ICT - Based Approaches to Support Learners with Disabilities

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Abstract
Learners with disabilities do not have equal access to educational opportunities as a result of their learning difficulty, or exclusion factors arising from social disadvantage. Information and communication systems (ICT), existing supporting systems in schools and organizations and other approaches like mentoring are not efficiently used to empower people to integrate and decide what they need and like. Mentoring is a complex process involving not just guidance and suggestion, but also the development of autonomous skills, judgments, personal and professional mastership, expertise, trust and the development of self-confidence over the time. It is particularly important for people with special needs to support them in utilization of their resources (knowledge, skill, aptitude) and to socially integrate them also into the work society. In this paper experiences of the authors in European projects as well as work in progress in a new Erasmus+ project are described in this context. Best practices collected by the authors in order to be used in the work with people with disabilities will also be presented.

Keywords: Inclusive education, Inclusive ICT, Learners with disabilities, Mentors, Diversity, Accessible platforms, TikiWiki.

Inclusive ICT to Support People with Disabilities
Learners with disabilities at all levels of education are vulnerable to exclusion from educational opportunities and often from social life. The World Report on Disability (European Agency, 2014) estimates that there are between 93 and 150 million school-aged children with disabilities globally. Many of these learners are excluded from educational opportunities and do not complete primary education. As a result of their learning difficulties they do not have equal access to educational opportunities and exclusion factors arise from social disadvantage. Information and communication technologies (ICTs) should be used in all sectors of education and training, because technology skills are essential for global citizenship (European Agency, 2014). ICTs can be particularly efficient for learners with disabilities who are vulnerable to the digital divide and exclusion from educational opportunities. Inclusive ICTs by fostering inclusive education for learners can improve their quality of life by increasing participation and reducing social exclusion. “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” (European Agency, 2014).

This aspect is recognized but access to appropriate ICTs in education is hindered by: physical barriers, content and materials which are not accessible, cognitive barriers for some learners with intellectual disabilities or specific learning problems, content barriers that may
occur when the operating language of a device or software is not the same as a learner’s mother tongue, didactical barriers where learning is inflexible and teachers lack of the skills to facilitate inclusive education, financial barriers relating to the costs of devices and software. Inclusive ICTs are i.e. (European Agency, 2014):

Mainstream technologies including computers, web browsers, word processors, whiteboards and mobile phones that contain in-built accessibility features to provide equally effective access for learners with and without disabilities; Assistive Technologies including medical aids and also learning aids such as screen readers, alternative keyboards, augmentative and alternative communication devices and other specialised applications of technology used by individual learners with specific limitations in gaining access to ICTs; Compatibility between assistive technology products and mainstream technologies; Accessible media and formats; Accessible digital learning content and platforms based on learning management systems (LMS) and software.

ICT using in education for learners with disabilities is a ‘trans-sectorial’ field. Many different sectors of expertise and activity need to be taken into consideration, like:

Stakeholder input and views; Education and specifically meeting diverse learning needs in inclusive settings; ICT in education and Knowledge Societies generally; Training of teachers, mentors, leaders and other education professionals and the training of IT professionals such as software and content developers and web designers.

But results of projects (Hamburg, 2013a) show that the used ICT, existing supporting systems in schools and organizations, the networking of stakeholders, diversity approaches, training of teachers, mentors, are not efficiently used to empower people to integrate and decide what they need and like (Kaplan & Haenlein, 2009).

Mentoring is a complex process involving not just guidance and suggestion, but also the development of autonomous skills, judgments, personal and professional master ship, expertise, trust and the development of self-confidence over the time. It is particularly important for people with special needs to support them in utilization of their resources (knowledge, skill, aptitude) and to socially integrate them also into the work society. The nature of mentoring is “friendly” and “collegially”. Mentoring also has to operate within professional and ethical frameworks. It should remain voluntary and subject to mutual agreement (Kram, 1985), (Hamburg, 2013b).

**Examples of ICT Supported Learning within European Projects**

The cases we show in this paper describe mentoring approaches for people with disabilities and ICT support platforms developed within the innovation transfer Leonardo da Vinci projects Inclusive Disability Care IBB2 (http://www.lebenshilfe-guv.at/ibb2) and Diversity and Mentoring Approaches supporting Active Ageing and Integration DIMENSAAI (www.dimensaai.eu). IBB2 was the continuation of the successful EU project IBB. The aim of the IBB2 project was to support an inclusive education and to help care workers with learning disabilities during their job entry. DIMENSAAI (Diversity and Mentoring Approaches supporting Active Ageing and Integration) transferred a mentoring model from former projects to Germany and other partner countries in order to improve participation in training and particularly on the job qualification and employment for two target groups: active seniors and people with disabilities by the use of a diversity and mentoring model focusing on the working places in the health and care sectors (having skill shortage). The support model developed within IBB2 and transferred in DIMENSAAI has been developed based on experiences with inclusion of people with learning difficulties into the labour
market exchanged by experts from the participating stakeholders (inclusive care workers, employer representatives, employees in the education and social sectors, vocational training assistants, researchers and representatives of public welfare administrations), takes into consideration needs on all levels of participating actors (employers, inclusive care workers, and colleagues – employees) and is oriented to success factors for the integration of inclusive care workers into the labour market defined in the expert meetings and discussed also during the diversity workshops in partner countries.

Such success factors of this support model are:

A clear activity and competence profile of the inclusive care worker; Evaluation of the specific staff requirements – staff management and human resource; Planning; A clear understanding of the legal framework, such as collective legal agreements, labour laws, qualification requirements from the responsible bodies, etc.; Clear allocation of roles; Strengthening the team’s diversity competences; Individualized job training stages; Applying a mentoring programme; Additional support as required, such as job placement assistance, supervision, translation of texts into easy-to-read language, etc.

The three-modules of the support model are (Figure 1):

Familiarity with Basic Conditions; Developing Diversity Competences; Establishing a Mentoring Program within the Enterprise.

Figure 1. Modules of the support model.

The mentoring process used in IBB2 (Figure 2) is based on the diversity team workshop and the inclusive care worker’s job entry requirements and is divided into three stages: The entry stage, the exchange stage and the conclusion stage which have duration depending on the people involved and their individual needs.
In the entry stage the candidate is accepted to the position a diversity team workshop is conducted. The care worker selects a mentor from the team within the first two work weeks on a mutually voluntary basis. After that mentor and mentee schedule a meeting, in which they once again determine their roles, aims, and tasks regarding the mentoring process. In the exchange stage mentee and mentor discuss current work-related issues in weekly meetings. The mentors help the mentees get used to the new environment and tasks ahead by imparting formal and informal knowledge and experiences, encourage the inclusive care worker to act autonomously and in a self-determined and make the team aware of the inclusive care worker’s needs. A few central aspects have to be taken into consideration like the training stage may last longer for inclusive care workers, an external job placement assistant may assist the inclusive care worker in learning new tasks if needed, the aims and tasks of the mentoring process have to be transparent for all, the mentee has to be willing to share information about himself or herself and his or her disability.

In the conclusion stage meetings with the mentor at greater intervals than before should be held. All essential information (formal and informal) for coping with everyday professional life has already been exchanged, and team competences have been communicated and made transparent for all.

**Projects dealing with ICT based learning**

**IBB – Inclusive Care**

The IBB Support Model was adapted and used within DIMENSAAI and applied in two cooperation partners of the IAT are Gelsenkirchener Werkstätten and Children’s home in Gelsenkirchen. In the following we present the approach of ICT based platforms developed within the two projects supporting social learning and networking, collaboration and mentoring particularly through the use of social media services. The approach allows mentors and mentees to learn on-line, to communicate and collaborate, and to share knowledge and other different pathways to assess learning processes which are used in both projects. The use of social services requires technical skills rather low. Blog software, for example, can replace
sophisticated and costly content management systems. It is even faster and less demanding to communicate through social networks, such as Facebook, Twitter and others. Another important characteristic communication feature of such applications and “spaces” is the decreasing technical difference, such as the one between teachers and taught, between formal and informal learning processes, between education and knowledge acquisition/management. This gives rise to integrated and world-wide forms of learning, e.g., in “Communities”. A community is based on shared interests and can provide learning in a community of technical equals (content wise, experience wise and truth assuring however non-equal participants) by exchanging expertise and experience without building a hierarchy, because any of the participants is considered teacher and taught at the same time. A low-cost and easy to access virtual room to accommodate formal and informal learning practices, group collaboration and the gathering and exchanging of learning materials could be realised in an e-Learning environment.

DIMENSAAI – Diversity and Mentoring approaches to Support Active Ageing and Integration

The ICT prototypes we developed within the two projects support the following processes in a community (www.ibb2.com; http://platform.dimensaai.eu): Social networking and learning in a social community; Training of mentors; Mentoring process inclusive mentee learning; Communication. The ICT prototypes have been developed by the use of TikiWiki CMS Groupware, originally and more commonly known as TikiWiki or simply Tiki, which is a free and open source wiki-based content management system written primarily in PHP and distributed under the GNU Lesser General Public License (LGPL) license.

Figure 3. The DIMENSAAI ICT platform.
To support training, the modules are available online, but in addition, a discussion forum for each module enables learners and trainers/experts to exchange and express ideas. This allows learners to give feedback (anonymously, if desired) to the experts. It also enables them to post questions to which other participants, mentors or experts can answer. Our experience with the support of mentoring processes by the use ICT platforms shows that there are also people with disabilities which would like to act as mentors and also mentees with disabilities who would like to use the system. Due to needed accessibility we use MobileTiki, which allows access to contents from many different devices and browsers. Tiki mobile is a synonym for the enhanced capabilities of Tiki concerning accessibility and mobility.

The ICT approach we use in the two projects supports different learning abilities of students and overcomes the limitations of time or space like in traditional face-to-face training. The ICT prototypes, when adequately designed to be particularly easy-to-use, can reduce the limitations of the classroom and allow the learners to work at their own space, speed and depth with support of educators/trainers/mentors and the other learners. However, in inclusive education ICT supported mentoring informal and e-Learning methods should be blended with traditional face-to-face methods. Experience from other projects also demonstrates the need for a constant presence of experienced and qualified mentors on the ICT platform.

IDIPOWER – Empowering Disabled People through Collaborative Learning

The main objective of the ongoing Erasmus + project IDIPOWER (Empowering disabled people through collaborative learning) is a reorientation of the roles of support services and their providers to help people with disabilities to be more independent. By using collaborative learning within the support systems, people with disabilities should become active participants in planning and could obtain the help which best meets their needs and goals. In the frame of the project IDIPOWER an ICT based platform based on TikiWiki is in development to support collaboration and communication between stakeholders including professionals, families and people with disabilities. The platform will support social networking, a meeting space based on forums, a collaborative working area and a learning area containing e-Learning modules for trainers/professionals/mentors, for parents and for people with disabilities. The following screenshot shows the main page of the IDIPOWER Web-site (Figure 4) and an example for a user’s page within social networking (Figure 5).
Figure 4. The project website of IDIPOWER. www.idipower.eu.

Figure 5. Communication support by the use of the IDIPOWER platform.
Best Practices in the use of ICT
In the frame of the European learning partnership TRAINDIPICTS (www.traindipicts.eu) the project partners collected best practices for the use of ICT to best address the problems appearing in the integration of people with disabilities in work and society and to contribute to further and improved inclusion of children and adults with intellectual and development deficiencies.

Those people face in their desire to work and to be socially included with lack of vocational training to achieve employability skills, accessibility of training centres, lack of information and communication, rapidly changing labour markets, employers’ attitudes and perceptions referring competences and work style of this group of people.

The project paid particularly attention on best practices for motoric-, visual- and hearing impaired people in order to integrate them in ordinary education and working places with the help of ICT.

Motoric Impairment
From the point of view of ICT those people can be divided into two groups; one group consists of people who can handle with computers in principle, but with limitations. The use of special keyboards adjusted to their needs (large field, small field, mini field) will often be enough to use a computer. The other group consists of people who are not able to use a mouse and keyboard and can only use a computer with the help of sensors and special software to control it by the knees, elbows, head motions, mouth or even through eye tracking. The picture below shows a large field keyboard.

Figure 6. Large field keyboard from the company Igel.
Software and web developers should avoid using small buttons and clickable fields, because people with motoric impairments may have problems to click them. The use of the software should be enabled with just the keyboard, so the control elements are selected with the tabulator key and therefore the order of the control elements selections should be logically. A best practice for people with motoric impairments not being able to talk is the use of a modern computer with a voice synthesizer. Those computers can be expanded with many input devices dependent on the individual needs, e.g. touchscreen, trackball, joystick and eye control. The users can either type the words to be spoken with the help of a virtual keyboard or choose predefined sentences which are represented as images on the screen, this depends on the software.

Figure 7. Computer with voice synthesizer with eye control, Tobii Ceye from the company epitech.

Hearing Impairment
For young people with hearing loss in principle all levels of qualification are now open and attainable. Almost all children who have received a cochlear implant, a prosthetic device that enables them to perceive sound and understand speech, at an early age attend kindergarten and go to an ordinary school. But they need much more support, because the levels of assistance they currently obtain are nowhere near adequate.

An alternative to support people with loss of hearing in work and education is the use a computer to translate text or spoken language into sign language. It allows recording the
voice of the conversation partner and shows a translation on the computer monitor of the deaf person.

**Figure 8.** Sign language computer CONSIGNOS from the company AETeco Ameco.

**Visual Impairment**
Blind people rely on particular technical devices to use a computer. The classical output device for blind people is the braille display, which shows written text in braille.

**Figure 9.** Braille display for people with visual impairments.
Almost all modern web browsers and operating systems also include screen readers to read written contents aloud. The problem in training blind people in subjects like anatomy, electrotherapy and similar is that they do not have complete access to the textbooks in these subjects and they cannot use modern multimedia software for education and training. On this account the project “Audio-tactile CBT for blind masseurs and physiotherapists” works on approaches to enable access for people with visual impairments by the use of speaking maps, ground plans, network diagrams, plans of museums and exhibitions, and so on. The user puts a tactile overlay onto a touch pad, touches it with his fingers and gets spoken information controlled by a PC. The project has been realised during the last two years at the three German colleges for blind masseurs and physiotherapists.

Research, development and field trials in the colleges succeeded in the following results: The ATT system for interactive audio-tactile training for blind masseurs and physiotherapists, series of audio-tactile diagrams for computer based training especially for anatomy, therapy and massage related closely to traditional braille texts, graphic-oriented training places for the blind.

The ATT system consists of a touch pad for putting overlays there, a bar-code reader for automatic identification of overlays, a speech synthesiser for acoustic presentation of text, a PC for control and management and the special data base for training of masseurs and physiotherapists. ATT fulfils every requirement mentioned above. All ATT components are available commercially. Series of audio-tactile graphics for systematic and functional anatomy, for histology, skeleton and muscles, for physical basics of electrotherapy and some special massage areas are available. For every audio-tactile graphic of the data base a tactile overlay exists. The training material for blind masseurs and physiotherapists is now used in the colleges. Students are very much interested in that CBT method and apply it permanently. A lot of advantages could be attained: Independent training; Reduction of tactile graphics complexity caused by removing braille; Better touching and recognising of the tactile objects; Better handling of textual information related to graphics; Use of multimedia techniques also for blind people.

Conclusions
Information and Communication Technologies are a crucial element of any personal development, empowerment and institutional framework for inclusive education and development. ICTs can enable and accelerate the educational, social and economic inclusion of persons with disabilities. Only if they are available, affordable and accessible, they can significantly improve the inclusion of persons with disabilities in all aspects of society. Some barriers in this context in connection with the realisation of an inclusive education, which were presented in this paper, are universal; others refer specific areas of development such as cost, accessibility and access to ICT. European cooperation, the collaboration of stakeholders in every sector, as well as concrete actions by each group of stakeholders are necessary as well as the development of relevant indicators for evaluation and progress monitoring.

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References

Author Note
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