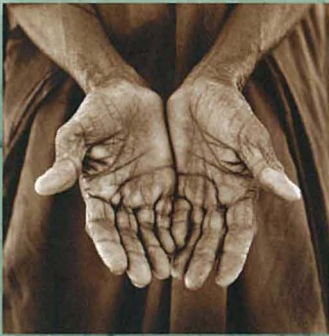


Equity and Information Communication Technology (ICT) in Education

Neil Anderson



WITH LYN COURTNEY, CAROLYN TIMMS, AND JANE BUSCHKENS

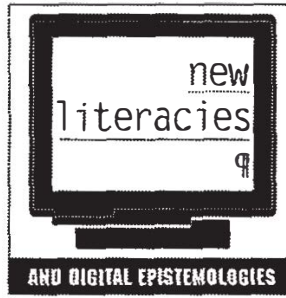
Advance praise for

Equity and Information Communication Technology (ICT) in Education

“This book is a must for all educators. Developments in communication technology are having a profound effect on education. What has become increasingly important is to ensure that the advances facilitate efforts to meet disadvantaged groups—to close the widening information gaps. Professor Anderson does a masterly job in weaving innovations in the educational uses of ICT with research and evaluation (including the important work he and his team have done) to address equity issues. As the book rightly points out, empowering disadvantaged groups is not just about developing technical expertise but also developing the skills needed to select and apply appropriate software. Strengths of the book include the chapters on equitable access for girls and women, people with intellectual and physical disabilities, and closing the digital divide using low cost hardware and open source software. The book represents a thoughtful, state-of-the-art analysis and synthesis, and should serve as a handbook for practitioners and education policymakers.”

*Emeritus Professor Colin Power, Chair of the Commonwealth Consortium
for Education; Editor-in-Chief of Educational Research for Policy and Practice*

Equity and Information
Communication Technology
(ICT) in Education



Colin Lankshear, Michele Knobel,
and Michael Peters
General Editors

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and Jhai Foundation Project from the *Encyclopaedia of Developing Regional Communities with Information and Communication Technologies* and rural education using blogs and podcasts from the *Proceedings of the Australian Computers in Education Conference, 2008*. I would like to acknowledge the support of the Australian Research Council through two consecutive grants for research in the area of gender and ICT and our industry partner, Technology One, for their financial and staff support.

■ ■ ■

Introduction

Information communication technologies (ICT) permeate almost every facet of our daily business and have become one of the most important priorities for formal and informal education. Readers in developed countries would be familiar with the type of rhetoric presented in the first sentence and many would identify with the sentiments, since they would resonate with the everyday evidence of their lives. However, many people, particularly those in least developed countries, would not have any empathy with the ICT driven lives common in developed countries. Nor would they always have any expertise in use of ICT or understanding of the benefits that ICT affords to people living in developed and developing countries. Nevertheless, very few people can escape the effects of globalization fuelled by new and emerging technologies.

ICT has become a key driver in culture, economics, politics and education with profound effects on all countries which in turn affect people in the most remote and least developed areas, even if they are not directly using the technologies. Culture, economics, politics and education are all intertwined, and the impact of ICT in one

area often has flow on effects to other areas. For example, the level of ICT infrastructure a country builds up, directly affects the level of direct foreign investment which, in turn, affects the amount of knowledge and technology transfer. Knowledge transfer and technology transfer affect the willingness of foreign investors and the local government to provide education and training, influencing the likelihood of attracting and retaining expertise from various countries.

Another example of flow on effects is the original development of the Internet for the United States military and then the rapid spread to government, business and public use and its ubiquitous presence in education within developed and developing countries. It is difficult to determine the exact current level of spending on ICT by the U.S. military, but the Department of Defense Fiscal Year 2009 Budget Request showed one budget line as U.S. \$68.5 billion dollars for communication and mission support systems and another one of \$11.5 billion for science and technology. The Australian Defense Review in 2007 emphasized the importance of ICT and recommended a substantial ICT reform agenda. Israel's first high tech exports were produced by the Department of Defense—a trend that has continued over time, and New Zealand, a relatively small country spends \$20 million per year on ICT for the military. The governments of these countries believe that being at the forefront of ICT development provides a strong measure of protection for their citizens and that lagging behind means that they are vulnerable. People with access to Internet or television services are only too familiar with the military advantage of technology enhanced weapons and military communications. Likewise, in the area of developing sustainable systems for environment protection, ICT has become the key driver, albeit with much smaller budgets than the military. In the arena of democracy, ICT via e-voting and online debate/campaigning is seen to be a solution to the lagging participation rates in voting, which has been identified as a threat to the democratic process.

This book presents many examples of the advantages and opportunities afforded by new technologies and examines innovative ideas that foster equitable access to ICT and the essential education and training that enables powerful use of new technologies. Education needs to go further than merely providing the technical expertise to operate software but also needs to develop the skills that all people need to be able to choose the most appropriate software and hardware tools for specific needs.

While some countries invest enormous amounts of money in research and development of ICT, and recognize the importance of education and training to reap the benefits associated with technology, many citizens in other countries are left wishing they had any form of electronic communication. Part 4 outlines a case study in Laos where the local villages requested access to the Internet and voice over IP (VOIP) telephone access as a higher priority than mains electricity. Providing these services without mains electricity was challenging but, in the end, achievable.

Provision of equitable access to information communication technologies along with associated education and training has become an important United Nations goal. This book provides information and seeks to stimulate discussion on many of the important aspects of ICT in relation to equity and education. Recognising the interconnected nature of equity issues with ICT in education, the book follows a structure that uses broad parts with sections rather than chapters. Each part provides evidence from the current and past literature but, where possible, also provides details of original research. The parts of the book include gender and ICT; intellectual disability and ICT; assistive technology; digital divide—including socioeconomic factors and rurality; software and hardware developments and finally knowledge and technology transfer.

Part One examines one of the most important current equity issues involving ICT and formal participation in education—the negative mind-set towards ICT of many female students in the United States, Australasia, Europe, Israel and some Asian countries such as Singapore. This mind-set has led to under-representation of girls in high school and university higher level courses with resultant negative effects on the ICT industry and the products and advances emanating from that industry. This development has been examined by many researchers in Western and Asian countries, and addressing the problem has become a high priority for large ICT companies such as IBM. The United States government has provided large research grants, and universities have set up substantial research centers such as The Center for Women and Information Technology at UMBC, Maryland. Likewise, other countries have established centers that engage in research, publication, events and courses along with advocacy. Recently, the APEC (Asia-Pacific Economic Community) international meeting included a major forum devoted to this problem. A team working with the author has engaged in long term research that has shed some new light on this problem and these illuminating results are presented in this section.

Part Two considers the use of ICT to enhance educational opportunities and outcomes for students with intellectual disabilities included in regular classrooms. In the United States the Individuals with Disabilities Act covers approximately 6.5 million students aged from 3 to 21 years with about three quarters of them being educated in inclusive school environments. An overview provides information on current legislation and the results of recent research in the United States and elsewhere. The next section presents a two year case study of how the infusion of ICT in students' everyday work led to the development of competence and the improvement of academic self-concept and peer acceptance. Reference is made to contemporary literature and research studies throughout the intervention discussion.

Part Three looks at a compelling example of the power of information communication technologies to provide an equitable educational environment for people with physical disabilities. The term 'assistive technologies' refers to technologies that assist people with disabilities to function better. Examples of assistive technology

discussed in this section range from the latest research in the United States by Velliste, Perel, Spalding, Whitford and Schwartz (2008), which has enabled monkeys to control artificial limbs with their thoughts, to more mundane yet important examples that have made the difference between participation and nonparticipation in educational activities for many people. An extensive literature review gives a general overview of assistive technologies, examines emerging and future trends and then focuses on issues related to educators and assistive technology.

Part Four is devoted to a discussion on the digital divide, including socioeconomic disadvantage and rurality. The first section goes beyond a typical deficit approach to the digital divide that sometimes focuses only on access to ICT resources. This section extends the argument to making a case for 'particular' uses of ICT in education that make a positive difference to educational outcomes for students affected by poverty. The following section uses informative case studies to illustrate various ways that ICT can assist to alleviate poverty in developing and least developed countries. For example, in the Jhai Project currently being undertaken in Laos, the local villagers prioritised ICT as a pressing community need, even though mains electricity was not available. The case study reveals how computer use, Internet connectivity and VoIP (voice over IP technology) were enabled despite the challenges of geographical isolation and poverty. Other case studies from developing countries are presented to illustrate diverse ways of approaching the problem. A further case study from a developed country is also presented and is centred on the use of blogs and robotics by an elementary school teacher in an extremely geographically isolated location to enhance a classroom unit of work and to provide the students with electronic connectivity to other isolated students working on the same unit.

Part Five focuses on hardware and software developments and reviews the recent advantageous and powerful coupling of low cost hardware with Open Source Software. Nicholas Negroponte's and MIT's One Laptop Per Child (OLPC) program is reviewed, since it acted as a catalyst to a 're-think' of the production of ever increasing power in portable and desktop computers and the continual development of bloated and expensive software. Some researchers and writers have argued that the OLPC project became a commercial threat to hardware and software manufacturers, who then responded with their own version of low cost mobile computers. This turn of events promises to assist in the affordability of ICT resources. As previously discussed in other sections of the book—pure access to ICT resources is not by itself a means of overcoming disadvantage. A key factor in the potent use of ICT is the way that computers are used and the interaction of the participants through the available software and associated educational activities. With this in mind, the second section presents information about the rise of serious games and their potential to assist in the education of people with particular needs. It also presents an interesting pilot study to examine the use of games to promote an understanding of indigenous cultures.

Part Six examines a major area of research that is usually confined to the business and economics domain. This important area of research has been labeled ‘knowledge transfer,’ ‘technology transfer’ or ‘knowledge exchange’ and is of immense importance to international equity in the use of ICT in education. International knowledge transfer facilitated by ICT has the potential to improve conditions for people in all countries, especially developing and least developed countries. This section defines the important terms and concepts and then presents a report based on in-depth interviews with key players involved in international knowledge transfer. The responses provide insight into the factors that facilitate or hinder the international transfer of knowledge. The final section deals with one of the most important international relationships for knowledge transfer, between the United States—the world’s richest economy—and China—the world’s most populous country.

Information communication technologies (ICT) permeate almost every facet of our daily business and have become an important priority for formal and informal education. This places an enormous responsibility to achieve equitable deployment of ICT on governments, education systems, and communities. Important equity issues examined in this book include gender issues, disability, digital divide, hardware and software developments, and knowledge transfer. Previous books have tended to concentrate on single aspects of equity and computer use; this book fills the pressing need for a comprehensive look at the issues. *Equity and Information Communication Technology (ICT) in Education* is an essential book for professionals involved in this emerging area of study, and a useful text for undergraduate and graduate classrooms.



Professor NEIL ANDERSON is the Pearl Logan Chair in Rural Education at the Cairns campus of James Cook University in Australia. His research has focused on equity issues arising from the effective use of information communication technologies. His

research and publications span the areas of gender and ICT, rural education, pedagogy, e-learning, ICT use in developing countries, and ICT use for people with disabilities. Professor Anderson is a foundation member of CAMOT (China Association for the Management of Technology) and is the Director of SiMERR QLD, the state centre for the National Centre of Mathematics, Science and ICT research for regional and rural Australia.

