

# INNOVATION AND TECHNOLOGY FOR PERSONS WITH DISABILITIES

*Nabil Eid\**

## 1. Introduction

One of the disabled students at an information technology (IT) course answered, when asked why he was doing the course, *“I want to show the world that, though it may be true that I am disabled, I am not disqualified.”* “Disabled but not disqualified” – this is the motto under which governments, organizations, non-governmental organizations (NGOs) and private sectors are working together to enable persons with disabilities (PwDs) to become integrated into mainstream society so that they may realize their full potential.

With the advent of information and communications technology (ICT), new hopes are emerging for PwDs. Despite the huge challenges, sincere efforts are being undertaken to implement the use of ICT to counter obstacles related to disability. The information society represents at once significant opportunities but also potential new barriers for the social inclusion of disabled people.

Information and communications technology and assistive technology offer new opportunities for everyone, but these opportunities are specifically more significant for PwDs, who use assistive technology for their daily activities to a higher extent than people in general. Today’s assistive technology, which is adapted to everyone’s abilities, means that disabled end users are able to participate in all aspects of social life on more equal terms than ever before. It is vital that people are able to benefit on an equal basis from the rapid development of ICT, to enable them to partake in an inclusive and barrier-free information society.

## 2. “A Journey of a Thousand Miles Begins with a Single Step”

We need information and knowledge in order to meet our basic needs, make decisions, move around, and participate in social, economic and cultural activities. ICT is of course an

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enabling technology and we should not lose sight of this fact. If it is not properly planned, managed and implemented, it might throw us into social gaps or the “digital divide.”

The use of ICT in the field of e-learning and education is very high on the political agendas of Arab countries, with considerable efforts made at national, regional and global levels to address the special requirements of persons with disabilities, including appropriate educational, administrative and legislative measures to ensure their full inclusion.

One of the opportunities for connecting these students is through information communication technologies and assistive technology (ICT and AT). ICT and AT for the development of disabled persons involve adopting appropriate techniques to obtain maximum benefit. In addition, the use of assistive technology (AT) can increase disabled persons’ capabilities and independence both in and out of school settings. The technologies can be used for communication and productivity ends, or to provide an individual with an opportunity to experience recreational opportunities.

Individuals with serious sensory disabilities such as physical disabilities, visual impairments or deafness have benefited more than any other group of individuals from advances in assistive technologies. The advances in technology for these individuals can lead to increased productivity, employment and recreation opportunities.

Although some progress has been made towards disability-inclusive development, there have been very few initiatives aimed at including disability in the Millennium Development Goals (MDGs) “Education for All.”

New teaching methodologies for persons with disabilities include information communication technologies and assistive technology (ICT and AT). No pencils, copybooks or books for teaching students with disabilities... Now it’s all ICT and AT! ICT has the potential to make significant improvements in inclusion, development, e-learning and education for students with disabilities.

### **3. Statistics and Factsheet**

- On average, around 10 percent of the world population is disabled and this number is likely to increase in the near future due to various factors, according to the World Health Organization (WHO).
- Eighty percent of persons with disabilities live in developing countries, according to the UN Development Program (UNDP).
- Disability rates are significantly higher among groups with lower educational attainment in the countries of the Organization for Economic Cooperation and Development (OECD), according to the OECD Secretariat. On average, 19 percent of less-educated people have disabilities, compared to 11 percent among the better-educated.

- The World Bank estimates that 20 percent of the world's poorest people have some form of disability, and tend to be regarded in their own communities as the most disadvantaged.
- Ninety percent of children with disabilities in developing countries do not attend school, according to the United Nations Educational, Scientific and Cultural Organization (UNESCO).
- The global literacy rate for adults with disabilities is as low as 3 percent, and 1 percent for women with disabilities, according to a 1998 UNDP study.

Despite these challenges, ICT and AT have the potential to make significant improvements to the lives of students, promoting equality and fostering the development of students with disabilities. Including these students in the use of ICT and AT improves their social skills, learning and ultimately their employment opportunities, by providing the best education possible, building their capacities and developing important life skills.

#### **4. Overall Goal(s) of Empowering Persons with Disabilities through Technology**

Information and communications technology (ICT) has been identified as an important aspect of the wider strategy for the social inclusion of students with disabilities. The following are some of the common approaches utilized:

##### *4.1. Distance e-Learning*

The distance learning home is accessible to students with disabilities. Distance courses allow students with disabilities to continue living at home while they are studying, to share documents, lessons, exchange ideas and make presentations. Using a computer is a common component of the training and studying process.

##### *4.2. Reading digital and audio libraries*

Students with intellectual, hearing or reading disabilities, impaired sight, dyslexia and other disabilities are now able to follow educational courses via digital and audio libraries, accessing their material, content and resources via the Internet. Students can connect from home and read or hear the relevant books, without having to go to the local university or library.

##### *4.3. Internet, broadband for persons with disabilities*

People with disabilities are today using the Internet, which builds their capacity to communicate with each other at a distance. Using the Internet helps them to gather and understand public information and news, to participate in leisure interests with others, to chat, shop, manage their finances, and write to authorities and friends. A computer with a

broadband connection provides opportunities for improved participation in everyday life and independent living.

#### *4.4. Winning communication*

Persons with disabilities are now able to communicate with others online, taking e-learning courses and interacting with the instructor and other students through online discussion forums. Since learners often find it hard to manage synchronous communication, they may experience problems working on the many elements active simultaneously during an online course. The moderator or facilitator of the course will therefore ensure that all learners understand and act on the information presented. The moderator will also monitor the relationship between what is happening on screen, what the presenter may be saying, and what is appearing in print.

In the case of online discussion for learners who are deaf, for example, participation in audio conferences or video-conferences will not be possible. Another example is online discussion for learners with mobility impairments; these students can make use of an alternative keyboard or speech input software to access the online course and participate in written communication. "In Arab countries, we are lacking moderators for synchronous communication in education and e-learning on these websites."

#### *4.5. Access points for persons with disabilities in disadvantaged communities include ICT telecenters and AT centers.*

These centers, particularly abundant in the Middle East and North Africa (MENA) region, maximize the use of IT skills for the welfare of disabled students in rural and disadvantaged communities. They also promote public awareness of the fact that PwDs can be fully operational and work proficiently in society by using adaptive technology. "But the key question is how many assistive technology centers are there in Arab regions? I feel that the number is very limited."

## **5. Empowerment of the Target Group**

The approach used by ICT and AT for developing students with disabilities is to adopt feasible techniques to attain maximum benefit from the use of ICT for students. To do so, it makes use of all forms of provision within special-education settings as a result of national or regional policy in Arab regions.

Some of the approaches used are:

- Direct training in disability cases, through specialists, developers, special-education teachers and volunteers.
- Indirect training through communication with households and disabled parents.

- Exchange of expertise with the other interested agencies, universities, researchers and specialists.
- Implementation of special e-learning networks for disabled teachers and students to exchange lessons, courses and information among themselves.

For example, I created network “ICT and AT4DPwDs,” a community of people, researchers and organizations working together to improve the social and economic impact of PwDs. For more information, visit <http://ict4dpwd.ning.com>.

Direct online support for students with disabilities so that they can inquire about certain services and suitable support and consistent follow-up for the disabled through surveys and statistics, providing guidance for disabled students to help them locate educators through ICT.

This can be implemented through special-education teachers and regional specialist work groups. For more information, visit [www.telecentre.org/group/telecentrefordisabilities](http://www.telecentre.org/group/telecentrefordisabilities).

## **6. The Benefits of ICT in e-Learning and Improving Capabilities of Students with Disabilities**

Basically, we all believe in an “information society for all,” and this target can be achieved through a series of steps; for example, building and supporting knowledge centers/telecenters in remote and disadvantaged communities all over the world, specifically in poor and developing countries, which should be structured in such a way as to look after the needs of the disabled.

- ICT is useful in improving a person’s quality of life by enhancing effectiveness of teaching, developing life skills; complementing learning in special needs education, and exploring other related issues.
- ICT enables disabled students to gain access to the curriculum and supported learning, and provides a platform for disabled trainers to promote their skills.
- ICT can be compared to a magic stick wand will help disabled students to get ahead through capacity building and empowerment, subsequently combating poverty among the disabled within their communities, if utilized in a coordinated, planned and appropriate manner.
- ICT is heralded as enabling PwDs to participate fully and to enhance the social and economic life of their communities. Combined with proper methodologies, it can offer individuals the capacity to compensate for physical or functional limitations.
- ICT is a significant force in terms of choice and opportunity for disabled students, and a significant means of bridging this gap.
- ICT offers the old and young alike an opportunity to overcome social barriers to

interaction and communication that can be caused by the lack of provision for impairments or lifelong limiting illness.

- ICT has also been identified as playing a significant role in offering severely disabled people an increased degree of independence in their everyday lives.
- ICT provides disabled persons with an improved quality of life and offers the possibility of accessing knowledge by adapting digital media to the nature of their disabilities.

## **7. Technology for Persons with Disabilities**

There is now a general consensus that for students with disabilities to share in the benefits of new technology, the use of technology for students in the field of education has tremendous potential in alleviating particular problems associated with specific disabilities as well as making employment opportunities available for persons with an intellectual or physical disability, or visual or hearing impairment. This is achieved through specialized computer programs and models that enhance the capacity of the disabled, by sharing the teaching and learning skills, successes and challenges of fellow educators working with students with disabilities.

In 2009, we launched a new project, RPoA, to build the information society through information and communications technology for the development of persons with disabilities (ICT4DPwDs). This regional project was a follow-up to the outcome of the World Summit on the Information Society, UN-ESCWA, and involved Syria, Lebanon, Egypt, Sudan and Yemen. *“But so far, the project has not been effectively activated, despite communication with a lot of organizations in the Arab region.”* For more details about the project, visit:

[http://css.escwa.org.lb/ictd/850/Track3/Nabil\\_EidRPoA\\_ICT4D\\_PWD.pdf](http://css.escwa.org.lb/ictd/850/Track3/Nabil_EidRPoA_ICT4D_PWD.pdf)

## **8. E-Learning and Education of Students with Disabilities**

E-learning, or “electronic learning” is fast becoming the leading mode of distance delivery in adult education, with an increasing diversity among learners; as more learners become engaged in e-learning, instructors and course developers are finding that the pool of learners is becoming increasingly diverse. Among the learners who access adult education through e-learning, a proportion will be those who have learning challenges. E-learning and education meet the accelerating needs of our communities in Arab countries.

The number of cases of students with disabilities in our societies, especially in remote and disadvantaged communities, has increased. For this reason, we need to work with groups of developers, researchers, teachers and volunteers to combat this situation, as well to establish work plans and to look at the measures and efforts made so far to realize this goal.

Working closely with special-education teachers, volunteers and donors, we develop the most effective e-learning strategies and find ways in which instructors and course developers can prepare their e-learning courses with a view to maximizing learning for all students, including those with disabilities. The aim is to establish a universal design for learning, “best practice” teaching strategies and accessibility guidelines that will reduce barriers in an e-learning environment.

For example, in the Studies Center for Handicapped Research (SCHR), we have applied a few principles of universal design to learning, as follows:

- Like Work to increase education participation earnings and the quality of education for groups that experience persistent barriers to education, including students with disabilities.
- Improve overall education outcomes for students by extending sustainable education objectives.
- Encourage the development of a range of options recognizing the diverse needs of disabled people.
- Ensure that students with disabilities have the same education and inclusion conditions.
- Ensure that ICT methods offered to the general public available in formats appropriate to the different needs of disabled students.

More details about SCHR and best practice can be found on these links:

<http://www.caihand.org>

<http://www.epractice.eu/en/cases/ict4dev>

## **9. Persons with Disabilities Moving from Isolation to Integration**

Our goals are to:

- Design a learning profile of each student (disabled): By being aware of the learning styles, work level, reasoning ability, classroom participation, comprehension and progress of a student with disability.
- Develop effective teaching techniques: Develop or modify curricula and testing to ensure that disabled students obtain the information and skills they need and that they are evaluated accordingly.

- Provide individualized instruction: To be effective, special-education teachers should modify their instruction to meet the various learning styles and abilities of students with disabilities.
- Provide a structure for learning: Many students with disabilities have difficulty organizing information and developing work habits.
- Build self-esteem of students with disabilities: Deliver information in a gradually more progressive manner, allowing them time to master a topic at one level before moving on to more difficult material.
- Meet with parents to discuss their child's problems at school.
- Collaborate with parents and guardians regarding their child.
- Use technology that can help to include the disabled in the curriculum framework and ensure they have seamless access to computer literacy – this is a priority requirement.

There are many other ways in which ICT could be used to enhance the skill sets of PwDs, raise their education, hopes and opportunities. In this respect, we have developed programs to benefit PwDs:

- Development of program services for students with mild/moderate disabilities and flexible control mechanisms would facilitate easy learning for them.
- Adaptation of standard software to the needs of children with intellectual impairment. Compatibility of application and cooperation, in order to obtain a standardized storage format for text, pictures and sounds in different teaching materials and software according to the differing needs of children with disabilities.
- Certain special browsers can be programmed and equipped with speech recognition devices, thus offering wider access to the Internet for the disabled. These devices would facilitate access of information for persons with disability, enabling them to access the Internet in the same manner as their peers.
- Improvement of networking facilities to allow more efficient cooperation between universities, institutions and telecenters for all types of disabled students through online networks (discussion groups, mailing lists, chat, etc.).
- Improved disability prevention will require a change in organizational priorities, restructuring of the symptom-driven healthcare system, and training for providers and clients to cooperate in collaborative care.
- Extensive research is needed to activate the role of ICT in the community.
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## **10. ICT Providing Computer Accessibility for Persons with Disabilities**

For intensive exchanges of knowledge and experience on promoting awareness, planning and developing accessible ICT solutions in the context of sustainable and equitable development for present and future generations. To address the digital divide faced by persons with disabilities in the world and to promote the digital opportunities of PwDs, the

decisions and declarations adopted a set of recommendations including the definitions of PwDs, (ICT) “and “Accessibility.”

“Accessibility” can readily be achieved or used by: Students with physical disabilities, blind and visual impairments, intellectual and hearing disabilities. Also, learning disabilities, autistic spectrum disorders, Down syndrome and dyslexia. The role of ICT is to promote and enhance teaching, learning and exploration. The following pages cover the ways ICT enhances learning, and explore how ICT enriches the learning opportunities and potential of students with disabilities. ICT is largely a software concern: when software, hardware, or a combination of the two is used to enable the use of a computer by a person with a disability.

### **Use of ICT and AT in education to achieve more goals**

- ICT helps disabled students by providing access to learning.
- ICT provides support for learning.
- ICT helps disabled students’ teachers and promote their skills.
- ICT helps students to integrate into their local society.

### **Use of ICT in making sites accessible**

For instance, how can we make sites accessible to students with learning disabilities? What can do to ensure that a site is accessible to these students?

We can ensure that a site is accessible through a screen reader that assists students when they are using a site with certain Web content accessibility guidelines.

We can greatly improve the accessibility of a site to PwDs in terms of: Navigation; Necessity of content; Links and Headings.

Improving readability is also important and certain techniques aimed at assisting PwDs include: Shortening sentences; reducing column width; using headings; reducing color contrast; and presenting only one idea per sentence. Commitment to applying the principles of the Web Accessibility Initiative (WAI) and the Web Content Accessibility Guidelines (WCAG 2.0).

### **Best practice**

In our efforts to make sites accessible to PwDs in the MENA region, we contributed to the auditing of the Web Content Accessibility Guidelines (WCAG) 2.0 with the research Unit of Technologies of Information and Communications (UTIC) and Higher School of Sciences and Technologies of Tunis, University of Tunis.

<http://www.utic.rnu.tn/wcag2.0/>

## **Use of ICT by students with a physical disability**

- ICT may be essential for access to communicating with other pupils.
- ICT assists students in IT skills.
- ICT tools that can offer support
- Communication aids, computer access devices, switches.
- Access utilities and specialized software, software with alternative input options.

### **Best practice**

I trained groups of students with physical disabilities on applications programs such as ICDL, Graphics Design, Web Design. These are all good programs for people with physical disabilities and proficiency in them ensures good opportunities for education and future employment.

[css.escwa.org.lb/ICTD/1052/NabilEid-ICTforDevDisabilities.pdf](http://css.escwa.org.lb/ICTD/1052/NabilEid-ICTforDevDisabilities.pdf)

<http://www.telecentre.org/profiles/blogs/2086278:BlogPost:6217>

<http://www.telecentre.org/photo/album/listForOwner?screenName=34rdhhr8a1pzh>

Use of ICT for blind and visually impaired pupils.

Very useful for the blind and visually impaired, since computer interfaces often solicit input visually and provide visual feedback in response. ICT allows students to make the most of their vision when using ICT and AT.

In this regard, we have to take the following points into consideration:

- Consider the position of the student. Consider the position of the screen and the clarity of the display.
- Use large, clear fonts if they help.
- Adjust colors and add speech feedback where possible.

### **ICT tools that can offer support**

Speech recognition, talking word processors, big pointer utilities, screen magnifiers, screen readers, electronic Braille, closed-circuit television.

### **Best practice**

We launched the first project in the MENA region with UNDP/Egypt, ICTDAR Program through ICTARB project in ReefNet project, Salamieh Telecenter, Syria, 2005-2006.

ICTDAR program: Information and Communications Technology for Development in Arab Regions.

ICTARB project: Information and Communications Technology Arab Region for the Blind.

Please find the links:

<http://ictdar.pogar.org/Projects/ICTARB/ICTARB.htm>

<http://ictdar.pogar.org/Projects/ICTARB/Syria/ICTARB-Syria.HTM>

<http://www.caihand.org/leransight.htm#le6>

<http://www.caihand.org/new.htm>

Success stories

[http://ict4dpwd.ning.com/profiles/blogs/success-story-tuning-to-life?xg\\_source=activity](http://ict4dpwd.ning.com/profiles/blogs/success-story-tuning-to-life?xg_source=activity)

<http://ict4dpwd.ning.com/profiles/blogs/yara-obiedo-walking-towards-a>

<http://www.telecentre.org/group/telecentrefordisabilities/forum/topics/telecentres-for-disabilities>

<http://www.telecentre.org/group/telecentrefordisabilities/forum/topics/success-stories-ali-alhaj>

### **Use of ICT for pupils with hearing impairments**

Here, language is a major difficulty. While sound user interfaces have a secondary role in common desktop computing, usually limited to system sounds as feedback, software producers take into account people who can't hear, either due to personal disability, noisy environments, silence requirements or lack of sound hardware.

ICT can be used for language development activities; symbol- or picture-enhanced text can bring meaning to print, and illustrated concept keyboard overlays make writing more accessible.

### **ICT tools that can offer support**

Symbol-generating software, word processors, concept keyboards, word lists, clip art to illustrate writing, and spellcheckers and grammar checkers.

### **Best Practice**

In 1994, I launched a new sign language in Syria for teaching hearing-impaired students computer science. I suggested creating a new dictionary for computer sign language. Please see the following links:

<http://www.caihand.org/as.htm>

<http://www.telecentre.org/group/telecentrefordisabilities/forum/topics/how-to-make-a-classroom-more>

## **Use of ICT for students with Autistic spectrum disorders, dyslexia, Down syndrome and learning disabilities.**

Explore ways in which ICT can be used to support individual students' needs and provide exposure to online resources. Software which the teacher can use to support those needs. Learn about the use of these resources and strategies to assist with their integration into the curriculum. Learn about different uses of ICT and AT for assisting in language development and communication, as well as for focusing on a topic of particular interest to the participants through a project in a supported environment.

### **ICT tools that can offer support for specialized programs**

Talking books, word-list facilities, laptop computers, talking word processors and speech-driven writing tools.

### **Best Practice**

#### **Development of Educational Software**

New program for Teaching Children with Intellectual Disability

Name of Program: Listen, Look, Think then Answer

<http://www.telecentre.org/profiles/blogs/listen-look-think-then-answer>

This program specializes in teaching software for children with an intellectual disability. The program is in Arabic and is suitable for local environments, especially in the MENA region communities. Any child with an intellectual disability can benefit from this program. I have tailor-made my program to meet the needs of children with mild/moderate disabilities/mental retardation who have learning disabilities. The intellectual disability program is a unique teaching tool offering teachers and parents an individualized (and progressive) educational program for early intervention.

<http://www.telecentre.org/photo/photo/slideshow?albumId=2086278:Album:58023>

<http://www.telecentre.org/profiles/blogs/be-a-fan-of-hope-to-your>

#### **Where the program is utilized**

The program is utilized in:

**Sultanate Oman, Muscat.**

More details on the following links:

<http://www.telecentre.org/profiles/blogs/workshop-in-5-days-to-use-of>

<http://un-gaid.ning.com/profiles/blog/list?user=34rdhhr8a1pzh>

#### **Syrian Arabic Republic**

More details on the following links:

<http://www.caihand.org/tf.htm>

<http://www.caihand.org/tym.htm>

**Workshop in Libya** at the First Arabic Conference on the Rights of Persons with Intellectual Disability.

More details on the following links:

<http://www.telecentre.org/group/telecentrefordisabilities/forum/topics/ict-and-inclusive-education>

<http://ict4dpwd.ning.com/events/the-first-arabic-conference-on>

We will also be implementing the program at the Friends of Disabled Association in Lebanon and Gedaref Digital City in Sudan.

More info on the following links:

<http://www.telecentre.org/photo/albums/be-a-fan-of-hope-to-your>

<http://www.telecentre.org/photo/albums/listen-look-think-then-answer>

<http://www.caihand.org/tf.htm>

I have also programmed more supportive programs for children with intellectual disabilities:

<http://ict4dpwd.ning.com/profiles/blogs/using-ict-to-empower-people>

Teaching Montessori at Home (software program) for children with cerebral palsy.

<http://www.caihand.org/pm.htm>

Assessment and treatment of children with cerebral palsy (software program).

<http://www.caihand.org/shd.htm>

Studies of attitude toward intellectual disabilities in Arab regions (software program).

<http://www.caihand.org/atg.htm>

### **Education strategy for persons with disabilities**

ICT and AT open up great opportunities for improving students' quality of life. Education is made possible for students with disabilities who want to learn, develop, live and finally work in the future. The role of the strategy is to rehabilitate ICT in the field of disabilities to enable students to access education and ultimately secure future employment.

Together we work to:

- Develop students with disabilities for a successful transition from education to work.
- Educate special-education teachers.
- Increase education participation earnings and the quality of education for groups that experience persistent barriers to education, including students with disabilities.
- Improve overall education outcomes for students with disabilities through extending sustainable education objectives.
- Encourage the development of a range of options recognizing the diverse needs of PwDs.
- Ensure students with disabilities have the same education and inclusion conditions.
- Foster public awareness and responsiveness.

- Ensure that all information and communications methods offered to the general public are made available in formats appropriate to the different needs of disabled people.

We also need to improve and develop the necessary human and knowledge resources required to deliver the specialized training that will enable PwDs to become gainfully employed.

We will simultaneously draw attention to the breadth of potential value of ICT for persons with a disability in education and employment.

### **Students with disabilities and barriers**

What do we need and what are the challenges? We need to raise awareness about the barriers that students with disabilities face and identify the potential of technology to overcome these barriers.

Six interrelated barriers to ICT can be identified in existing literature.

These are:

- Lack of interest
- Lack of awareness
- Difficulty of access
- High cost of ICT
- Lack of ongoing support
- Lack of training

Limited complementary services – for example, assistive technology, special accommodation for certified exams, vocational counseling and assessments.

Limited accessibility features at mainstream ICT training facilities.

For the sake of brevity, these barriers will often be referred to throughout the document simply as “interest, awareness, access, cost, training and ongoing support.” In this sense, the above-identified barriers can be seen as bottlenecks in the path towards ICT education and inclusion.

People enter this process at different stages; for example, some students may already have an interest in and awareness of ICT having recently retired from a job requiring computer literacy. Others may have money but lack awareness of methods by which they would be able to access ICT.

They interrelate and overlap; for example, there is often a cost associated with training or ongoing support, sometimes a prohibitive cost. Similarly, awareness of low-cost and no-cost options can bring ICT equipment within the financial reach of many PwDs.

There are different types of support structures available within countries, but we must focus upon combinations of one or more of the following in order to achieve success with ICT in disability development in terms of attitude barriers and understanding of the benefits and possibilities of ICT. At a policy level, in terms of diffused responsibility for policy implementation, specialist national, regional and global working groups to support networks and online networks should be established.

The development of theory on the use of ICT in e-learning for people with a disability is believed to be potentially enhanced if there are opportunities for cooperation between different groups of actors (PwDs and their families, teachers, support professionals and researchers) at both national and international levels. The possibility of enhancing virtual cooperation through face-to-face meetings and exchanges was also raised.

The power of ICT as a communication and learning tool is reinforced through personal contact and exchange between persons with disabilities and ICT specialists. But although we know what is needed, we are keen to learn more about the challenges facing projects for students with disabilities. It is extremely rewarding for us to see the PwDs and their families living a better quality of life.

## **11. The Future: Moving from Advocacy to Action**

The use of ICT in education for students with disabilities needs to be looked at in great depth by policymakers, researchers, developers and information providers. The following suggestions provide an insight not only into areas of present and future needs, but also into what the ICT in disabilities field may look like in the future if these practitioners' requests are met.

There are four areas of ICT for the education and development of persons with disabilities, which require particular attention:

### **1. Requirements in terms of IT infrastructure development:**

- **Hardware and software development**  
ICT innovations as a solution to problems of communication and access to mainstream activities, diagnostic uses and suggestions – needs to be a clear focus upon the educational context: cultural and philosophical as well as technological development.
- **Internet Access**  
Widening of Internet access and improvement of networking facilities to allow more efficient cooperation between institutions, with development of an international virtual resource centre which houses all the information related to ICT and disabled students.

- Compatibility/application issues

Adaptation of standard software to meet the needs of the children with different disabilities, including integrated research into hardware and software in order to ensure compatibility.

## 2. ICT provision: training, support and learning

- Policies

Examples of policy documents were examined regarding ICT-for-development PwDs from different countries, data on important results and outcomes resulting from policies. Also, comparative reports on support structures with statistics and trends identified.

Information on ICT policy, its implementation in practice and its evaluation in other countries was seen as being of high importance. Exchange and reflection on policy information was seen as being an important aid to the learning process at a global level.

- Usage

The main priority for sharing information and practical information on the latest hardware and software developments. Overviews of information on available hardware and software relating to particular types of PwDs, examples of innovation in teaching strategies that could be transferred from one country to another, innovations and successful practices in ICT4D PwDs.

International exchange of resources; comparisons of resource provision across regions and global and information on available training and training resources, management of schools, educational processes.

- Other users

The information on users focused on addresses of experts and institutions in the different countries. International contacts on ICT development and implementation, international conferences/seminars for products and services.

## 3. The potential focus of future research and collaboration

Implementation and evaluation as well as research and development of technology through research into the psychological aspects of ICT4D PwDs, development of new technologies specifically designed for children with special-education needs, research into the actual effects of ICT in the learning process, research into the ways ICT could help support the education and inclusion process of students with disabilities, and research into systems directly related to the educational environment and its requirements, as well as a survey of initiatives and projects using the full range of opportunities for educating students with disabilities.

Curriculum development using ICT (considered in both a theoretical and practical sense). In the development of educational software, there should a clear focus upon the educational context – cultural, ethnic, philosophical and psycho-pedagogical.

All the suggestions in this area point towards the need for systematic, long-term collaboration, research and/or evaluation that would require the input of different groups of ICT within a practical range.

## 12. Lessons Learned and Concluding Remarks

In this area, we explore practical examples of ICT being used to assist with the teaching of disabled students by providing help to identify the most appropriate technologies for addressing individual needs, and suggestions on how these might be managed in educational learning, understanding of ICT and an awareness of the needs of learners with different disabilities. The aim is to identify key areas in which ICT can help specific learners.

We present practical experiences of the use of low-tech aids and ICT to support access to the curriculum, focusing on disabled students of nursery age and those who are developmentally young. Also included is a series of templates designed to help and create special software.

Please see the following link:

<http://telecentremagazine.net/articles/article-details.asp?Title=Consolidation-and-Expansion-of-the-ESCWA-Knowledge-Network&articleid=301&typ=Event>

*"The people are the real wealth of a nation"*

With its rapid succession of innovations, ICT today provides opportunities and makes life easier for many students with disabilities, who are now able to communicate with each other and learn, thanks to assistive technology (AT) and information and communications technology (ICT) tools.

Despite the fact that AT & ICT helps many students with disabilities to learn and interact, how, there are still some barriers that can prevent the disabled from taking advantage of these wonderful technologies. The following steps will help address this:

- Ensure that all students with disabilities have access to free appropriate public education that emphasizes special-education and related services designed to meet their unique needs and prepare them for further education, employment and independent living.
- Design and develop special-education programs and instructions to meet the unique needs of a student with a disability, at no cost to the child or the child's parents. This

education is to be provided in a classroom, at home, in an institution or other setting.

- Establish training programs for disabled instructors and include personal training, classroom training, e-learning and online seminars according to needs and preferences.
- Collaborate with universities and research studies on innovation in the area of Arabic language solutions to expand the reach of AT solutions to Arabic-speaking students.

***People with disabilities should have the same rights to participate in the information society as other citizens. (ICT) should be tools that help overcome the hurdles these people face in education, the workplace and social life.***

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