impairments to fully participate in social life and achieve higher academic goals (not restricted by their impairment) by giving them easy access to digitised versions of standard schoolbooks

A major goal is to develop software to facilitate the automation of converting text in PDF files into a ready-to-read version for text-to-speech. The adapted version has to be usable irrespective of the software application of the user.

To reach this goal, it is also essential to promote a mind shift in publishers, to ensure a wider selection of materials is available to students with learning disabilities. In addition to the ADIBib project team, the key partners were educational publishers, distributors of text-to-speech-software and the Flemish Ministry of Education.

The project is working to three phases:

1 - Converting schoolbooks for primary education and first stage of secondary education. Itemise technical problems and possibilities. Provide the publishing companies with the data files.

2 - Converting books for second and third stage of secondary education. Formulate the concept for automating conversions and the digital library.

3 - Developing software to automate conversions.

After phase 1 the converted books were available online. From then on schools and parents could order titles or request new conversions online. Users with a recognised special need – dyslexia, dyspraxia, physical impairment – can obtain the files for free.

The publishing companies now regard ADIBib as a structural partner in delivering suitable digital files and are prepared to help brainstorm optimising the conversion process.

The need for digital books suited for educational purposes is huge. Last year the number of orders and requests for conversions of books rose significantly. The first two months of 2010 have shown an increase in requests of 40%.

From May 1, 2012 onwards the online library should be fully operational.

More information is available from: <http://www.letop.be/projecten/digibib/default.asp> and www.letop.be

The example from Belgium highlights the need to develop flexible technological approaches to meeting different learners' special needs, but also **overcoming possible attitudinal barriers from key partners in ICT developments** – in this case commercial publishers.

An example of possibilities for fostering positive attitudes and awareness raising with educational professionals can be seen in Sweden. A simple ICT application – a DVD – is being used to make **different educators aware of the need for access to specialist ICTs to support learning and teaching.**

Promoting positive attitudes towards using augmentative and alternative communication tools and assistive technology in Sweden

The purpose of the DVD film is to influence the attitudes of head teachers, teachers and other school staff working in a municipality called Bredaryd in the south-western region of Sweden. The film inspires all educators to think in a way that includes all learners via the use of ICT. The project was co-ordinated by the National Agency for Special Needs Education and Schools (SPSM), which works to provide support for professional development in ICT and learning in several ways, including: offering advice and support to school management in matters related to SNE and how ICT can be included in the total learning situation for students with SEN; producing various publications and information to facilitate the use of ICT in the learning process.

The idea for the DVD came up in a network that SPSM runs for staff working in schools with students who use augmentative and alternative communication (AAC) tools such as Blissymbols, supported by a range of assistive technology (AT) software and hardware. The film addresses the questions of how can educators create a good school environment for a learner who does not speak? It presents the experiences of one learner who has developed his communication and literacy skills. With the support of 2 switch control input and commercial software (such as Clicker 4 with a Blissymbol vocabulary and letter grids), free and open source software like SAW 5 (Special Access to Windows – see www.oatsoft.org – with Blissymbol and letter grids), he is able to follow the school curriculum and syllabi. He is now performing most of his schoolwork with a letter based eye gaze system and uses Bliss charts mainly for quick person-to-person communication.

The film illustrates how engagement and co-operation between all school stakeholders (school leaders, teachers, special education support services, rehabilitation and AAC / AT services, family and students) can accommodate the challenging needs of a particular student.

The film also shows how this sort of specialist ICT can be beneficial for the whole class and school. For example, Blissymbols have been used, not only for the individual non-speaking student, but also to raise language awareness in the class and school. The use of assistive technology has also raised the awareness of ICT and new educational opportunities.

The DVD-film is available from the project organisers (please refer to the contributor's details).

This example clearly illustrates a key point: ***specialist technologies in mainstream settings can and do benefit all learners***. Specialist ICT tools have the potential for a positive impact upon the learning of a wide range of learners needs – both those with and without different disabilities – as they can be used as tools to support effective learning and teaching strategies.

A **final dimension to the concept of access** to be examined in relation to the thematic area of ICT to support learning and teaching is that of ***accessing educational opportunities open to people without disabilities***. In all societies there are barriers for people with disabilities that result in them not having the same educational opportunities as their non-disabled peers. The Case Study from Syria presents work that uses ***ICT to address educational inequalities experienced by adults with disabilities***.

Case Study – ICT4Dev: training adults with different disabilities to be competent ICT users in Syria

Overview

ICT is continuously developing, transforming human life into a more informative, knowledgeable and productive one; it also offers a real opportunity for social inclusiveness. However, this is not a straightforward process due, partially at least, to the digital divide existing between societies and within societies themselves.

One of the best solutions for bridging the digital divide and taking full advantage of the available ICT has been the establishment of telecentres in Syria. These centres have quickly gained a social and cooperative connotation and become 'Community Telecentres' where citizens can access ICT services with a minimum cost and maximum benefit. This concept has been adopted almost everywhere, in rich as well as in poor areas, in urban as well as in rural areas. Community telecentres are the key instrument in offering IT literacy and access to information, directly by users or with the assistance of a qualified staff member.

These community telecentres have additional benefits in the area of gender equality, particularly in conservative and traditional societies where women may experience difficulties in using ICT structures such as Internet cafés, and in the area of disability where community telecentres can open opportunities for people with disabilities. Blind people can actually 'read and write' and motor-disabled people can have a wider and richer range of jobs.

The ICT4Dev-Syria project started in 2005 to use ICT for people with visual impairments, living in a small town located in the centre of Syria. The results were very encouraging, so the scope was enlarged to cover more towns and also cater for people with different disabilities. The aims were to enhance the means of communication of the participants and to widen their job opportunities by providing them with key ICT competences.

The ICT4Dev-Syria established 40 community telecentres across the country where, during 2.5 years, around 24,000 citizens have been trained in ICT use, 47% of them are female. Six of these community telecentres are equipped with screen readers, where 245 blind people receive training, many of them to use the Internet. Some of the participants are ready to take the International Computer Driving License test, but unfortunately there is no such proper facility for blind people to take the test.

One of the 40 community centres is located in Damascus. The aim of this centre is to train primarily people with physical disabilities in ICT topics – such as ICDL, Graphic design, Typing, Website design, etc. – leading to a profession. In the region of Damascus there are, according to official statistics, 9,770 people registered as motor impaired, but the true number is thought to be double that at least.

The Damascus centre has training rooms equipped with PCs, networked and connected to the Internet via a broadband connection. Another room has networked PCs and is equipped with screen readers and a Braille printer for the visually impaired. In addition, this centre has various projection and professional printing equipment. The premises and furniture are designed to meet the needs of people with different disabilities.



Learners and educators involved

The main partners in the various developments have been: local authorities; local NGOs; the Syrian Ministry of Communication and Technology, and the Syrian Ministry of Social Affairs; the UNDP-Syria. The Community Telecentre initiative started in 2005, via an agreement signed by the UNDP-Syria, ICTDAR and the ICT4Dev-Syria. It targeted visually impaired people. ICTDAR (ICT for Development in the Arab Region) provided the ICT4Dev-Syria with screen readers, for Latin and Arabic languages in addition to training for the telecentre trainers.

A small Syrian town (Salameih) has a high level percentage of blind people and this was considered a very stimulating area for the use and experimentation of the usefulness of the screen reader. This began in 2005 following in 2006 with telecentres in Damascus and Maarat Alnoumaan (North-West of Syria), 2007 in DeirEzzor (east of Syria), 2009 in AlboKamal (east of Syria).

Half of the trainers are not educators of people with disabilities, they are ICT trainers. The other half are educators of people with disabilities who have very high skills in ICT or they are people with disabilities themselves (one educator is blind and a second is hearing and speech impaired).

By the end of 2009, the following numbers of students have been supported in the telecentres:

- People who are blind and visually impaired: 245 in using screen readers and 80 for English courses;
- People who are deaf and speech impaired: 537 (some of who went on to receive two or three more training courses);
- People with physical disabilities: 407;
- People with Down's Syndrome: 20.

99% of the people had no ICT skills prior to their training.

Reflections and evaluation

Reaching an acceptable level of ICT skill (ICDL level at least), being able to use the Internet easily and being knowledgeable about some professional computer applications has been essential for the people attending the telecentres.

With this adaptive technology, most of trainees with visual impairments have been able to comfortably follow their studies, at university as well as at high school. People with different forms of hearing and speech impairments have had their communication possibilities with peers, relatives and others enhanced tremendously.

In reflecting on the telecentre benefits for different trainees, organisers suggest that learners with disabilities are: 'very keen to learn' and their families: ... *very enthusiastic to see their children having the same rights and possibilities as others.*

Importance of using ICT to support learning and teaching situations

ICT is seen within the ICT4Dev-Syria as an enabling technology that can widen educational and employment opportunities of people with different disabilities. However, there are clear areas for development:

- Awareness at the society level of all disabilities concerns and issues needs to be raised;
- There needs to be a national vision and strategy related to people with disabilities in education generally and specifically the use of ICT in education for people with disabilities;

- The training of specialised trainers needs development. Within the ICT4Dev-Syria project ICT trainers were not that familiar with the specific needs of people with disabilities. This can be overcome by training educators of people with disabilities in the use of ICT in education.

The ICT4Dev-Syria organisers suggest that trainers in ICT for people with disabilities need to be: ... *creative, this technology has unlimited possibilities ... [any] disabled group can be the group that can take full advantage of it!*

The Case Study information from Syria highlights the possibility of employing people with disabilities themselves as trainers. **People with disabilities know their own needs best** and are often in the best position to understand the needs of colleagues. However, this possibility needs exploration and dedicated action as the limits to educational opportunities restrict such possibilities. Initiatives such as the telecentres in Syria illustrate how **projects can develop from being focussed upon working for people with disabilities, to working with and actively employing people with disabilities.**

The work presented in the Case Study reinforces the message that ICT usage is not necessarily an 'end in itself'. In Syria, the goal of **providing people with disabilities with key ICT competences is to increase their job opportunities by overcoming unequal access to educational opportunities.** This involves training people with disabilities to use ICT for employment, rather than as a general tool for everyday life.

A similar type of initiative in Denmark illustrates how **ICT can be used to promote the life chances of students with Asperger's syndrome** by providing them with advanced ICT skills that will give them increased job possibilities.

AspIT – an ICT skills training programme aimed at young people with Asperger's Syndrome in Denmark

AspIT is a tailor-made Vocational Education and Training (VET) programme that is aimed at young people diagnosed with Asperger's Syndrome. The programme provides these learners with an opportunity to develop IT skills at a high level. In this way the programme meets the demands of the labour market for highly skilled IT workers.

It was established as a co-operation among many different stakeholders in the Danish VET system: the Danish Ministry of Education, the National Centre for VET, Vejle Regional Development, the National Institute for Evaluation (EVA), the national interest organisation for autism (Landsforeningen Autisme), the national knowledge centre for autism (Videnscenter for Autisme), Region Southern Denmark and E-learning Børsen (a private company).

The 3-year programme started in 2006 and the first students graduated June 2009. The evaluation dealt with the process and the content of the project aiming at providing feedback for the project. Three evaluation reports are available (in Danish only at www.eva.dk/projekter/2006/aspit) and describe how the project developed over the three years. Overall the evaluation was positive and both companies and the pupils who have gone through the programme and their parents have provided positive feedback. On the basis of an evaluation, the Ministry of Education has prolonged the programme.

AspIT is now provided by five vocational colleges located in different parts of Denmark: TEC Ballerup which is located in Copenhagen Metropolitan Area; Tietgenskolen in Odense (Funen); Vejle Handelsskole in Vejle (East Jutland); EUC Vest in Esbjerg (West Jutland) Skive Handelsskole in Skive (North West Jutland).

The biggest challenges faced have been to maintain learning momentum in the students, and to convince companies to provide internships for the students. These challenges were

overcome, suggests the Education Manager at Technical Aalborg College: *through persistence and goodwill!*

More information is available from: <http://www.aspit.dk> (in Danish only) and <http://www.techcollege.dk/english/Sider/default.aspx>



In the Case Study from Syria, ICT is viewed as ***an enabling technology that can widen educational and employment opportunities of people with different disabilities***, but ***there are a number of factors to be overcome***: attitudes and awareness raising; training of trainers and the need for a clear vision in policy are all stressed in the Case Study as being critical factors.

These factors all combine into presenting genuine barriers such as the fact that despite the learners have the necessary skill level: *there is no such proper facility for blind people to take the [ICDL] test* that would give them a recognised qualifications and so increase employment prospects. Such a situation is not unique to Syria and is the focus of an initiative in Estonia that uses ***assistive technology as means of supporting students' access to public examinations***.

Making school examinations accessible through ICT in Estonia

Three years ago Tartu Emajõe State School for blind and visually impaired pupils in Tartu, Estonia, began an initiative with the State Examination and Qualification Centre (EQC).

The main aim was to simplify taking state examinations (at the end of basic and upper secondary school) for pupils who are blind or visually impaired. Pupils get the examination papers electronically and can use a computer with the special programmes to complete the examination.

The initiative was implemented in co-operation with the subject experts of the EQC. The school explained the pupils' special needs and also introduced the special programmes (e.g. screen readers, Braille display and magnifying programmes) that could be used.

The biggest challenge was how to adapt the graphics and pictures in the paper. In general the same approach has been used as in Braille; the pictures are described in a textual form and graphs have been given in an appendix or these kinds of questions have been replaced.

Additionally, an ICT specialist has to be available all the time during the examination as there is always the danger that something happens to the ICT equipment.

However, there are real benefits to this initiative. It is easier for a pupil to use the electronic version of paper and to orientate among different tasks within it. The marking process of the paper is also simpler and less time-consuming because the answers are not in Braille. Using the electronic version of the examination paper, there is no need for the paper version in Braille anymore.

Tartu Emajõe School is very much interested in continuing the co-operation with the EQC to develop this system in the future. The aim is to have no questions in the examination that are impossible to adapt for visually impaired pupils – that is, all examinations will initially be designed with accessibility in mind!

The different examples presented in this section demonstrate how various uses for ICT can support learning and teaching opportunities in relation to:

- Overcoming physical barriers to attending school;
- Access to specialist ICT tools that are needed for learning;
- Promoting and supporting inclusive education opportunities;
- Addressing longer term inequalities by supporting access to educational opportunities open to non-disabled people.

Within each of these dimensions, ***promoting positive attitudes towards the use of ICTs, providing teachers with adequate training, partnerships with a variety of stakeholders, as well as providing learners and teachers with a range of specialist ICTs to support learning*** are vital.

Overall, the examples demonstrate how ***ICT can be a tool to improve learning opportunities for people with disabilities, ensuring their entitlements to educational opportunities are fulfilled***. It is also clear from a number of the examples presented here that ensuring entitlements to educational opportunities is a genuine means of increasing the short and long term life chances of people with disabilities.

5. ICT TO SUPPORT PERSONAL COMMUNICATION AND INTERACTION

The area of application of ICT in education for people with disabilities that has received possibly the most focus is that of assistive technology (AT). How such tools can be used for alternative and/or augmentative communication (ACC) to overcome personal communication barriers, or as a means for overcoming social and/or geographical isolation has been the focus of global research work.

However, there continues to be ***the need for more specialised and increasingly sophisticated applications to be developed***, within specific contexts and to meet the specific needs of users in their local environments. One such initiative is presented in presented in the Case Study from France.

Case Study – Handicarte: a research based ICT tool to support mobility for visually impaired students in higher education in France

Overview

The initiative is a technological and technical innovation of a tool that helps ‘moving’ on campus. It is software that calculates the best itinerary from one spot to the other on campus by choosing the easiest, most accessible route. The project started with a group of students who aimed to create a local travelling system to help a person with physical disabilities avoid obstacles. The project evolved and support for people with visual disabilities was integrated to the design of the project.

The name of the initiative is Handicarte (as in ‘handicap’ and ‘carte’, meaning disability and map in French).

In France the use of ICT in education is globally encouraged by the French government, and not only for people with disabilities (please see: www.enseignementsup-recherche.gouv.fr/cid21086/le-t-2008-schema-strategique-des-systemes-information-des-telecommunications-horizon-2008.html). Equal opportunities for people with disabilities is enshrined in the legislation of 2005 (n°2005-102 / NOR: SANX0300217L / consolidates version on 2010, June 12).

Other actions are being implemented to help people with disabilities in France, but this initiative is one of the first that started in an university, but can potentially be generalised and industrially produced.

A further benefit is that at the same time, the university community can become aware of the everyday difficulties of the students with disabilities.

The application can be downloaded from a web site. Using a global positioning system, it creates a digital interactive map, which indicates the actual campus routes. The application aims at improving the autonomy of people with disabilities by providing them with the best way to go from one place to another, keeping in mind their personal situation.

The Handicarte project started in 2008 with an initial team of students and was after that continued in 2010 by another team. Two years were necessary for the creation of the tool: the first step being to build the software architecture, collect the geographic data and build the HMI prototype; then the tool could be finalised and adapted in order to support other kinds of disabilities (in this case visual impairments).

The fully embedded solution can be maintained on smart phone devices. The main intention now is to extend the project to a new kind of pedestrian guide for any kind of people.

A public presentation of students’ work (including Handicarte) took place in June 2010 and is available from: <http://toulouse.miage.fr/gem/texte.php?id=101¬exte=47>

Learners and educators involved

The initiative is located in France, at the Toulouse Paul Sabatier University. The university campus is a rather vast area which appeared to be a good ground for experimentation as it has on one hand, most of the features of an urban structure and on the other hand, a large population: students, university staff, visitors among whom are people with various kinds of disabilities.

Handicarte was initially a project of a group of 5 students as part of their first year of Master's degree in co-operation with the Accessible Education Office at the University and the IRIT Computer Science Laboratory, who are specialised in disability focussed research.

Later, other actors from industry joined the project. This project is an illustration of how students, teachers, administrative actors and industrial professionals can work together.

At the beginning, the initiative was funded by students themselves. Now, the initiative is managed by a permanent (administrative) team that orient the work of the students as well as the industrial developments. A possible weakness is potentially the reliance on such a diversity of human resources, which need to be well managed.

Reflections and evaluation

The project was the winner of the 'innovation trophy' (Handi-friends trophée) in 2010 (<http://www.trophees-handi-friends.com/cf/laureats-2010>), but there is a lot of potential for developing this tool further.

A first objective will be to experiment with adaptive real time methods for helping people with disabilities to use self-configuring networks of indoor and outdoor sensors and to propose accessible and innovative services for improving the mobility and the autonomy of students, employees and visitors who might have disabilities.

The final aim will be to make this service available to any people (university students or staff as well as visitors) with or without impairments on the university campus, using portable and mobile devices. This objective is establishing a way to make the campus accessible and adaptable for everybody.

Importance of using ICT to support personal communication and interaction

Rather than this being an example of a tool supporting personal communication, Handicarte is in fact an ICT tool designed for supporting interaction and overcoming social and/or geographical isolation of students with disabilities within their university environment.

The key outcomes are the provision of a web site and real time web services that can help people with motor impairment and visual disabilities within the university campus. However, in order to achieve this outcome, the group had to face the difficulties of collecting the geographical data (streets and pavements) and adapting the technical information in order to be used within accessible ways. Collecting the topographic data appeared to be a true challenge.

Other work that will be carried out in this area by future students will focus on among other topics the implementation of the product on a new generation of smart phones, as well as conducting further experiments with diversified groups of people.

Future work will deal with the optimisation of the Human Computer Interaction (HCI) and the consideration of making the service work inside buildings. Trying to make it evolve to increased reality interfaces will be a further step.

The Case Study from France illustrates how **ICT can be an effective tool in overcoming isolation and supporting personal autonomy** for people with disabilities.

In Slovenia, **increased personal communication as well as improved learning opportunities** for students with hearing difficulties in higher education are being made possible via ICT.

On-line e-learning with innovative solutions for deaf and hearing impaired learners in Slovenia

To show the possibilities of using video technology (players and recorders) for deaf and hard of hearing people who use web pages and web based e-learning material, a complete e-learning course with the title 'How to get a job?' has been developed.

The course makes use of the Sign Language Interpreter (SLI) Module, which enables a multi-modal approach to retrieving information for people who are deaf and hard of hearing (sign language interpreter, audio and subtitles). The e-learning portal for Deaf and Hard of Hearing is based on a custom modified version of the Open Source educational Moodle platform. The e-material covers six sections where users can get advice on finding a job, writing a job application letter, curriculum vitae (CV) and using the websites of the Employment Service of Slovenia. Communication is managed by tools that are translated into the Slovenian language – chat, video-conference and video forum. The latter provides a new approach in communication among deaf users, since it is possible to post answers in sign language and/or in written text.

The e-learning course was developed as part of the European Union project under the 'Lifelong Learning Programme', titled 'DEAFVOC 2: Transfer of Curricula for Vocational Language Education of the Deaf in Europe'.

The project partners were: the Finnish Association of the Deaf (FAD), Helsinki, Finland; the Irish Deaf Society, Dublin, Ireland; Klagenfurt University Centre for Sign Languages and Deaf Communication, Klagenfurt, Austria; the Finnish National Board of Education and the Faculty of Electrical Engineering and Computer Sciences, University of Maribor, Slovenia.

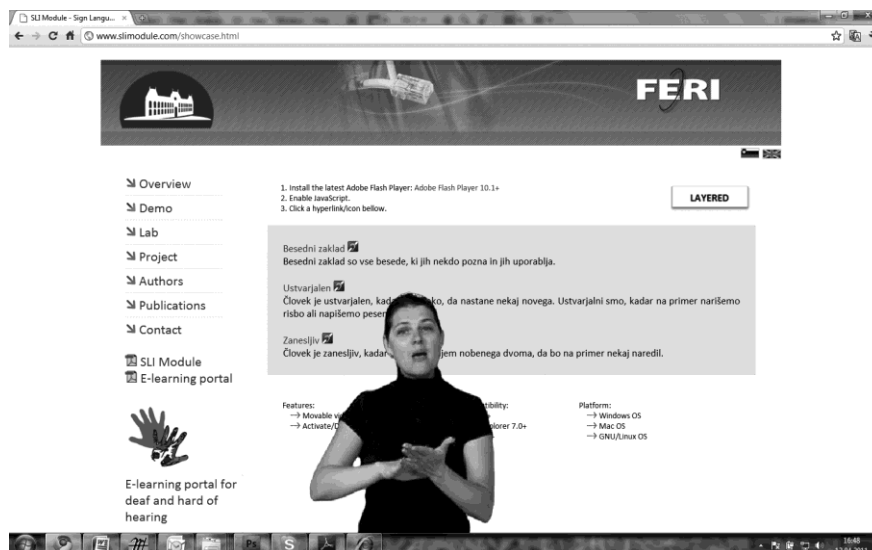
The project started 2009 and in 2010 the pilot course was successfully implemented with deaf and hard of hearing unemployed people using accessible e-learning material. In the future, the e-learning course will be freely available via Governmental and Deaf Educational Institutions.

The key outcome was the final course curricular was adapted to the Slovenian environment. Most importantly, the design and development of the prototype e-learning course showed the importance of the sign language video translations of written text for these users.

The biggest challenges faced during the course design related to technological aspects: maintenance of the video streaming server, implementation of a custom Flash Player (transparent background, external subtitles), customisation of the Moodle environment (custom php scripts) as well as accessibility and usability of the Moodle portal (based on evaluation studies with deaf and hard of hearing users). In addition, adapting and simplifying the e-learning materials for deaf and hard of hearing users with low levels of literacy was also a content related challenge.

More information on theDeafvoc2 project can be found at: <http://ara.uni-mb.si:85>

Information on the SLI Module is available from: <http://www.slimodule.com>



The Case Study from France also demonstrates how **a specialist device developed for people with disabilities has the potential to be of benefit for everyone in the specific context** – in this case the University environment – not just those with people with special needs it was developed for.

The work in France is also a clear illustration of how students, teachers, administrative actors and industrial partners can work effectively together. As in many of the preceding examples in this Practice Review, **developing partnerships were crucial for the success of the initiative**. Researchers in particular may have the detailed knowledge necessary for the development of new tools, but they may not have access to educational settings to develop tools in a partnership with learners and teachers as well as trial them in a user centred context.

Research based partnerships into **specialised tools to overcome extreme physical and communicative isolation** experienced by some people with disabilities is the focus of ongoing work in Portugal.

Developing technologies to support people with severe physical limitations in Portugal

The Instituto Politécnico, located in Guarda, Portugal and the Fundação Portugal Telecom have worked together since 2005 in a project named MagicKey (www.magickey.ipg.pt) to develop customised technology solutions for citizens with severely restricted physical mobility.

ICT solutions have been developed so that by just moving their eyes, users can access and completely control their computer. The PTMagicEye solution enables full computer control only through eye gaze. This solution is aimed to help people who are completely immobilised, or people who suffer from involuntary head movements (such as Cerebral Palsy) but still have eye gaze direction control.

The PTMagicKeyboard is a multiple function application. It can be used as a fully configurable virtual keyboard, with a predictive text system that increases up to 5 times the writing speed. As a simple example it is possible to produce a keyboard with only 8 very large buttons, or have more than 100 buttons. It incorporates a voice recognition system that allows control over the computer by using only voice commands. It also has the ability to convert text into voice for any application. In conjunction with the hardware MagicHome, connected to the PC via a USB cable, it is possible to control the home environment in a very simple way, by using infrared commands or radio-frequency commands.

Such solutions have significantly increased the quality of life of its users. In many cases these interfaces are the only way for users to communicate with others, and, as we know, communication is the most important activity for all people.

These individual solutions are often re-used in other situations of limited physical access to computer.

The main challenge the work has been to develop technologies in a small town in rural Portugal without a financial and commercial support framework. However, the intention is to keep on developing new personalised ICT solutions – a new system is now being developed which will allow people who are both deaf and blind to interact with the computer. In addition, the developers are also working on an eye-gaze controlled wheelchair; the first prototype has already been tested on a real user.

More information is available from:

<http://www.magickey.ipg.pt/reportagem.asp?reportagem=17>

An exemplar video is available from:

www.ipg.pt/user/~luis.figueiredo/PedrocadeiraHD.wmv



This example illustrates **ICT can be used to increase personal autonomy of people with severe disabilities** in a quite different context – this time in people’s own homes – and in a far more direct way – that people with disabilities controlling their immediate environment.

The focus of research work in Belarus is upon how **ICT tools can be used in developing social skills in students with learning disabilities** in order to reduce their current and future social isolation.

ICT to support the development of social competences in students with learning disabilities in Belarus

The National Institute of Education in Belarus, conducts applied research for education development. One area for research focus has been to develop computer programmes that can help social development and competences for students with learning disabilities.

1. The first initiative has aimed to develop a computer-based programme to be used as a diagnostic tool of social competence, adapted for senior aged students with learning disabilities. The following methods adapted for teenagers with learning disabilities are used in the programme: a diagnostic questionnaire of social development; a questionnaire

exploring student motivation; a survey of values orientation; an index of social development and a socio-metric scale and test.

The computer diagnostic programme has been evaluated by over 50 people from 9 classes of integrated teaching and education in Minsk schools. The results of the diagnostic programme coincided with the assessments of students' levels of social competences carried out by educational professionals.

2. The second initiative has been to develop specific computer programmes that promote playing in typical social situations that might not normally be accessible for students with learning disabilities either living in boarding schools, or those having limited physical movement possibilities. The programmes aimed to help such learners to acquire additional social knowledge about social norms and rules.

Two programmes have been developed – 'Eat Properly' and 'Give Assistance' – for senior aged students of schools and boarding schools for students with intellectual disabilities.

The programmes teach the student to take on social roles and follow social rules by simulated role-play of types of social situations, which may not be experienced by such students. Each of the typical situations presented in the programmes, suggests a task with a choice of actions that require the knowledge of certain social norms from the user (student). They can be used as stand-alone programmes, on the basis of which a whole lesson is built, as part of the students' learning activities developing their understanding of social norms and rules.

A number of publications describing these computer programmes have been prepared and these can be made available by the developers (please see the contributors' details).

In this example from Belarus ***ICT is used for assessing needs and then providing intervention*** in the form of support in developing key social skills for personal autonomy and social inclusion.

Some ***learners may be doubly disadvantaged*** in that they may have disabilities or ***special needs requiring assistive technologies*** on one sort or another, but that ***they also live in remote or under developed areas resulting in their geographical isolation as well***. Addressing this combination of factors has been the focus of an initiative in Finland.

Supporting distance vocational special education using ICT for students with disabilities in Finland

Luovi Vocational College operates nationwide in Finland, in 24 locations. It provides vocational education and training for students with special needs. The particular location of this initiative is the Luovi unit in Liperi, near Joensuu city in eastern Finland. The project aims to develop e-learning for Luovi College students using ICT based Individual communication environments and possibilities, as well as develop learning materials, student assessment and criteria for vocational training.

The activities are a part of an ESF project called 'Developing integration, equal opportunities and participation of people with severe disability (VAVA II)' and involves 10 staff members, students with severe disabilities as well as project partners in Eastern Finland.

It has been recognised that vocational training has not been able to reach all potential students in Eastern Finland. Journeys from home to colleges can be long and all vocational colleges cannot offer accommodation services. Some of the potential students also need new ways of learning since they cannot benefit from traditional teaching methods. As a response to this, specialist ICTs for e-learning have been applied.

In Liperi, a visual communication system has been implemented to deliver teaching outside the college. At the moment there are 2 students evaluating this system. The technical

infrastructure had to be built from 'scratch' at the students' locations and has proved to be time consuming.

Daily counselling involves a personal counsellor at the student's location and the teacher from Luovi College takes responsibility for planning the studies and individual teaching sessions. The teacher also visits the students on a regular basis.

Personal guidance and counselling services are provided to all Luovi College students. However, it was challenging to offer these services for students living elsewhere and hardly ever visiting the college.

More information on the work of Louvi college can be found at: www.luovi.fi

Information on the VAVA project can be found at: <http://tkk.joensuu.fi/vava>

This example from Finland illustrates how ***ICT can be used to support specific learning needs whilst at the same time be a tool for overcoming physical isolation.***

Ensuring geographically isolated people with disabilities are fully involved in wider educational initiatives using ICT is the focus of a global example.

Including learners with disabilities in the 'Connect a School, Connect a Community' project in developing countries through the provision and use of ICTs

'Connect a School, Connect a Community' is a public-private partnership launched by the International Telecommunications Union (ITU) to promote broadband Internet connectivity for schools in developing countries around the world. Its aim is to promote understanding and awareness among government decision makers, donors and partners on the need for co-ordinated policies, regulations and practices that promote school connectivity and community benefits.

A key message of the project is that connected accessible schools can also be used as community ICT centres, facilitating job skills training and even providing employment opportunities for youths and adults with disabilities in the wider community. A number of modules are currently being developed focussing on policy development, implementation strategies and practical solutions required to enable indigenous peoples, women and girls and people with disabilities to receive an inclusive education in a Connected School through the use of ICTs and for these schools to be leveraged as local community ICT centres to support the wider community in accessing the benefits of the information society.

The module on people with disabilities aims to assist policy makers at all levels in the educational systems (government, regional, local and school) in developing countries. The launch is scheduled for the end of 2010.

The main aims are:

- To clearly demonstrate to education and communication policy makers that people with disabilities can receive an inclusive education in Connected Schools with the right mix of ICTs and supports;
- To provide practical advice on the types of technologies that can enable people with disabilities to access learning resources, communicate in class and participate in learning activities;
- To provide detailed advice on the development of evidence based policy for the inclusion of people with disabilities through the use of technology in mainstream education;
- To locate this policy advice within the framework of international legislation and policy including the dispositions of the UN Convention on the Rights of Persons with Disabilities;

- To provide case studies (7) on exemplars of schools, training centres and other projects in developing countries that enable people with disabilities to receive an education and/or job training skills.

It is expected that this module will act as a repository of information for developing countries as they move further towards providing internet access in schools and support the use of ICTs to enable access to education by marginalised groups.

More information is available from: <http://connectaschool.org>

The 'Connect a School, Connect a Community' project highlights the ***need for co-ordination within policies as well as research in order to maximise the possibilities generated by various research initiatives***. This is echoed in the Case Study from the United Kingdom.

This example emphasises the need for ***an infrastructure in order to provide co-ordinated services for learners with disabilities and their families***.

Case Study – Developing an infrastructure of services for meeting learners' needs for assistive and augmentative communication technology in the United Kingdom

Overview

This initiative in the United Kingdom aimed to:

- (a) Support the development of sustainable Augmentative and Alternative Communication (ACC) services in England;
- (b) Produce new and innovative advice and guidance (through Innovative Practice grants).

There has been a significant focus in England in recent years on services to young people with speech language and communication needs. Research, consultation and a government review identified a low level of awareness of AAC technology and significant variability in the services that families could access. The funded activities were intended to address some of these concerns, particularly related to the assessment, provision and exploitation of communication devices.

Grants were given to six organisations for building sustainable services focussed on areas identified as important for the provision of sustainable services to the AAC sector over a 3-year period. These included:

- Extending existing assistive technology services to local authorities and children's services to include AAC;
- Enhancing their service offer to develop cost-effective practice in the provision of AAC;
- Developing partnerships with local authorities, primary care trusts and schools in the South East in order to provide a sustainable income generation stream and build service delivery capacity;
- Offering trial service level agreements to London local authorities in order to promote services;
- Promoting services by developing closer links with other AAC centres, local authorities and other community groups;
- Developing services in the South West of England, with initial funding to develop an appropriate business case.

The individual Innovative Projects identified in the majority of cases filled an identified gap – either in terms of service provision, currently available advice or guidance, or products/ tools

for young people with AAC technology requirements. Grants awarded for Innovative Practice aimed to develop amongst other initiatives:

- A scalable range of AAC assessment services and identifying cost-effective devices, training and support working closely with local authorities, health teams and local support teams;
- Information and support for professionals and parents with young children with a wide range of complex learning needs working in partnership with ICAN (a children's communication charity);
- High-tech touch screen packages using PCs and ultra-mobile personal computers with VSD software especially devised for children with a lower ability range, enabling better communication;
- An AAC Competences Framework and a Parent Training Programme for AAC users.
- A symbol-based vocabulary software programme, for use in the college and the local community, suitable for the needs of teenagers and young adults using AAC equipment.

Learners and educators involved

The initiative took place in a different locations ranging from AAC service providers operating at a regional level through to individual schools or organisations working within their local area.

The different partners involved included: young people who use AAC – to ensure the outcomes are appropriate and meet their needs; parents – particularly in trialling of materials to use with their child (in partnership with professionals); local authority children's services (both education and health professionals) – in developing advice, guidance, training and support materials; schools – in creating resources, online materials, vocabulary sets (partnering with the pupils and the wider community).

Those organisations who received funding to develop innovative projects added to the body of understanding and knowledge in the area of AAC and technology application for young people with disabilities. Some examples include:

- Remote training for AAC users and their local teams (key workers and families). A range of technologies were used including desktop sharing software, Skype, web cams (turned on remotely by the organisation), an e-learning site including Web2 technologies such as blogs, video training clips and user forums (see: <http://www.abilitynet.org.uk/aac/>).
- Speechbubble – a searchable online database with details of nearly every communication aid available in the UK. Speechbubble lets you find out details about a particular aid, or you can search for aids that share particular characteristics – all the ones that are accessible using a headpointer, for example. It is also possible to setup a side-by-side comparison of the devices. Many of the computer-based aids offer specialised communication software and vocabularies that effectively turn the computer into an efficient communication devices. See: (<http://www.speechbubble.org.uk>).

Reflections and evaluation

The innovative practices were varied and included for example: the development of the use of low cost portable devices to support learners with autism; a developing set of standards for services including the required competences of the work force; AAC vocabulary/symbol set appropriate for the needs of teenagers; remote assessments of learners with AAC technology needs. The intention is that all these materials become widely available.

Funding has been made available for 2010–11 for the further development of advice and guidance (through Innovative Projects grants) which it is anticipated will be made widely available later in 2011. Funding has also been made available to continue to support the building of sustainable AAC services.

It is expected that the Year of Communication in 2011 (<http://www.hello.org.uk/>) will significantly raise the national awareness of the needs of young people with speech, language and communication needs including ways in which technology can be used.

Importance of using ICT to support personal communication and interaction

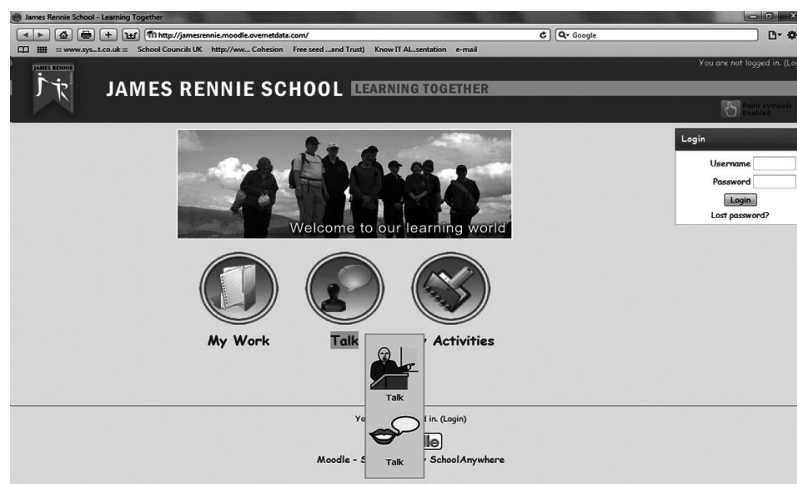
Communication is fundamental to all people and much can be learned and applied to the wider understanding of how ICT can support all learners. It is a long standing and widely held belief that: *what is good for learners with special educational needs or disabilities is good for all learners.*

The recent move towards highly mobile touch screen devices is considered by many working in this area as opening up new opportunities, for example; removing the barriers between special devices and mainstream ones reducing the likelihood that users are viewed as different; the devices are soon as socially acceptable/'cool'; speech technology is becoming common on many devices and this technology harnessed on highly mobile devices could be invaluable for older people who need communication support. However, for school age learners with disabilities the main issues are:

- Variable levels of capability of the school workforce in the assessment of need and use of ICT and assistive technologies to provide access to learning/the curriculum;
- In the area of AAC a combination of a significant lack of awareness of the range of technologies available and variable access to high-level assessment and training in the exploitation of communication aids;
- An agreed and uniformly applied funding model for AAC technology based on an entitlement to communication.

More could be achieved by de-mystifying the language of technology and disability so it becomes part of the mainstream language of educators.

The development of national service standards for specialist services, such as AAC, and providers of assessments and training across the wider assistive technology field is an area for future work and development. This would enable schools to make informed judgement when purchasing/commissioning such services.



The Case Study from the United Kingdom reinforces a number of messages highlighted within other examples presented in this Review, the most obvious being ***the need for awareness raising activities, even in a situation with – what can be perceived as – a highly developed ICT infrastructure.***

The Case Study clearly shows ***the need for co-ordination and rationalisation of specialist ICT services provided to children with disabilities and their families.*** A number of elements are apparent within this rationalisation:

- The development of national standards for specialist services;
- The need for a stable funding model for augmentative and alternative communication technology based on *an entitlement to communication*;
- The removal of the barriers between special devices and mainstream ones reducing the likelihood that *users are viewed as different*;
- *De-mystifying the language of technology and disability* so that all educators (particularly learners, parents and mainstream teachers) are familiar and understand ICT related terms and expressions.

In addition to an infrastructure for co-ordinating research initiatives in the area of ACC technology development, ***training learners with disabilities, their families and their teachers in using various specialist tools is also an area requiring attention.*** This has been the focus of an initiative in Ireland.

Case Study – Supporting teachers to use specialist assistive technology in Ireland

Overview

The Special Education Support Service (SESS), under the Teacher Education Section (TES) of the Department of Education and Skills co-ordinates, develops and delivers a range of professional development initiatives and supports for school personnel working with students with special educational needs in mainstream primary and post-primary schools, special schools and special classes (www.sess.ie).

Principles of inclusion and the prevalence of ICT combined require teachers to ensure that students have access to and can participate in the digital world. The development of *Camera Mouse* and *EagleEyes* technology enables students with specific special educational needs to engage with ICT. SESS was particularly interested in enabling teachers to become familiar with this access technology, the intention being to enhance learning and teaching opportunities for the students.

Camera Mouse is a free, downloadable programme that facilitates control of the mouse pointer on a Windows computer just by movement of the user's head. Developed at the Information Systems Department, Boston College in association with the Boston College Campus School (<http://www.bc.edu/schools/lsoe/campsch/>), *EagleEyes* is an innovative mouse substitute, using eye movement that facilitates communication and instruction. Its purpose is to provide access to the computer for individuals with limited motor and verbal abilities.

Boston College and the Republic of Ireland have had a long-term relationship sharing educational innovations, through the Irish Institute at Boston College (<http://www.bc.edu/>). Following the Boston College programme '*Autism in Education Settings*' the SESS established links with Boston College and Boston College Campus School. The SESS was particularly interested in exploring the use of *Camera Mouse* and *EagleEyes* – the two technologies at the centre of the initiative.



The overall aim of the initiative was to enhance the quality of learning and teaching for students with special educational needs through the provision of continuing professional development in *Camera Mouse* and *Eagle Eyes* technology for teachers working with the students in the School of the Divine Child, Ballintemple, Cork.

Specifically, the project aimed to: develop skills and competences of key members of the school staff in the operation of the access technology; enable students access to, participation in and benefit from engagement with information and communication technology; enable the school to become a resource regionally, in relation to *Camera Mouse* and *EagleEyes* technology.

Continuing professional development was provided for the teachers in the school in November 2007 (*Camera Mouse*) and in May 2009 (*EagleEyes*). Initially, the school identified a 'Lead Teacher' with necessary ICT skills to support the other teachers. Today, *Camera Mouse* is used throughout the school, with very positive outcomes for students and teachers alike. It is also thought of as 'family friendly' as it has also been downloaded onto home computers. The *Camera Mouse* was downloaded initially in one room and as teachers became more confident and skilled it was downloaded in every classroom. The school server has also facilitated access to and exchange of programmes suitable for use with the camera mouse.

Continuing training and professional development has been provided for the teachers by SESS in collaboration with Boston College and Boston College Campus School. The teachers have become 'a community of learners' with engagement in professional dialogue and exchanges of resources as key features. The school has become a regional resource to schools and other organisations with regards to the use of the technology.

Learners and educators involved

This was a collaborative project Special education Support Service (SESS), the Information Systems Department, Boston College, USA, and Boston College Campus School and the School of the Divine Child, Ballintemple, Cork.

The initiative took place in 2007–2009; at the start the project the time-scale was open-ended to facilitate developments.

Eleven students with physical and multiple disabilities were involved. They required training and support in using the technology. Their specific needs were related to actually accessing the technology.

Six teachers from the school staff were directly involved in the project. In addition, three of the schools ancillary staff participated under the direction of the class teachers.

The kinds of ICTs (hardware and software) being used within this project were: PC and Monitor, Webcam, Camera Mouse download, EagleEyes box.

The project has been expanded to four other schools catering for pupils with different special educational needs in a different geographical location of Ireland.

Reflections and evaluation

In general terms the key aim has been realised. The teachers have been trained in the use of the technology (Camera Mouse and Eagle Eyes box). In addition, pupils of school not originally selected for the project requested and were given an opportunity to participate.

The project is perceived as a very positive one for the pupils and teachers of the school. Using a cascade model (teachers informing teachers), the school itself continues to develop and expand the use of the camera mouse into other classrooms.

Already the School of the Divine Child has facilitated a school in the area with regards to training a teacher and a student in the use of the Camera Mouse. A member of the disability office from one of the Irish Universities also visited and *Camera Mouse* technology is now being used with success by Third-Level students with special educational needs in the University of Limerick, Limerick.

The biggest challenges were matching the technology with individual pupils' special educational needs. This required a negotiation between teachers, pupils and Boston College Project Co-ordinator in the initial stages, but also required experimenting with the technology in order to establish suitability for the pupil. Ensuring the teachers were familiar with the technology was also an issue and SESS continues to provide support to the school, as does the Project Co-ordinator from Boston College (through e-mail).

It is felt that keeping up with developments in ICT through linkages with researchers and colleges in other countries is essential as is the provision of continuing professional development regarding developments in ICT. The Boston College collaborative model of a school and college department (focussing on Information Systems) working in partnership on technology development is a productive and beneficial one. Once there is a commitment, determination and willingness to co-operate, it is possible to work across education systems through ICT.

Importance of using ICT to support personal communication and interaction

Promoting communication constitutes a key element in the education of students with disabilities and in this context the value of ICT in providing students with access to communication is acknowledged and valued.

The initiative was funded by Special Education Support Service under the auspices of Teacher Education Section of the Department of Education and Skills (DES). The funding allowed SESS to provide the necessary continuing professional development for the teachers and motivated the school and its teachers to engage with the project. The funding model is considered very positive and effective in this context.

As with all innovations developing teachers' confidence in the use of the technology is critical. The commitment of the teachers in the school and ensuring access to on-going support was essential to overcoming any initial challenges.

The reaction from the teachers has been extremely positive but the impact upon the students had made the initiative so worthwhile. The following quote from a teacher working for the first time with a student with severe physical limitations illustrates the real impact of the initiative:

On the initial visit to the school I sat at the computer with the Camera Mouse aligned to my head movements, watched by Pat, a seventeen year old student. Using my head to control

the mouse I played the 'Aliens' Game. When Pat saw my high scores on the monitor and noted my success with the programme he beamed across at me and with great enthusiasm exclaimed, 'Great score. Joan! This is cool ... when do I get to have a go!' In that moment Pat conveyed the attraction of ICT for his generation, the motivational power of ICT for learning and teaching and the reality of inclusion, enshrined in legislation but a reality, as the technology was enabling him to, in his own words, 'to have a go'.



The Case Study from Ireland clearly indicates ***the importance not only of having appropriate assistive technology, but of training all the teachers working with a learner to use it effectively.*** This training necessarily considered not only input on how to use assistive technology, but involving teachers in assessing pupils' needs for aides and ICTs.

This example echoes a number of points raised in the United Kingdom Case Study as well as other examples:

- The funding model was considered important to establishing and maintaining the project;
- Partnerships with researchers and developers were vital to the success of the initiative;
- Developing teachers' confidence is seen as critical.

The project co-ordinators suggest that: *Once there is a commitment, determination and willingness to co-operate it is possible to work across education systems through ICT.*

This ***commitment and willingness to co-operate*** can be seen through this Case Study as being necessary at different levels – the policy level in relation to funding; the organisational level in relation to establishing partnerships and the individual professional level in relation to personal involvement in the work.

Supporting the commitment of teachers to use assistive technology is the focus of on-going work in Belgium. Developing assistive technology with ***associated training materials for teachers*** has been the approach taken.

'Modem': initiatives to develop augmentative communication aides in Belgium

Modem communication and computer centre is part of the Governor Kinsbergen Centre in Belgium. Modem's mission is to offer independent advice and assistance to those in need of alternative/augmentative communication and/or computer adaptations.

Modem conducts various projects, two of which are reported here:

1. This first project aimed to lower the threshold in using ICT when developing communicational aides in special education.

A very real need for basic help in developing communicational aides was recognised. Modem has identified this need through workshops, seminars and the day-to-day assistance it provides to teachers, families and students. People have been shown how to start and have been given how-to instructions. However, none of this resolved the questions 'But what do I do?' and 'How do I begin?' There was need for an easily accessible, transparent and clear way of supporting people. Furthermore, these instructions had to be instantly repeatable, even without an instructor.

Every IT-layman should be able to make communication aides with the correct support and so in this project, support was given by offering screen-casts on the subject. These screen-casts are step-by-step instructional videos that help the teacher or caregiver. To make these videos easily and accessible off-line, they are presented in a website-format on a DVD, with extra information and a printout with the basic steps. The DVD offers over a 100 hyperlinks, background information on software, pictograms and photography. This information helps the teacher in the practical development of the communication aide of his or her choice.

The instructional videos can be browsed by choosing either one of 15 communication aides or by choosing software the school or institution already uses.

The aim is to distribute 10,000 copies across Belgium. The downloadable ISO-file is available from: http://modem.kinsbergenvzw.be/index.php?option=com_content&view=article&id=173%3Aresultaat-van-projecten&catid=31&Itemid=218

2. Despite the continuously growing number of international pictogram/symbol systems, teachers still express the need for more specific symbols for children with special needs. Moreover, many practitioners ask for free symbols of a good quality. The sets of pictograms that are actually available are very much communication orientated. They are mostly intended to develop communication books.

The aims of this project were drawing more than 1,000 new or renewed symbols for use in a school setting and to develop new teaching materials using these symbols. The purpose of these symbols is to support the education of both learners using assistive or augmentative communication and learners with poor or no reading skills. They are also intended to maximise visual support of the verbal communication/information for every learner with special needs.

The project resulted in more than 1,300 new or renewed pictograms for education, divided into six themes. A range of examples associated with these pictograms was developed as well. These pictograms were placed on a CD and this CD has been included in a new book 'ICT zonder beperkingen' (ICT without limits) edited by the Ministry of Education in Flanders. 20,000 copies of this book and CD were freely distributed among teachers and other caregivers in the Flemish schools.

The pictograms are not just a completion of a large existing set of free pictograms. By listening to the real and actual needs of teachers in the classroom, the new pictograms include (among others) a modern theme of global citizenship: the problem of waste (sorting waste, preventing waste). Until now it was not possible to find adequate pictograms for this in the existing sets of pictograms (free or commercial).

The book (with CD) can be ordered for free at:

<http://www.onderwijs.vlaanderen.be/publicaties/?get=NL&nr=377&i=145>

The set of 1,300 pictograms can be downloaded for free from:

<http://www.sclera.be/pics/download/onderwijs.zip>

Training sessions about this material can be requested from Modem: www.modemadvies.be

Information about these pictograms and teaching materials is available on the education portal: <http://www.klascement.net/artikels/13579/?previous>

The example of developing new augmentative communication aides highlights an issue emerging across a number of examples – the **importance of involving the end users of technology in its design and development**, an issue raised across the previous thematic areas considered in this Review.

Involving end users in the development of ICT tools, aides, programmes and courses ensures that individual needs including **possible combined disadvantages** such as those experienced by people with disabilities who are also geographically isolated, can be identified and addressed.

User involved as well as user centred development can lead to new tools that have potential benefits not just for people with disabilities – within this Review there are clear examples of specifically developed tools and approaches that are useful for people without disabilities as well.

However, research and development, making technological tools available in education and training learners and teachers in their use is most effective when occurring within a **policy and provision infrastructure that provides clear goals for the maximisation of possible benefits of ICT** usage in education of people with disabilities.

6. ICT TO SUPPORT ACCESS TO EDUCATIONAL ADMINISTRATIVE PROCEDURES

There are obvious possibilities for ICT to be used in order to support access to as well as the implementation of administrative procedures in different educational contexts for people with disabilities. However, ***ICT as a tool for accessing administration should not be seen as an end in itself – it should be seen as another opportunity for increasing educational opportunities and ultimately life chances.***

A clear example of this potential is presented in the Case Study from Belarus.

Case Study – Developing ICT tools to support the employment of people with disabilities in Belarus

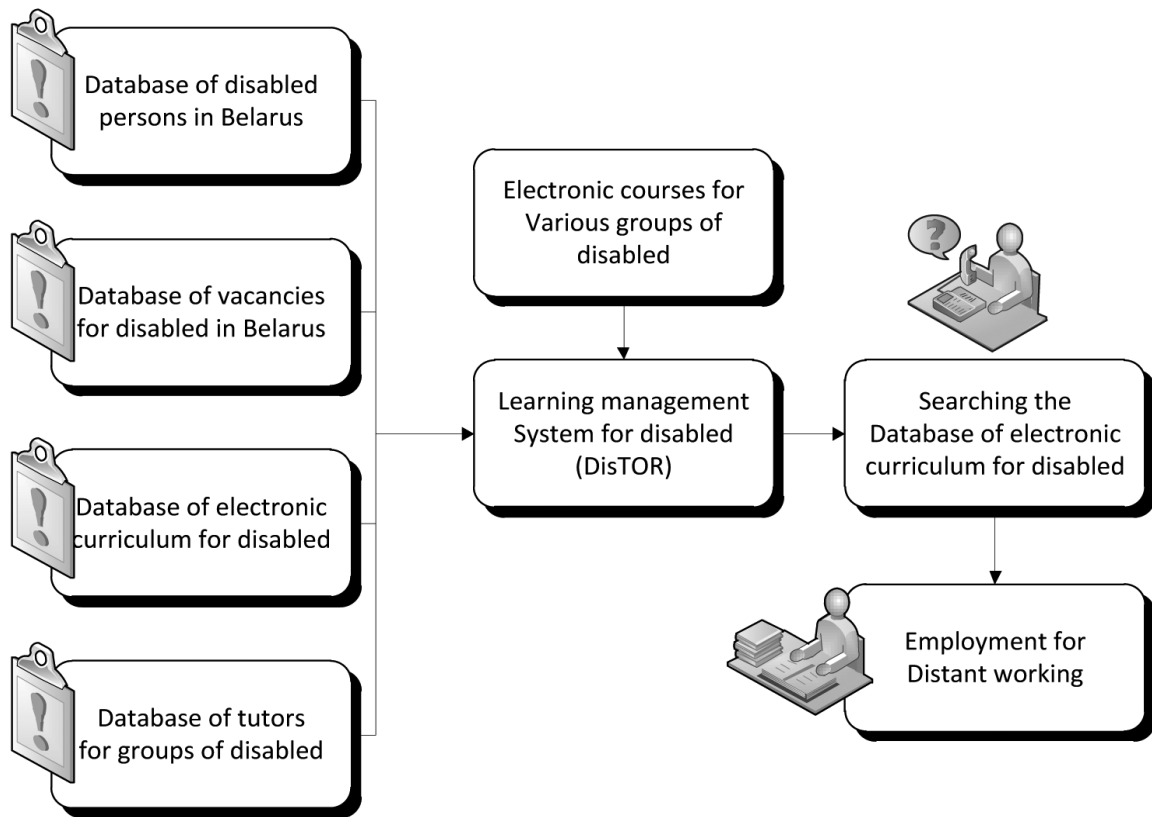
Overview

The initiative took place in Minsk in the Republic of Belarus and was based on collaboration between the Belarusian State University, Institute of Management and Social Technologies (www.e-edu.by) and the Moscow State University of Economics, Statistics and Informatics (MESI), Minsk Branch of MESI (www.mesi.ru).

The goal was to develop a database of information relating to and for people with disabilities wanting to be professionally re-qualified, e-learning educational services for higher professional education (economics, marketing, accounting) and relevant vacancies within the employment market in Belarus. The ultimate aim for the initiative was to support the social rehabilitation of people with disabilities via the simplification of procedures for gaining employment via an automated system for accessing information and e-learning opportunities.

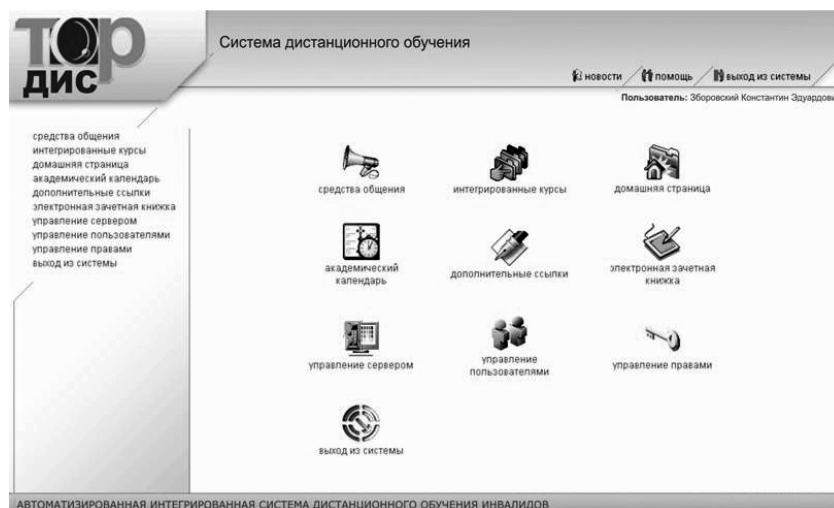
The work was based around a scientific research project, the ‘Development of Automated Integrated System (AIS) of Distant Learning, Socio-psychological Rehabilitation and Employment of Disabled in Belarus’. In 2003, the project was included in a State Programme ‘Electronic Belarus’ for 2003–2005 (with a view to 2010) as a countrywide automated system for supporting the e-learning and employment of people with disabilities.

Organisational diagram of “Automated Integrated System of Distant Learning and Employment of Disabled Persons in Belarus”



The AIS work involved a research stage (2003) with research into the potential labour market in Belarus for people with disabilities and an examination of ICT competences and e-learning possibilities for people with disabilities. A development stage (2004) involved the programming of the database, including personal portfolios; a database of tutors able to teach various skills and groups; the development and programming of a Learning Module System (LMS); development of an integrated, accessible website of vacancies for people with disabilities in the open labour market. The implementation stage (2005 onwards) focussed upon e-learning course development as well as delivery and exploitation of the system.

The AIS database of tutors able to work with specific groups of people with disabilities within the project included over 500 tutors able to work using e-learning toolkits. An automated workspace within the LMS allowed tutors to teach various curriculum disciplines (economics, accounting, marketing, etc.) depending on the specific needs of the learners.



In addition to 'ordinary' ICT tools (computer, internet access) specific ICT equipment for learners with disabilities were developed and provided by the Rehabilitation Department of the State Institute of Management and Social Technologies of the Belarusian State University. These included special video/audio content, tools for supporting speech input/output, specialist peripherals, etc.

The system allowed people with disabilities to search for educational/re-qualification programmes accessible to them depending on their disability and then access relevant distance learning courses using the LMS in order to obtain state recognised qualifications. It also allowed them to search the database of perspective vacancies in order to obtain professional employment.

Learners and educators involved

The project was based on collaboration between two research institutes. The Belarusian State University – State Institute of Management and Social Technologies – provided methodical support for e-learning for people with disabilities. The State Educational Establishment of Higher Professional Education, Moscow State University of Economics, Statistics and Informatics (MESI), Minsk Branch of MESI provided the technological platform for the LMS.

In addition, the Academy of Public Administration under the aegis of the President of the Republic of Belarus provided e-learning content for the subjects relating to economics, marketing, accounting, etc. which was enhanced and developed in order to be accessible for people with disabilities.

The Ministry of Health Care provided information for the database on people that could be potentially re-qualified and the Ministry of Labour and Social Care provided information for database on vacancies for people with disabilities.

All students and tutors involved in the various e-learning courses took a specially developed e-learning course in order to improve their ICT competences. Special methods and multimedia facilities were included into the curriculum of the professional e-learning courses.

Reflections and evaluation

The initiative was implemented at the state level and financed within the state programme of ICT development. The major challenge in developing such an initiative was the unification of resources from the Ministries responsible for different fields of rehabilitation of for people with disabilities within one system.

Currently, due to the end of the State Programme 'Electronic Belarus', the development of the system is suspended. However, if future financing is made available, the developers will continue the development of the system. This would involve a unification of the LMS platform at the country level as well as allow for decreasing costs of content development for specific groups of people with disabilities.

According to current legislation, procedures for final educational course or programme attestation (exams) can only be held inside universities; no distance examinations are allowed. Revisions could be introduced that would support the physical access of people with different types of disabilities in order that they can access examinations.

In case of continuation of the project, it is considered necessary to involve public organisations of and for people with disabilities more widely. Such development projects could unify the efforts of public organisations of people with disabilities, universities and official establishments of the state. In the words of one of the AIS developers, with the correct levels of support and the right partnerships: *Everything is possible!*

Importance of using ICT to support personal access to educational administrative procedures

At the stage of the AIS project initiation and development, electronic services available to citizens in Belarus were very limited and there was no specific administrative procedures available to people with disabilities. The system allowed for a type of automation of administrative procedures involved in searching vacancies of employment and educational opportunities that was relatively new in Belarus.

There is no overall specific policy on ICT in education for people with disabilities – some activities were conducted within separate research projects, but a factor that may lead to limitations of initiatives is the responsibility for ICT in education for people with disabilities between the Ministry of Education, Ministry of Health (medical rehabilitation) and Ministry of Labour and Social Care (social rehabilitation).

Similarly, there is currently no special ICT support for educators working with people with disabilities in Belarus. However, a new state programme 'E-learning and development of human capital' for 2011–2015, which is in preparation will outline plans for distance learning development.

The most important short and long-term developments in ICT in education for people with disabilities would focus upon:

- The systematic documentation of specific methods of e-learning implementation to various groups of people with disabilities;
- Legal developments with revisions to be inserted into current examination regulations in the universities, in order to extend accessibility for people with disabilities to take formal examinations;
- Practice developments particularly the unification of technological approaches to LMS development, leading to the creation of a unified repository of current e-learning courses that may be enhanced for distance learning for people with disabilities.

The ***provision of electronic information services on educational opportunities for people with disabilities has clear potential*** for development. However, the Case Study from Belarus clearly illustrates a number of areas for future development, the main issues being related to ICT and education policy:

- There is need for more coherent funding opportunities and a ***unification of resources***;
- There is a need for great co-ordination between policy and service sectors in order to reduce the ***split of policy responsibility*** for ICT in education for people with disabilities.

A very specific example of a real barrier within educational administrative procedures raised in this Case Study reflects experiences reported in other countries – notably Syria and Estonia – **access to formal qualifications and examinations remains a barrier for many people with disabilities**. This situation requires a policy response guided by the principle that **all learners should have an entitlement to be involved in all assessment and examination procedures**. **ICT can be an invaluable tool in making assessment procedures accessible** for all learners, including those with disabilities.

There are also possibilities for ICT to be used in relation to education administrative procedures in a variety of other ways. An example from Estonia demonstrates **the potential of ICT in easing educational administrative tasks for teachers**, allowing them to focus more upon the learning and teaching process.

The development of specialist software for education professionals working with students with special needs in Estonia

Koolitark is an electronic school bureaucracy management environment for educators, specialists and students. Among other possibilities it is well suited for working with students with special educational needs. The system was created step-by-step and tested in a few Estonian schools from 2007 until present. This system was created by the staff of Loo Secondary School in Estonia and is one part of the quality control system of the school's electronic environment. The key partners were Estonian general education schools (Tallinn 32 Secondary School, Kiili Gymnasium, Käina Gymnasium, etc.), students, specialists and parents. The server with an electronic environment (web page) is located in Tallinn, Estonia. It is a programmed electronic environment consisting of 503 files and it was made in 4 programming languages.

The electronic system provides individualised possibilities for all participants in the educational system to help students with special educational needs and to co-operate with each other in this process. The system gives the possibility to operate faster, without communication mistakes within a certain logical formula.

The biggest challenges faced in developing the system were the complicated structure of the software and creating a logical and 'comfortable' user interface. The basic software was created during 2007–2010, but this project will continue. The plan is to take the full system to consumers at the beginning of the 2011–2012 school year. The web link www.koolitark.ee is password protected, but more information is available from the developers (please see contributors' contact details).

In Austria, the ***use of ICT is embedded within a school wide approach***. E-learning systems are seen as:

- An important tool to support teachers in their work;
- A crucial approach to supporting students' learning.

School-wide e-learning for pupils with learning disabilities in Austria

Sonderschule Langenstein is a school for pupils with learning disabilities. Around 10 years ago the school staff undertook to change their teaching to e-learning and try to provide all pupils with the best opportunities provided by latest hard and software. Every year the school team aim to improve their skills and methods as well as upgrade hard and software.

All pupils and teachers have their own notebook giving them access to teaching and learning activities as well as educational administrative tasks. The school team uses different learning programmes and takes part in initiatives such as 'Serious game based learning' supported by the Austrian Ministry for education. Depending on the needs of the pupils, the school staff try to support all kinds of special needs with suitable hard and software.

This is a school-based initiative that began with a search for sponsors to finance the project implementation. When reflecting on the value of school-wide e-learning, the school's Head Teacher said: *It is the best way to teach children!!! Never before has any method had such good effects!*

The school team welcome possibilities to develop e-learning cooperative initiatives. Information on the school and the e-learning project is available from: www.asolangenstein.eduhi.at

In the words of the school's Head Teacher, the ultimate aim of this school-wide approach is to: *give learning back to the children.*

Such a ***dual approach – ICT as an administrative support and learning support*** – is also being used in another educational setting, a vocational education setting in Ireland.

ICT and e-learning to support inclusive education in a vocational education college in Ireland

Killester College of Further Education, a College of the City of Dublin Vocational Education Committee (VEC), is a post-primary vocational school in Dublin Ireland. The college provides initial VET courses to students who have left compulsory education, adults returning to education, students with disabilities and/or special education needs and international students.

In 2003 Killester College adopted a policy of inclusive learning and introduced a process of providing all courses in an inclusive way. A key part of this strategy was the use of ICT and blended or mixed learning methodologies (i.e. teacher-lead, classroom-based courses supported by e-learning). The college has 5 computer labs, 1 ICT learning resource room and a wireless network throughout the college. Last year the broadband service to the college was increased from 2MB to 100MB.

The e-learning part of the strategy is delivered using the virtual learning environment Moodle. Currently 70% of courses use a blended learning approach.

The college had a history of supporting local disability groups, but in an informal way. However, in 2002 work began to formalise inclusive education, which commenced in September 2003. A key part of implementing the policy on inclusive learning was the development of strategic partnerships. The first and probably the most important was the partnership with Belfast Metropolitan College in 2003. Also at this time Killester College

became one of eight colleges in the City of Dublin VEC to receive the services of a qualified Disability Support Officer as part of the Disability Support Service provided in partnership with a disability services provider, National Learning Network. The next major partnership was through an EU funded project under the EQUAL community initiative. This project brought together networks in Poland, Germany, the Netherlands and Ireland.

The most recent collaboration is with two organisations in North-East Dublin that provide services to people with disabilities – one to people with physical disabilities and one to people with intellectual disabilities.

Killester College takes the view the inclusive education is about improving the quality of teaching and learning for all students in the college and not just students with disabilities and/or special education needs. In quantitative terms this can be demonstrated by the improvement in overall academic achievement in the school, improvements in attendance and retention rates and the increasing number of students being supported in the classroom without the need to see the Disability Support Office.

The college continually reviews the implementation of the Policy on Inclusive Learning. The college Principal says that: *Care must be taken that the college continues to become more inclusive ... it is not possible to be inclusive in one part of what is done and not in another. Areas of strength need to be enhanced and areas of weakness need to be worked on.*

More information is available on the College's website: www.killestercollege.ie

This example has the clear message that *inclusive education is about improving the quality of teaching and learning for all students*, not just learners with disabilities. In line with other examples presented in this Practice Review, **ICT is seen as tool for supporting the implementation of inclusive education.**

A further exemplar of how ICT can be applied in a more administrative type capacity is from Belgium where **teachers' access to information on ICT resources that may assist them in their work**, are collated and centrally presented via a web portal.

A dedicated website of resources and information for teachers of students with special needs in Belgium

www.leerzogsite.be is a Web 2.0 site for educators working with children or young adults with a disability. On www.leerzogsite.be teachers can share learning resources like worksheets, lesson plans, tests, websites, software, hardware solutions, interesting seminars, etc. Teachers can even share educational video, pictures or audio. The use of the website is completely free and supported by the Flemish Government. Most of the materials found on www.leerzogsite.be are distributed with a Creative Commons license.

Children with special needs require a very individualised approach and use very specific teaching materials. As these children are a limited group within the already small Dutch market of educational resources, teachers often find themselves making everything on their own. The site gives these teachers the possibility to share and use the materials within their specific area of interest.

All teaching resources on the site are selected from the large database of KlasCement.net for their usability with children with special needs. A moderator reviews every new addition to the site and evaluates it in relation to use with children with disabilities. When this is the case, the reviewer adds metadata to quickly sort the available materials by type of disability, age and topic.

The website combines the strengths of Web 2.0 with a high standard for quality. It provides the empty 'shell' that is filled by the users, but never without losing sight of quality and usability with children with disabilities.

www.leerzogsite.be is a part (a project-site) of the KlasCement portal that has more than 60,000 members. The majority of those members are Belgian; eleven percent of members are from the Netherlands and there is a small percentage international guests using the website via an automatic translation of all the information on the site into English. From those 60,000 members, 3,800 people are actively using the project-site www.leerzogsite.be looking for specialised materials.

www.leerzogsite.be started as 'ICThelp' (ICT helps) which aimed to show good practice in the use of ICT with people with disabilities. However, with the growing focus on inclusion in mainstream education and the need to broaden the information on ICThelp, the website was transformed into leerzogsite.be. Now the focus is also on good teaching materials that do not need a computer, as well as good ICT practices.

In the future the web site will try to gather partners in the field and it is hoped it will function as a channel between government and teachers. A lot of teachers find their way to www.leerzogsite.be more easily than the official websites of the Flemish government.

A short video on KlasCement that works exactly in the same manner as the site is available from: <http://www.klascement.net/video/22256/>



The possibilities presented by ICT for educational policy makers also need considering here. The Case Study from Moldova shows how **ICT can be the mechanism for providing policy makers with relevant information required for effective decision-making.**

Case Study – ICT as a tool for mapping information on inclusive education possibilities in Moldova

Overview

The Institute for Public policy is an independent, non-profit making organisation, committed to the values of individual liberty, democratic society, rule of law and free market economy. Through research, publications, policy recommendations and public forums the Institute provides political, business, academic community and media leadership with a deep analysis of public policy issues confronting our society in order to improve the policymaking process.

With the World Bank and UNICEF Moldova support, the Public Policy Institute has

developed and implemented a school mapping system, which allowed the Ministry of Education to collect information on indicators that characterise the possibility of integrating children with special educational needs into mainstream schools:

An ICT based information collection system was used to collect complete information collected about the preparedness of each educational organisation – school, further and higher education institution – to receive students with special educational needs. Information collected included: the number of floors of the study block; the possibility of installing lifts; the possibility of creating routes with improved physical access in rooms; the existence of spaces to create centres for rehabilitation related services (psychological, primary health care, social and physiotherapy services, etc).

The period of development and implementation of the school mapping system was 2005–2010. During 2007–2008 data on local schools was collected. This led to the development of a study on educational policies and in 2009 the Education Sector Development Strategy was consolidated, focussing on expanding inclusive education based on accurate data that characterised each educational institution.



Recommendations were made for greater information on inclusive schools in the Republic of Moldova and educational policy regarding the possibility of integrating children with special educational needs into mainstream schools. The UN Convention on the Rights of Persons with Disabilities was signed by the Republic of on 30 March 2007 and was ratified by the Parliament of the Republic of Moldova on 9 July 2010.

In Moldova, the issue of ensuring access for learners with special educational needs to quality education is very acute, because the number of these children is continuously increasing. Developing tailored approaches to provide real opportunities for educational success for each learner, focussing on learning needs is a priority and different initiatives have been instituted during the mapping exercise.

One of these is the centre 'No Barriers' for students with visual disabilities. The centre was opened in September 2008 under the project 'Access to university for people with visual disabilities' Tempus programme, funded by the European Union. The main purpose of the centre is to provide the necessary conditions of support for students with visual impairment. Students have access to a computer room, equipped with special ICT hardware and software that make it possible to study using books and the Internet.

The educational process is based on the use of information technology. The centre services benefit not only students from the State University of Moldova, but also those from other universities.

A further ICT based initiative is 'Using information technology in institutions for children with physical and sensory disabilities' which began in 2008 and is being implemented by the Orange Foundation and Advising Centre and supported by the Ministry of Education. The project aims to provide children and especially those with disabilities, with a higher level of education by facilitating their access to new ICTs. Computer laboratories have been established in four special boarding schools and by the end of 2010 four more special education institutions will benefit from computer laboratories equipped to the standards required by the Ministry of Education.

Learners and educators involved

The initial mapping information project was supported by the World Bank Moldova and UNICEF Moldova. This was a nationwide initiative involving all educational institutions and their staff.

A main challenge faced was the relatively low level of training of school managers, decision makers, regional and central level in using ICT. In order to overcome these obstacles special training has been organised for school heads, representatives of district education departments and civil servants from the Ministry of Education in ICT and the Mapping System.

Reflections and evaluation

The key outcomes of the mapping work was the collection of complete information collected about the preparedness of each institution to work towards integrating learners with different needs. Clear recommendations were made for greater information on inclusive educational practice in the Republic of Moldova. However, there is a challenge in ensuring that the policy and laws related to inclusive education are implemented in full. There is a risk that inclusive education might become a rhetorical device of educational reform.

The potential role of ICT as an administrative tool and a tool for learning and teaching is clear, but there are strengths and weaknesses of the present support structures. The strengths are virtually the entire educational system is largely equipped with computers, improvement of Internet access, development of software in some disciplines and specialised staff training continues. The weaknesses are that there is insufficient equipment and limited educational software, some of which is under-used; teachers have limited proficiency in the use of ICT for people with disabilities; there is a lack of assistive technology specialised networks and generally a lack of experience in the field of people with disabilities.

Importance of using ICT to support personal access to educational administrative procedures

Modern education results in the need for change in and optimisation of methods and means of instruction used in the learning and teaching processes. The role of ICT systems in this respect becomes essential as a means of learning, as a source of information gathering and as a means of providing access to information both for pupils and for teachers and especially for people with disabilities.

At this moment, the application of ICT in different aspects of education for learners with disabilities is an isolated initiative coming from motivated teachers from a limited number of educational institutions who have benefited from some form of assistance programmes.

It can be said that the barriers in using information systems for people with disabilities in Moldova centre upon the lack of requirements to use ICT in special education, as well as

the lack of skills to use ICT combined with poor equipment and limited software in the teaching process for teachers.

In addition to proper equipment, the main factor that supports teachers in using ICT is training to use ICT skills linked to training on particular disabilities. Diversification of in-service teacher training and developing new training programmes, as well as networks in this field is required.

On the whole, the implementation of ICT in education for people with disabilities is at an early stage; computers are still mainly used in computer classes and the use of ICT to support access to administrative procedures is limited. However, Moldova's ratification of the UN Convention on the Rights of Persons with Disabilities means that providing complete and equal opportunities to education to everybody, including access to ICTs for different purposes, is to become a clear goal.

Within the Case Study from Moldova it can be seen how **ICT as a tool for policy related information collection** has facilitated key decision-making and supported policy initiatives for learners with disabilities. However, within this example, the **difficulties experienced as a result of the low level of ICT competence amongst educational managers and decision makers** at the regional and central levels are clearly highlighted.

In many respects, **the need for ICT awareness raising, confidence building and training described in previous examples appears to be relevant for policy makers and leaders of educational organisations**. One crucial area for this development work to focus upon is the impact of the UN Convention 2006 on policy and practice for ICT in education for people with disabilities.

The example from Moldova illustrates the **difficulties experienced where there is no policy requirement or guidance for using ICT with people with disabilities**. However, the 2006 CRPD makes clear the potential benefits of such usage. Key decision makers within education require **dedicated information on their responsibilities to ensure the effective use of ICT in education for people with disabilities**. An international example describes such an approach.

Case Study – An international policy ‘toolkit’ on e-accessibility and accessible ICT policies

Overview

The e-Accessibility Policy Toolkit is a resource for policy makers on the various requirements of the UN Convention on the Rights of Persons with Disabilities (CRPD, 2006) across many sectors including education. It provides advice on a number of cross cutting issues such as ICT design, different types of accessible and assistive technologies and advice on the development and implementation of ICT accessibility policies. This advice includes information on the use of assistive technologies to gain access to education and job training and a checklist for policy makers on high-level cross cutting issues that need to be considered in the development of national policy on accessible ICTs.

One of the main challenges facing State Parties due to the UN CRPD is the development of effective policies that will impact on the provision, uptake, use and development of accessible mainstream and assistive technologies. The Toolkit's section on policy development outlines the key steps required to develop such policy including the benefits of consulting with people with disabilities, the types of research and impact assessment necessary to develop appropriate policy interventions and good practice policy examples from around the world.

A key aim of the Toolkit is to promote good practice and share practical examples of how policies that support ICT accessibility can enable people with disabilities to live, work and

study with independence and dignity. In the area of accessible television, for example, the Toolkit provides advice on the definitions and features required by people with disabilities, applicable standards and samples of regulations for areas such as captioning and video description services.

The Toolkit also deals with broader issues such as promoting the use of assistive technologies to support education, job training, communication, mobility, etc. It provides advice on understanding user needs, providing examples of solutions to meet these needs and looks at the policy interventions required to support training in and support services for assistive technology.

The Toolkit is designed to:

- Support country members of the International Telecommunications Union (ITU) in understanding the requirements of Article 9 of the Convention.
- Assist ITU members in promoting accessible ICTs and identifying and eliminating any ICT accessibility barriers.
- Provide a framework for the development of policies and strategies for mainstreaming digital accessibility at national, regional and international levels.
- Serve as a global electronic repository of policies, international standards, good practices and technical references on digital accessibility.
- Facilitate the design of effective policy frameworks responding to the needs of e-inclusiveness principles covering Communication, Information and Services.
- Promote accessible and assistive ICT applications by fostering public-private co-operation in order to expand ICT usage by people with disabilities.
- Provide specific guidance to adequately address key issues of particular relevance to developing country environments.

Work between the Global Initiative for Inclusive ICTs (G3ict) and ITU on the Toolkit began in 2008 and the Toolkit was officially launched at the ITU Telecommunication Development Advisory Group (TDAG) meeting in February 2010 in Geneva. (A listing of the ITU's most recent activities can be found here: <http://www.itu.int/ITU-D/sis/>)

Learners and educators involved

Given the scarcity of available information on ICT accessibility good practices and policies the G3ict and ITU saw the need to develop a web based toolkit for policy makers on all the complex technologies, applications and policies supporting ICT accessibility.

The Toolkit has been the information resource used by ITU and G3ict in their joint and separate initiatives to promote the development and use of accessible ICTs worldwide as are outlined in the CRPD 2006.

The Toolkit is an example of international co-operation in that it received contributions for over 50 authors and editors worldwide. Given the number of contributors, the biggest challenge facing the project was collating and proofing all the content received.

Reflections and evaluation

The Toolkit was initiated in 2008 and officially launched at an ITU Membership meeting in February 2010.

G3ict has used the Toolkit to raise awareness on effective public policies, private sector initiatives and standardisation references. It reached 2,500+ multi-stakeholders via conferences, outreach activities, and publications as of January 2010. ITU continues to use

the toolkit as a repository of information for its global capacity building and regional training programmes in this field.

In 2010 the Centre for Internet and Society (India), with the support of the Hans Foundation oversaw the publication of a print version of the online Toolkit. Other plans for the Toolkit include its continued development and improvement, its use as global repository of information on ICT accessibility for people with disabilities and its translation into a number of languages.

Importance of using ICT to support personal access to educational administrative procedures

Internationally, the Toolkit aims to provide advice on these central issues:

- The lack of cohesive government policies specific to this area;
- The lack of specific supports for teachers and students to use Assistive Technologies and accessible formats in the classroom to enable communication, learning and
- Low levels understanding and/or appreciation by teachers to how ICTs can be used in the classroom to enable communication.

In well resourced countries the central policy issue has been identified as the lack of comprehensive support structures available to teachers, support staff, pupils and their parents which are underpinned by specific policies at national regional and school level.

In developing countries the issues are more profound. The lack of IT infrastructure in most school systems, coupled with the low rates of inclusion of people with disabilities in formal educational systems preclude the vast majority of people with disabilities in developing countries from receiving the opportunity to use ICTs to access any form of education.

Policy development should target the three main strategic areas for development of infrastructure, support for practice and curriculum.

The policy toolkit is available from: <http://e-accessibilitytoolkit.org>

ICT as a tool for supporting access to and implementation of administrative procedures in education is ***an area that appears to have received relatively less attention and research focus*** than the other three thematic areas considered in this Practice Review. However, as with the other thematic areas ***it can be seen to be highly inter-connected with aspects of supporting educational opportunities and long-term life chances for people with disabilities.***

ICT as an administrative tool has the ***potential to ease and or simplify administrative tasks of teachers and policy makers***, allowing them to dedicate more time to their core duties of supporting people with disabilities in education.

Additionally however, ***access to educational opportunities for people with disabilities often initially depends upon successful access to information on educational possibilities open to them.*** Access to information about – as well as for – education is a mechanism that supports participation in lifelong learning. ***Inaccessible information excludes groups of learners with disabilities from finding out about educational opportunities that may be open to them*** and the possible support they can access to effectively participate in education. This inequality can only be addressed by ensuring accessible information about all aspects of education for everyone – ICT can be effective tools in ensuring this access.

Participation in those educational opportunities may then depend upon accessing and implementing administrative procedures that allow them to undertake education. ***If***

ICTs in education for people with disabilities

information sources or administrative procedures are inaccessible, this is a barrier to access and participation. ICT can be an effective tool in removing those potential barriers.

7. A CONCEPTUAL FRAMEWORK FOR USING ICT IN EDUCATION FOR PEOPLE WITH DISABILITIES

The focus of this final chapter is to highlight the critical factors that are apparent across the various examples presented in the previous sections of the Practice Review. These factors underpin a possible conceptual framework for using ICT in education for people with disabilities.

This is not a simple task given the range and diversity of the examples presented in the Review in relation to the focus of the ICT work being described, but more crucially, the different issues facing countries at different stages in their ICT infrastructure development.

In order to address the problem of identifying key messages emerging from such diverse sources, two strategies have been employed:

- As far as is possible, critical factors identified across the examples of practice are those that are context free; these are factors that appear to underpin the effective use of ICT in education for people with disabilities in all situations and are not dependant on particular resources, or facilities being available.

- The factors identified have been linked to the five key propositions identified within the 2006 UN Convention on the Rights of Persons with Disabilities in relation to the use of ICTs in education:

1. Promotion of equity in educational opportunities at all levels of lifelong learning;
2. Access to appropriate ICTs, including assistive technologies to allow learners to reach their full potential;
3. The training of educational staff to make use of ICTs in educational settings;
4. The promotion of research and development into the availability and use of new ICTs;
5. Systematic data collection to identify and then monitor the implementation of minimum standards for ICT in education for people with disabilities.

Each of these five propositions is the focus of a separate section in the remainder of this chapter. Linked to each proposition, key messages arising from an examination of the Case Studies and Vignettes are presented, along with a number of recommendations for the future use of ICT in education for people with disabilities.

7.1 ICTs to promote equity in educational opportunities

This first proposition from the UN Convention on the Rights of Persons with Disabilities (CRPD, 2006) encapsulates the essential purpose of using ICT in education for people with disabilities – the use of ICT is not an end in itself; rather it is a means of supporting individual people's learning opportunities. This is also the clear message emerging from the Case Studies and Vignettes presented within the Practice Review.

Increasingly these learning opportunities occur within inclusive education contexts. This means that learners with and without various disabilities and special needs should have their educational needs met within the same settings, the goal for inclusive education being to promote full participation and opportunities for all learners vulnerable to exclusion, in order that they can realise their potential (European Agency, 2009).

Within this CRPD proposition, the word equity should be stressed; equity implies something more than equal opportunities (or having access to the same opportunities to take part in educational activities as everyone else). Equity implies people's individual needs being met

in inclusive settings through differentiated approaches that take learner diversity into account.

The UNESCO IITE (2006) report suggests that:

The conditions in every type of inclusive educational area cannot be successfully created without the appropriate ICT tools applied. Assistive tools must be used to allow students with SEN to participate in the educational process based on special techniques and equipment. (p. 28)

The examples presented in this Practice Review support this argument – ICTs can provide and/or support individualised access to learning opportunities.

However, a further assertion should be made here: ‘special techniques and equipment’ does not necessarily imply separate, or segregated provision in the use of ICT. The examples show how ICT can be an integral tool for supporting learning in a number of different ways within inclusive settings. Crucially, ICT can be and is a tool for all teachers, not just ICT specialists or ‘experts’ in their work.

The use of ICT to support learners with disabilities by all teachers is not something that can be achieved without considering a range of implications, notably training of teachers and availability of ICTs. This factor therefore cannot be seen in isolation from those presented in later sections of this chapter.

All of the examples presented show how ICT can be used to widen participation to increase educational opportunity for all learners in different ways. Many of the examples presented focussed upon learners of compulsory school age, but it is interesting to note the relatively high number of examples of ICT developments to support the learning of students with disabilities in inclusive vocational and higher education contexts. This situation draws attention to a further factor for consideration; that is the need for ICTs to be available to learners across a continuum of learning experiences they may engage in during their lifetime. ICT to support learning cannot only be available within certain educational settings – ICTs must be transferable to different lifelong learning contexts.

A small number of the examples presented focus upon specialist provision in non-inclusive settings. This is particularly the case for examples focussing upon provision for adults with disabilities. However, even though these examples did not take place in inclusive education settings, they all demonstrate a shared purpose and goal: using ICT to promote the long-term social inclusion of people with disabilities into wider society, particularly through enhancing their employment opportunities.

In summary, the varied examples within this Practice Review show how ICT can be used in order to support access to, as well as improve learning opportunities for people with disabilities across different educational, geographical and social contexts. A clear message from the examples is that the effective implementation of ICT can be a contributing factor to fulfilling entitlements to educational opportunities for people with disabilities.

With these arguments in mind, a number of recommendations can be proposed to both policy makers and practitioners relating to the use of ICT to promote equity in educational opportunities.

1 – ICT in education for people with disabilities should not be seen as an end in itself – it should be seen as a means, or a tool for increasing effective access to and meaningful participation in educational opportunities. This access and participation should have the ultimate goal of increasing life chances and opportunities for people with disabilities.

2 – The use of ICT in education for people with disabilities needs to be geared towards supporting inclusive education. ICTs should be an integral tool for inclusion and not be something ‘separate’ to the work of all teachers/educational professionals. The goal for ICT

within inclusive settings is that it should be inclusive in terms of its use as well as its purpose.

3 – The availability of ICT for people with disabilities must be viewed within a continuum of educational opportunities across lifelong learning. ICTs that support an individual person's learning must be available to them in any formal or informal learning situation they wish to engage in.

4 – The implementation of ICT in education for people with disabilities must take a systemic approach. This means that at the level of the individual learner, an organisation or the wider educational system levels, a range of inter-connected factors need to be considered and addressed. Key amongst these factors are issues surrounding access to ICT, training of professionals, the development of new approaches and tools as well as the policy framework supporting the use of ICT in education for people with disabilities.

7.2 Access to appropriate ICTs

The potential application of ICTs in the education of people with disabilities is enormous – the very varied examples presented in this relatively limited Practice Review support this assertion. There is no value therefore in attempting here to identify what different ICTs may or may not be appropriate for different types of disabilities or special needs. It can be argued that a more useful discussion begins with a consideration of what is implied in the use of the word 'appropriate'.

Two dimensions can be understood by this term are apparent from considering the examples within the Practice review. The first of these relates to the purposes of using ICT in education for people with disabilities. Within the four thematic areas of the Review, different possible purposes can be identified: supporting access to learning and teaching opportunities as well as knowledge, information services and administrative procedures; overcoming physical barriers to communication, interaction or even attending school; promoting and supporting inclusive education; or addressing inequalities in educational opportunities at different stages in lifelong learning.

What appears to be evident within all of these examples is that the specific ICT being considered is 'fit for purpose' in meeting individual learning needs. That is the technology itself, as well as the methods and procedures used for implementing it, should be used for the reason they were designed for and not used for others purposes or in other situations.

The second dimension to be considered within the concept of appropriateness is who makes the final judgement of whether an ICT is appropriate or not. Many of the examples in this Review highlight the importance of including people with disabilities and their families or caregivers in decision-making about ICT usage. There is a recognised need for learners with disabilities – as well as their families – to be supported so they are active decision makers and autonomous in their choices and use of ICT that is appropriate for them. This decision-making and autonomy also needs to cover assessments and judgements as to the appropriateness of an ICT for personal learning situations.

Within the CRPD 2006, access to appropriate ICTs can be seen to be linked to the concept of entitlement, that is people with disabilities are entitled to have access to ICTs that support their learning needs. With this and the different dimensions to the term appropriate in mind, a number of recommendations can be identified in relation to promoting access to appropriate ICTs from examining the examples in the Practice Review:

1 – Promoting positive attitudes towards the use of ICTs within different stakeholders groups may be as important as providing learners with a range of specialist ICTs. The attitudes teachers in particular hold in relation to using ICT are crucial. Positive attitudes can be fostered by the provision of appropriate training, support, resources and practical

experiences in using ICTs. Teachers require access to such experiences to help them develop the necessary positive attitudes to using ICT effectively to support the needs of learners with disabilities.

2 – A consideration of the possible ‘synergy’ of combined barriers to learning should to be considered in determining the appropriateness of ICTs. Many learners with disabilities experience multiple disadvantages in terms of learning needs, social or geographic isolation and/or poverty. Within some contexts it should be recognised that gender can also be a disadvantaging factor. The need to identify and address possible combinations of factors has to be considered in identifying appropriate ICTs in education for people with disabilities.

3 – Access to appropriate ICTs in different lifelong learning contexts – including home based situations – often requires input from professionals coming from different fields. These professionals can provide necessary insights into different aspects of using ICT to support the learning of people with disabilities. Ensuring that the work of diverse professionals is effective, co-operation and interdisciplinary working is required. This involves coordination between individuals, services and often policies for different sectors of work. It also involves flexible approaches to financing for ICT, with possibilities for local level decision making on expenditure linked to locally identified needs.

4 – All learners with disabilities are involved in and have opportunities to influence the decisions made regarding their access to ICT. This means that all stakeholders agree upon the aim of people with disabilities having autonomy in using ICT. Stakeholders must then implement a range of strategies and tools to support the realisation of this aim.

7.3 Training of educational staff

In the OECD (2009) TALIS results, the aspects of their work teachers most frequently say they require professional development within are ‘Teaching special learning needs students’, followed by ‘ICT teaching skills’ (p. 48). This ‘combined need’ is reflected across the examples in this Review with many examples emphasising the importance of not only providing ICTs, but also educating teachers to use them effectively.

One further observation emerging from a consideration of the examples located within from specialist, segregated provision is that knowledge in the use of ICT to support people with disabilities is often located in specialist facilities and more work needs to be done to spread this expertise to mainstream education settings if ICT is to be a more widespread tool in supporting inclusive education goals.

Teachers are crucial players in the successful use of ICT in education for people with disabilities. However, simply making ICTs available to them does not guarantee their effective use. Teachers require education/training in the following areas:

- Education and pedagogy;
- Working in inclusive education settings and supporting learners with a range of diverse needs;
- Using ICT in education;
- Using ICT for learners with disabilities and special needs.

These combined needs have implications for initial, in-service and specialised education of teachers and a number of recommendations can be proposed:

1 – Teacher education should provide information that makes clear the theory and rationale for using ICTs to support learning of people with disabilities, as well as practical experiences in implementing ICT tools and approaches. This means all teachers should be prepared to use ICTs to support learners with special needs in their initial training and then have access

to further, in-service training later in their careers in order to develop the knowledge and skills to enhance their practice in this area.

2 – Teacher education for all teachers – mainstream and specialist – should take a developmental, competency approach. Competences have the components of attitudes and beliefs, as well as knowledge and skills. Teacher competences need to cover general skills in education and pedagogy, as well as inclusive education approaches. Embedded within such training, there needs to be a consideration of the use of ICT in education generally, as well as the use of ICT for learners with disabilities specifically.

3 – There is a need for more careful examination of successful approaches to this combined, embedded model of teacher education. Research and evaluation from the perspective of teacher educators as well as teachers working in a variety of educational contexts should be conducted in order to inform further teacher education programmes in this field.

7.4 Promotion of ICT research and development

The general obligations of the CRPD 2006 state there is a need to:

... undertake or promote research and development of universally designed goods, services, equipment and facilities, as defined in article 2 of the present Convention, which should require the minimum possible adaptation and the least cost to meet the specific needs of a person with disabilities, to promote their availability and use, and to promote universal design in the development of standards and guidelines (Article 4).

The importance of research and development in the area of ICT is echoed across the examples within this Practice Review. This message is clear from examples that directly involve researchers and developers, but all examples in one way or another emphasise the need for systematic explorations of:

- New ways of using ICT, or
- Developing new ICT tools.

Within both approaches it is clear that a range of stakeholders – including people with disabilities – in education and ICT need to be involved and the importance of partnerships and collaboration in supporting innovative practice cannot be under-estimated.

However, a number of examples in this Review highlight the role of key innovators in using ICT in education for people with disabilities who have acted as initiators of developments. These innovators may be researchers, but are often professional educators who are skilled in the ICT field. These individuals act as a lever for change in the use of ICT in education for people with disabilities and they often work to a cascade model where they motivate and inform other colleagues about innovative practice.

Most often, the work of these key innovators – whether individuals or groups – has been upon developing simple ICT solutions that can be personalised in different ways for everyday use by learners with disabilities and their families. Many of the examples presented in the Practice Review reinforce the message that ‘high-tech’ equipment does not guarantee innovative practice; sometimes ‘low-tech’ solutions are good educational solutions.

A number of possible recommendations can be highlighted in relation to promoting research and development within this area:

1 – The end users of technology – people with disabilities and their families and caregivers – must be involved in its design and development. This is true for major technological

research projects, as well as simple adaptations and adjustments to existing technology. 'User involved' as well as user centred development can lead to new tools and approaches that are useful for people without disabilities as well those users with specific needs.

2 – There is a need to support networks involving all stakeholders in the use of ICT in education for people with disabilities. Facilitating contact and sharing of experiences between different stakeholder groups – particularly designers of ICT, people with disabilities and the educational staff that support them – is critical for developments and new innovation.

3 – Both research and development initiatives as well as action plans for making technological tools available in education and training need to operate within a coherent and well co-ordinated policy and provision infrastructure. Crucially, all policy directing research and development should have clearly stated clear goals for the maximisation of possible benefits of ICT usage in education of people with disabilities.

7.5 Data collection and monitoring

At the level of policy making, the specific ICT needs of people with disabilities need to be accounted for in educational as well as ICT action plans and policies at organisational, regional and national levels. Linked to this, ICT infrastructure across all levels of formal and informal education needs to be coherent and guided by co-ordinated policy.

For such co-ordinated policy to be developed there is a need for clear information – evidence and data information about specialist ICTs and their usage – upon which decisions can be made and plans based.

Much of this necessary information will be related to the key messages and recommendations outlined in the previous sections. However, a number of specific recommendations in relation to data collection in this area are apparent from a consideration of the examples in this Review:

1 – ICT in education for people with disabilities must be considered a 'trans-sectoral' field. There are many different sectors of expertise and information that need to be taken into account in developing, implementing and evaluating policies: stakeholder input and views; education and specifically the education of people with disabilities in inclusive settings; ICT in education and the Information Society generally; the training of teachers and educators. Coherent cross-sectoral policies must be based on a consideration of all these sources of inter-related information.

2 – In order to avoid confusion between stakeholders, a shared language for the use of ICT in education for people with disabilities is needed. It is important all stakeholders are clear about the terminology they are using and have shared understandings of key concepts and issues. Crucially, this shared language should be one that is easily accessible for the end users of ICT – that is learners with disabilities – via whatever communication mode or system they personally use.

3 – All countries need to track the implementation of their policies for ICT and education, both generally and specifically in relation to the education of people with disabilities. There are pressures – from the CRPD as well as other national and international sources – on policy makers to demonstrate how such policies are leading towards greater educational inclusion and increased life chances of people with disabilities. This results in the need for the systematic collection of qualitative and quantitative information that answers key questions in this area and can be used longitudinally to map developments. Within this context the development of indicators that will act as signposts for tracking progress in the use of ICT in education for people with disabilities may be necessary.

Many of the recommendations outlined in this chapter are not unique to the field of ICT in education for people with disabilities. As has already been discussed, inclusive education requires a systemic approach with co-ordinated policy and practice covering a number of thematic areas – such as teacher education, early intervention, curriculum development and assessment practice – in addition to ICT usage.

Several of the key messages here describe principles for effective education of learners with disabilities that are applicable across all of the elements of policy and practice that combine within an inclusive education approach. It can be argued that there are two main implications of this:

1. There is the need for policy makers and practitioners to not only share their experiences within their specific disciplines, but also ensure key messages are disseminated with professionals from other disciplines. In parallel to this, professionals need to be open to looking to these other disciplines for information and inspiration and using key messages as inspiration for their own work.
2. There is a need for more interdisciplinary investigations to be conducted in order to identify and disseminate key cross-sectoral messages that underpin the education of people with disabilities generally.

The work of international organisations such as UNESCO IITE and the European Agency for Development in Special Needs Education can be crucial in facilitating these areas. In particular, these organisations can effectively work to ensure that the key principles for ICT in education of people with disabilities are disseminated to a wide-ranging audience of policy makers and educators working in different educational situations, so that this information can be a source of inspiration for their work in education for people with disabilities.

CONCLUSIONS

The purpose of this final short chapter is to highlight essential messages emerging from the Practice Review that may further inform the three strands of action identified within the UNESCO IITE work programme on 'ICTs in education for persons with disabilities: education policy, capacity building and best practices'. The three areas are: increasing disadvantaged and excluded groups' access to ICT infrastructure; promoting basic ICT literacy and vocational training programmes targeted specifically at the most vulnerable segments of society; supporting regional, sub-regional and inter-country co-operation and good practice exchange on the extension of ICT usage to excluded groups.

From a consideration of the Case Studies and Vignettes presented in this Practice Review, it is clear that these three areas remain crucial for the development of national e-inclusive strategies and their successful implementation.

Increasing access to ICT infrastructure – the examples presented in this Review clearly illustrate the potential impact of ICT in education of people with disabilities; ICT can be an invaluable tool in the education of people with disabilities and so increasing access to ICT infrastructure remains a target.

However, it should be clear that this target is not an end in itself – the main purpose of providing ICT in education for people with disabilities must be kept in mind, and that is promoting both educational inclusion and wider social/societal inclusion. The ultimate goal of increasing access to ICTs that support learning must be increasing the short and long-term life chances and quality of life of people with disabilities.

For this goal to be achieved, it is essential that there are integrated policies across education, information technology and the social sectors that have common goals for meeting the needs of people with disabilities in relation to ICT access and usage.

Promoting basic ICT literacy – familiarity with and the ability to effectively use ICT for a range of purposes remains an objective for many groups of disadvantaged learners, including many people with disabilities. In reflecting upon the various examples presented in the Review, a concept that appears to be critical in promoting basic ICT literacy is 'Design for All'. Design for All – or alternatively universal design – involves the design of products, environments, programmes and services, etc. that are usable by everyone to the greatest extent possible, without the need for adaptations.

This concept applies to the design and development of new ICT tools, but it is also a concept that must underpin the pedagogy of using ICT in education for people with disabilities. Teaching and learning approaches should also be as far as possible accessible to all people – this is an underpinning principle of inclusive education – at all stages of lifelong learning.

A clear message can be highlighted here: more flexible and especially user centred ICTs have potential benefits not just for people with disabilities – specifically developed tools and approaches that are useful for people without disabilities as well. Increasing access to ICT infrastructure benefits all citizens, not just those with particular needs. In summary, in relation to ICT, what is good for people with disabilities is often good for all ICT users; in addition, educationally, what is good for learners with different forms of disability and special educational needs is good for all learners.

Supporting international co-operation and practice exchange – Once again it should be emphasised that international co-operation and sharing information on examples of practice is not an end in itself. The purpose of such activities is clearly identified by the OECD (2006). Case Studies can: *inform debate, guide innovative practice, provide reference and help frame ... policies.* (p. 16)

In various ways, many of the examples in the Review suggest that increasing opportunities for international co-operation and sharing of information would be beneficial; the usefulness of illustrating ICT initiatives at different levels – organisational, regional, national, even international – is clear. However, there remains work to be done to co-ordinate this information and make it available to all relevant stakeholders in ICT in education for people with disabilities in clear, coherent and unbiased, non-judgemental ways.

In conclusion, it can be seen that these messages highlight a number of possible areas of development work for the use of ICT in education for people with disabilities. A further, overarching area for future work is in relation to ***monitoring the implementation of policy and practice developments in this area***. Both in relation to the UN Convention (2006) as well as regional (i.e. European) and national level policy, there is a need for more detailed information linked to monitoring of qualitative and quantitative indicators and benchmarks on ICT in education for people with disabilities. A number of the recommendations presented in the previous section highlight areas that require further consideration as well as careful monitoring over the short and long-term. Such monitoring information is necessary to further to inform the work of policy makers and practitioners.

The Case Studies and Vignettes in this Review demonstrate that innovative practice in this area is occurring globally, in all types of educational organisations, within different ICT infrastructure situations and with a diverse range of learners. It is hoped that the messages and recommendations outlined in this Practice Review can contribute in a positive way to the necessary future debates focussing upon the development of policy and practice in ICT for people with disabilities.

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Vignette – A dedicated website of resources and information for teachers of students with special needs in Belgium

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Case Study – ICT as a tool for mapping information on inclusive education possibilities in Moldova

ICTs in education for people with disabilities

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Case Study – An International policy ‘toolkit’ on e-accessibility and accessible ICT policies

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GLOSSARY OF TERMS

This Glossary has been developed to provide short operational, or working definitions of key terms used throughout the Practice Review.

The definitions given are mainly working definitions agreed upon by the Practice Review team. Wherever possible, definitions are supported by references from current literature, for example terms that have been defined within the UN Convention 2006.

Accessibility: Article 9 the UN Convention defines accessibility as: *To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas.* (UN, 2006, p. 7).

Alternative/Augmentative Communication (ACC): Extra ways of helping people who find it hard to communicate by speech or writing to communicate more easily. This can include signing and gesture (unaided systems) or books and special computers (aided systems). (International Society of Augmentative and Alternative Communication, Accessed 2 December, 2010 http://www.isaac-online.org/en/aac/what_is.html).

Assistive technologies (ATs): 'adaptive devices that enable people with special needs to access all manner of technical products and services. ATs cover a whole range of ICTs, from customised keyboards and speech recognition software to Braille computer displays and closed captioning systems for TV.' (http://ec.europa.eu/information_society/activities/einclusion/policy/accessibility/assist_tech/index_en.htm Accessed 4 December, 2010).

Design for all: A design approach to products and services, aiming to make them usable for as many people as possible.

Digital divide: Refers to 'the gap between those who can benefit from digital technology and those who cannot.' (<http://www.digitaldivide.org/digital-divide/digital-divide-defined/digital-divide-defined/> Accessed 1 February, 2011).

Digital literacy: Refers to 'the skills required to achieve digital competence. It is underpinned by basic skills in ICT and the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.' (European Commission, 2008c, p. 4).

Digital Technology: Technology in which data is given numerical value. Computer based tools and products.

e-accessibility: 'overcoming the barriers and difficulties that people experience when trying to access goods and services based on ICTs.' (European Commission (M376) 2005).

e-inclusion: 'both inclusive ICT and the use of ICT to achieve wider inclusion objectives. It focuses on participation of all individuals and communities in all aspects of the information society. e-Inclusion policy, therefore, aims at reducing gaps in ICT usage and promoting the use of ICT to overcome exclusion, and improve economic performance, employment opportunities, quality of life, social participation and cohesion.' (http://ec.europa.eu/information_society/activities/einclusion/index_en.htm Accessed 2 December, 2010)

e-learning: Any forms of electronically supported learning and teaching.

e-skills: According to DG Enterprise and Industry (2005) covers ICT practitioner skills; ICT user skills (to include digital literacy) and e-Business skills.

Equal opportunities: The same chances to take part in activities, access services, etc. with no barriers to education and equal life prospects for individuals.

Equity: The OECD (2007) in the publication '*No More Failures: Ten Steps to Equity in Education*' highlighted two dimensions of equity in education – fairness, which implies ensuring that personal and social circumstances should not be an obstacle to achieving educational potential, and inclusion, which implies ensuring a basic minimum standard of education for all. Fair and inclusive education is one of the most powerful levers available to make society more equitable. OECD (p. 11) state that it is desirable because:

- There is a human rights imperative for people to be able to develop their capacities and participate fully in society. The long-term social and financial costs of educational failure are high.
- Those without the skills to participate socially and economically generate higher costs for health, income support, child welfare and security.
- Increased migration poses new challenges for social cohesion in some countries while other countries face long-standing issues of integrating minorities. Equity in education enhances social cohesion and trust.

Inclusive education: UNESCO (2009) provides this definition: 'Inclusive education is a process of strengthening the capacity of the education system to reach out to all learners ... As an overall principle, it should guide all education policies and practices, starting from the fact that education is a basic human right and the foundation for a more just and equal society.' (p. 8).

Inclusion: The UNESCO Policy Guidelines document (2009) suggests that inclusion can be seen as a process of addressing and responding to the diversity of needs of all children, youth and adults through increasing participation in learning, cultures and communities, and reducing and eliminating exclusion within and from education. It is based on a values system that welcomes and celebrates diversity arising from gender, nationality, race, language, social background, level of educational achievement, disability, etc. Inclusion also implies that all teachers are responsible for the education of all learners.

Information Communication Technology (ICT): 'consists of all technical means used to handle information and aid communication, including both computer and network hardware as well as necessary software. In other words, ICT consists of IT as well as telephony, broadcast media, and all types of audio and video processing and transmission.' (<http://foldoc.org/Information+and+Communication+Technology> Accessed 2 December, 2010).

Information Society: 'a society in which the creation, distribution and treatment of information have become the most significant economic and cultural activities... The information Society is considered as a necessary previous step to build Knowledge Societies.' (UNESCO/IFAP, 2009, p. 20–22)

Knowledge Society: 'contributes to the well-being of individuals and communities, and encompasses social, ethical and political dimensions.' (UNESCO, 2009, p. 21).

Social cohesion: This must be considered as a multi-faceted concept including the dimensions of material conditions such as employment, income, health, housing and education; social order and respect for others; relationships between individuals and communities; inclusion in society and equal access to opportunities/life chances. The promotion of social cohesion is intended to build more inclusive societies by giving everyone

the chance to have access to fundamental rights and employment, to enjoy the benefits of economic growth with equity and social justice and thereby play a full role in society.

Social exclusion: The European Commission (2004) defines social exclusion as: ‘a process whereby certain individuals are pushed to the edge of society and prevented from participating fully by virtue of their poverty, or lack of basic competences and lifelong learning opportunities, or as a result of discrimination. This distances them from job, income and education opportunities as well as social and community networks and activities. They have little access to power and decision-making bodies and thus often feel powerless and unable to take control over the decisions that affect their day to day lives.’ Social exclusion may result from ‘rootlessness’ and migration; rural exodus; dispersed families; disorganised urbanisation; rupture of traditional society and higher levels of education required to gain employment, amongst other things. (Acedo et al., 2008).

Social inclusion: Social inclusion is a process which ensures that those at risk of poverty and social exclusion gain the opportunities and resources necessary to participate fully in economic, social and cultural life and to enjoy a standard of living and well-being that is considered normal in the society in which they live. It ensures that they have greater participation in decision-making, which affects their lives and access to their fundamental rights (as defined in the Charter of the Fundamental Rights of the European Union).

Web 2.0: ‘web applications that facilitate interactive information sharing, interoperability, user-centred design, and collaboration on the World Wide Web. A Web 2.0 site gives its users the free choice to interact or collaborate with each other in a social media dialogue as creators of user-generated content in a virtual community, in contrast to websites where users (consumers) are limited to the passive viewing of content that was created for them. Examples of Web 2.0 include social-networking sites, blogs, wikis, video-sharing sites, hosted services, web applications’ (http://en.wikipedia.org/wiki/Web_2.0 Accessed 2 December, 2010). The term Web 2.0 is can be traced back to Tom O’Reilly and the O’Reilly Media Conference in 2004.

World Wide Web Consortium (W3C): ‘is an international community where Member organisations, a full-time staff, and the public work together to develop Web standards. Led by Web inventor Tim Berners-Lee and CEO Jeffrey Jaffe, W3C’s mission is to lead the Web to its full potential.’ (<http://www.w3.org/Consortium/> Accessed 2 December, 2010).

Universal Design: Means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design. ‘Universal Design’ shall not exclude assistive devices for particular groups of people with disabilities where this is needed. (UN, 2006).

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