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## Enhancing human rights: computer and information technologies with access for all

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**Abstract:** Inclusion of people with disabilities in the new knowledge-based society can be facilitated by universal design of information and communication technologies (ICTs). This will be a first step in providing the tools to reduce poverty and enhance human rights. Here, we present highlights of the Adaptech Research Network's ten-year corpus of empirical work on education and ICTs for postsecondary learners with disabilities. Consistent with various versions of the social model of disability, recurring findings from our research link the need for availability, affordability and accessibility of both the technological and learning environments and show a clear link to the notions advocated by various versions of the social model of disability.

When these three pertinent elements are provided, individuals with disabilities achieve academic success – and obtain jobs – at the same rate as their non-disabled peers.

**Keywords:** universal design and information and computer technologies; ICTs, postsecondary students; people with disabilities; human rights.

**Reference** to this paper should be made as follows: Barile, M., Fichten, C.S. and Asuncion, J.V. (2012) 'Enhancing human rights: computer and information technologies with access for all', *Int. J. Social and Humanistic Computing*, Vol. 1, No. 4, pp.396–407.

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## 1 Enhancing human rights with computer and information technologies

Literacy in the use of information and communication technologies (ICTs) is an absolute necessity for inclusion and full citizenship in the new knowledge-based economy (Council of Europe, 2001). For individuals with disabilities, access to the means to acquire such literacy poses several challenges as, historically, access to all resources as well as information and computer technology needs were not acknowledged. As Mary Pat Radabaugh noted many years ago (cited in Seelman, 1999), "For people without disabilities, technology makes things easier. For persons with disabilities, technology makes things possible".

The link between human rights and economic development by way of the new knowledge-based economy was promoted in the Summit of the Americas, Declaration of Principles. Here, it was noted that the new economy serves to, "propel nations toward free or freer trade – whether on a regional, continental or hemispheric basis", and that this has "been roughly paralleled in time by the steady expansion, now virtually global in scope, in the articulation of human rights values and principles, and their entrenchment in regional, continental and/or international instruments and declarations" (Begin and Hurley, 1997).

As a group, Canadians with disabilities are severely underemployed (CCSD, 2005). Fawcett (1996) showed that the economic realities demonstrate that in Canada, persons with disabilities who were employed had a poverty rate of 13.4%. Almost 28% of those receiving CPP/QPP (government) disability benefits were poor; and 14.5% of those

receiving workers' compensation (salary replacement due to workplace injury and impairment) were poor. Overwhelmingly, the literature on persons with disabilities shows that disability and poverty are closely associated. In fact, the World Bank acknowledges that persons with disabilities, "may account for as many as one in five of the world's poorest" [Department for International Development, (2000), p.1].

Increasingly, postsecondary education is one way in which poverty may be reduced. Postsecondary graduates with and without disabilities have better employment outcomes than their counterparts with no postsecondary education (e.g., Government of Canada, 1996; Stodden and Dowrick, 1999/2000). It has been shown, e.g., that although employment of university graduates with disabilities is somewhat lower than that of their non-disabled peers both in the USA (Horn et al., 1999) and Canada (Canadian Council on Social Development, 2001; Fawcett, 1996), once employed, salaries are similar, and rates of employment are still substantially higher than rates for learners who did not complete university. Those who attend college, in turn, fare better than those who never went to college (Canadian Council on Social Development, 2002; Roslyn Kunin and Associates, Inc., 2006).

It is this same new knowledge-based economy that has the potential to provide citizens with disabilities an unprecedented opportunity to fully participate in the social and economic life of their communities. However, this can only happen if people with disabilities are provided with access to acquiring computer literacy in the same way as these opportunities are made available to everyone else. In North America, postsecondary educational institutions recognise the need for literacy in the use of ICTs. This includes providing students with opportunities to learn and use the new ICTs in all aspects of their schooling, from online registration to virtual labs (Asuncion et al., 2004). The challenge is to ensure that these opportunities are both physically, technologically, and financially, accessible to all learners, including those with different impairments. Unless this requirement is met, people with disabilities face a real danger of being rendered technologically illiterate and, thus, unattractive to today's new economy labour market upon graduation (Asuncion et al., 2002).

During the past few years, skill in using ICTs has become mandatory in postsecondary education and the workplace (e.g., Stodden et al., 2003). For example, recent investigations show that computer use on the job and higher salaries for employees both with and without disabilities are associated (Canadian Council on Social Development, 2004), and that for people with disabilities this is especially important (e.g., Kruse et al., 1996).

If the new knowledge society is to be inclusive of persons with disabilities, it must provide 'winning conditions' which include diverse means to alleviate inequity created by poverty and lack of opportunity. This is implied in documents from the Summit of the Americas, Declaration of Principles, "The hemispheric objectives endorsed by state leaders included not only economic integration, but also the protection and promotion of human rights as means of strengthening democracy and the eradication of poverty and discrimination" [Begin and Hurley, (1997), para. 2].

"Disability limits access to education and employment, and leads to economic and social exclusion. Poor people with disabilities are caught in a vicious cycle of poverty and disability, each being both a cause and a consequence of the other" [Department for International Development, (2000), p.1]. These connections are made evident when applying tools such as the social model of disabilities, which consists of two elements:

- 1 impairment (i.e., ‘lacking part or all of a limb, or having a defective, organism or mechanism of the body’)
- 2 disability (i.e., “a disadvantage or restriction of activity caused by a contemporary social organisation which takes no or little account of people who have physical impairments and, thus, excludes them from the mainstream of social activities” [UPIAS, (1976), pp.3–4, cited by Oliver, (1990), p.11].

The social model locates problems in the social construction and production of disability. It focuses on inequities caused by lack of access to the resources available to non-disabled persons and by the unequal distribution of opportunities in society; this includes education and the means and tools to achieve it (Barnes, 1996). The model maintains that these inequities create discrimination, poverty, and segregation. The model refers to a ‘disabling environment’ (Oliver, 1993) which includes both physical and environmental conditions and influences as well as the social and cultural forces that shape the life of a person or a population. One of the outcomes of the focus on social factors has been the increasing number of students with disabilities in postsecondary education (Shaw, 2002).

A universally designed world, wherein the needs of people with disabilities are met in every aspect of the built environment (architectural, technological, etc.) would facilitate the inclusion of people with disabilities in the new global knowledge-based economy. Here, we focus on the role of computer and information technologies in postsecondary education for individuals with disabilities as a first step toward that new vision, expressed in the Summit of the Americas (Begin and Hurley, 1997). Our data are based on Canadian students with disabilities. Our findings, however, are of relevance to education in other countries.

## **2 Adaptech Research Network’s findings**

For the past ten years the Adaptech Research Network (2007) has carried out empirical research on ICTs for postsecondary students with visible and invisible disabilities. This research has involved over 4,000 participants – mostly two to three-year junior/community college and four-year university students with various disabilities and campus disability service providers. The research methods used include qualitative, quantitative, and archival techniques.

Recurring findings link the need for accessibility, availability, and affordability of all ICTs in the built and learning environments. Our research shows that when these three pertinent elements are provided, students with disabilities achieve academic success – and obtain jobs – at the same rate as their non-disabled peers (Fichten et al., 2006; Jorgensen et al., 2005). When these three elements are provided, ICTs are technologies that are enabling and that allow students with disabilities to prepare for – and to participate in – today’s knowledge-based economy.

### *2.1 Finances a key barrier to academic success*

The single most outstanding finding of our studies relates to concerns over the cost of ICTs, both to the students themselves and to the institutions they attend. Regardless

of what question was asked or how it was formulated, the high cost of acquiring and maintaining needed ICTs was the single most important and common issue noted by students and disability service providers alike. The majority of students in our samples, who had computer equipment at home, indicated that they (34%) or their families (30%) had paid for these and for their updates (Fichten et al., 2001). Students also borrowed equipment from family and friends (14%), and a small number benefited from equipment donated by a foundation or by their college or university. In spite of the availability of specialised government subsidy programmes in Canada, only one quarter of our sample took advantage of these. Of interest here is the general economic situation of persons with disabilities; some of these are described below.

### *2.1.1 Students' personal financial circumstances*

Disabled women and men face a number of extra expenses directly linked to their impairments or illness, such as dialyses, hearing aid batteries, etc. Other expenses are linked to disabling environments. This includes transportation (Barile, 2001).

Non-disabled students, when they cannot afford ICTs for home use, can go to a computer lab on campus. Because of the need for adaptive equipment, such as a screen reader for a student who is blind, students with disabilities often cannot do this, because students who are blind, deaf, or have learning or neuromuscular impairments, often need adaptive technologies (e.g., software that reads what is on the screen, an adapted mouse) to enable them to use computers effectively. So they need to buy general use hardware and software, as do many non-disabled students. But added to the expense for these students are the costs linked to disabling environments, because general use ICTs are often not accessible to individuals with disabilities. The adaptive technologies are generally very expensive, and frequently cost more than the computer on which they are installed. Other issues include the costs related to needed repairs. In addition, there are frequent compatibility problems between the adaptive technology and general use software and hardware, which need to be resolved. This, too, can be costly. These financial aspects of computer use situate students with disabilities at a level of economic inequity relative to their non-disabled peers, thereby producing discrimination, to use the language of the Summit of the Americas (Begin and Hurley, 1997).

### *2.1.2 Funding for ICTs for students with disabilities at colleges and universities*

A second financial barrier is posed by inadequate financial support to ensure the availability and accessibility of colleges' and universities' ICTs, particularly for students with disabilities. A recent study by our team, which surveyed 156 Canadian campus disability service providers, found that funds to ensure the availability of adaptive computer technologies in computer labs for general use and technical support for adaptive technologies posed problems on campus (Fichten et al., 2004). Postsecondary institutions need to make financial commitments to ensure that needed ICT-related facilities, services, and equipment available to students with disabilities are on an equal footing with equivalent equipment and services for the student population at large.

### *2.1.3 Subsidy programmes for home use of ICTs for students with disabilities*

As noted earlier, in spite of the availability of specialised government subsidy programmes in Canada for students with disabilities, only one quarter of our sample of college and university students took advantage of these. The reasons included lack of awareness about the existence of these programmes and difficulties in meeting the eligibility criteria. Nevertheless, our studies also show that in general, students who took advantage of a government computer technology subsidy programme were pleased with the equipment provided: the equipment they received was up-to-date and met their needs, the programme was flexible in accommodating their requirements, and contacting the necessary people was generally easy (Fichten et al., 2001). There were some complaints as well, however. There were many restrictive rules and regulations, long waiting periods, a complicated process for submitting applications, parental income was a criterion for adults learners, and there was a lack of good and timely training on the technology.

In some countries, such as Canada, where there is an acknowledgement of the importance of ICTs for postsecondary students with disabilities (Fichten et al., 2007) different levels of government make available different types of programmes to enable these students to acquire needed ICTs (for URLs, see NEADS, undated). These take the form of equipment loans or financial support to purchase needed ICTs. Nevertheless, students tell us that such programmes do not automatically translate into good access to needed ICTs for all students with disabilities (Dugas and Guay, 2007). There are numerous inequities and inconsistencies in available government subsidy programmes. Examples include lack in choice of ICTs, along with arbitrary requirements related to the type of impairment, how it was acquired, as well as the region of Canada where the learner lives and/or studies (Fossey et al., 2005).

## *2.2 ICTs on campus*

From an institutional perspective, our studies suggest that when campus-wide information technology purchases and computer infrastructure improvements in colleges and universities are being planned, the needs of students with disabilities are simply overlooked in much of the planning until it is discovered, often much too late, that the expensive new campus-wide ICTs are inaccessible (Fichten et al., 2000). This is through lack of forethought, rather than malice. Designing for accessibility always results in better, less expensive and more timely solutions than retrofits. It is important to ensure that the needs and concerns of students with all types of disabilities are represented in planning decisions from their inception. Implementing accessibility features in the initial design of ICT mitigates the potential expenses required to address accessibility after the fact.

### *2.3 How ICTs are used by students with disabilities*

Between 1/4 and 1/2 of the students in our samples had two or more disabilities (Fichten, et al., 2000, 2007). This suggests the need for college-based stationary work stations that have adaptations allowing individuals with different disabilities to use these. Our findings show a tendency for students to 'cross-use' ICTs, i.e., for students with one kind of disability to use technologies intended for students with a different disability (Fichten

et al., 2000; Nguyen et al., 2007). For example, software that reads what is on the screen is used not only by students with visual impairments but also by students who have a learning disability. In addition, there has also been a trend for students with various disabilities to exploit general use ICTs as adaptive aids (Fichten et al., 2000). Use of large screen monitors and voice recognition (dictation) software are recent examples. Multiple uses of adaptive technologies seems to be an important development, and the increasing number of accessibility features built into widely available mainstream products are of considerable interest to students with disabilities.

The nature and implications of our findings are evident. Students with disabilities can and do use ICTs to help them succeed in postsecondary education. ICTs are best seen as enabling technologies – ‘electronic curb-cuts’ – that allow students with disabilities to prepare for and to participate in the knowledge-based economy.

Our findings provide good examples of various versions of the social model of disability (Oliver, 1990; Pfeiffer, 2001). These propose that problems are located in the social construction and production of disability, and that lack of access to resources commonly available to non-disabled persons creates unequal opportunities in society, including opportunities for education and computer literacy. The findings of the Adaptech Research Network studies identify problems highlighted by students with disabilities; these include the unavailability of needed accessible ICTs and/or the means to purchase or acquire the tools that can render ICTs accessible to them through subsidy programmes.

### **3 Universal design as a facilitator**

The tenets of universal design (Story et al., 1998) are consistent with and responsive to the notions set out by the social model of disability (Oliver, 1990; Pfeiffer, 2001) as well as with other non-medical/individualistic models. Such models identify environmental factors as the primary locus of the problems to equal participation of individuals with disabilities. In effect, universal design takes this idea one step further by stating that all environments need to be useable by the largest number of people with diverse abilities. In social work language, this denotes concepts of access for all, human rights, and equitable access to social resources (Barile, 2011).

#### *3.1 Universal design for instruction and UD principles*

The shift in paradigm away from individual to social models of disability which took place in the last three decades (Oliver, 1990; Albert, 2004) has focused on social change. Universal design is an integral part of social change.

Universal design was first introduced through the architectural and graphic design of products, environments, and communication tools in the late 1980’s. Its central tenets are, “the design of products and environments are to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design [or at extra cost]” [Story et al., (1998), p.3]. Seven design principles were proposed:

- 1 equitable use
- 2 flexibility in use

- 3 simple and intuitive use
- 4 perceptible information
- 5 tolerance for error
- 6 low physical effort
- 7 size and space for approach and use (Story et al., 1998, Scott et al., 2003).

Each principle has a series of associated instructions which deal with various physical environmental applications. The principles of universal design have quickly spread to other areas of scholarship and practice such as teaching and learning.

**Table 1** The nine principles of universal design for instruction

<i>Principle</i>	<i>Definition</i>	<i>Examples of recommendation</i>
Equitable use	The design does not disadvantage or stigmatise any group of users.	An access ramp is available in the establishment; multiple modes of presentation of class material (can help diminish language related obstacles).
Flexibility in use	The design accommodates a wide range of individual preferences and abilities.	Offer choices or alternative ways of completing the course workload (can help decrease course difficulty).
Simple, intuitive use	Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.	Eliminate all material that is unnecessarily complex, use concise vocabulary and speak clearly.
Perceptible information	The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.	Use PowerPoint presentations and/or a projector to communicate class material (using a large font and a good contrast); make the content available online prior to each class.
Tolerance for error	The design minimises hazards and the adverse consequences of accidental or unintended actions.	When providing computer-based or online exams ensure that it will not be made invalid by an accidental keystroke.
Low physical effort	The design can be used efficiently and comfortably, and with a minimum of fatigue.	Avoid unduly long exams.
Size and space for approach and use	Appropriate size and space is provided for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility.	Classrooms used for exams should take into consideration the number of students and ensure their comfort.
A community of learners	The instructional environment promotes interaction and communication among students and between students and faculty.	Assign students to groups or give them group projects – this will promote greater communication and inclusion among students.
Instructional climate	Instruction is designed to be welcoming and inclusive. High expectations are espoused for all.	Assert your availability to all students; underline your openness to discuss individual needs.



The term ‘universal design for instruction’ was coined by Silver, Bourke and Strehorn in 1998 (Scott et al., 2003). In 2003, Scott and her colleagues added two other principles to the seven universal design principles to better respond to the needs of curriculum and exclusivity in the classroom. These two principles are called ‘community of learners’ and ‘instructional climate’. In Table 1, we present the principles of universal instructional design, adapted from McGuire et al. (2003), Nguyen et al. (2006), and Scott et al. (2003).

Proponents of universal design hold that if something works well for people with disabilities, it works better for everyone. As is the case for universal design of the built environment, the basic intent of universal design of instruction is to design environments and curricula that can be used by learners with diverse abilities. Such design includes elements that encourage students to learn regardless of learning styles. According to Burgstahler (2004), “the field of universal design can provide a starting point for developing an appropriate model for instruction”. Universal design of instruction consists of the design of instructional materials and activities that make learning goals achievable by individuals with a wide range of abilities. Teaching materials are created keeping the inclusion of students with different disabilities in mind from the beginning (Burgstahler, 2004).

#### **4 Recommendations**

Universal design could be applied from the outset to ICTs used in postsecondary education environments. This could result in substantial reductions in barriers and inequity, thereby facilitating the inclusion of people with disabilities in all aspects of the knowledge-based economy.

Organisations/agencies that provide money, loans or actual ICTs to students with disabilities need to do more effective ‘outreach’. In Canada, and likely elsewhere as well, broadly-based information dissemination to inform students (in accessible formats), financial aid offices, postsecondary personnel responsible for providing services to students with disabilities, and rehabilitation professionals about available opportunities is clearly needed.

To respond to the major concern of students with disabilities in regard to the affordability availability and accessibility of ICTs, the Adaptech Research Network team has undertaken the compilation of a list of free and/or inexpensive hardware and software alternatives that might be useful. Intended primarily for postsecondary learners with various disabilities, these are likely to be useful for non-students as well.<sup>1</sup>

#### **5 Conclusions**

In conclusion, universal design, be it of instruction, computer and information technologies, or the built environment, can facilitate the inclusion of people with disabilities in the new knowledge-based society. It can assist in reducing poverty and enhancing human rights – two central issues of preoccupation for both non-governmental organisations (NGOs) concerned with poverty, education, and inclusion of persons with disabilities, as well as for governments and agencies charged with putting into practice the tools of the new economy.

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## Notes

- 1 The listing is available in both English, [http://adaptech.dawsoncollege.qc.ca/fandi\\_e.php](http://adaptech.dawsoncollege.qc.ca/fandi_e.php) and French, [http://adaptech.dawsoncollege.qc.ca/fandi\\_f.php](http://adaptech.dawsoncollege.qc.ca/fandi_f.php).