Information Technology as a Tool for Addressing Inequities at the International Level

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Abstract

Information technology can bring tremendous opportunities to a society and its people. But how equitable a chance does a person, a school, a region, or a country have at accessing these opportunities? In this paper, we reflect on inequities in educational opportunity from an international perspective, and on the impact that IT in education may have on these inequities. Our reluctant conclusions are that IT may be more likely to contribute to widening the inequities than to narrowing them, at least if we proceed as we are now doing. We react to this with the suggestion of some strategies which might be able to change the direction of this contribution so that the potential of some IT applications to narrowing these inequities might be better realized. In particular we identify better access to resources and expertise for educational leaders in a country, via storage technologies such as CD-ROMs and transmission technologies involving terrestrial and satellite communication, as particularly promising. In addition, we consider familiar approaches to computer deployment in schools and suggest alternative strategies more likely to make equitable use of resources.

Keywords

Equity issues, Developing countries, Policy, Teaching materials, Portability.

INEQUITIES IN EDUCATION

There are many ways in which inequities in educational opportunity may be expressed. We can discuss inequities relative to the chance to enrol or stay enrolled in schooling; to the chance of access to, or of having successful experiences once in, the school environment; and to the chance that one’s schooling will result in an equal chance at employment or lifestyle opportunity after schooling is completed.
It is an inexcusable fact that inequities exist in all these categories, based on factors outside the control of the individual, such as the place where one's family lives, gender, socio-economic level, minority or ethnic status within a dominant culture, and physical handicaps. We take as a philosophical assumption that such inequities are unfair, and that improving the chance of more equal access to, successful participation within, and follow-up benefit from education is an unarguable goal.

Inequities in education at the international level

Such a goal can be addressed at various levels-ranging from within one's home or family to within the international community. Although our opportunities as educators specializing in the application of information technology (IT) in education means that our likelihood of influence is most likely bound to the level with which we most directly work - classroom, institution, regional or national - in this brief paper we take as our focus the international level. What can IT contribute to the reduction of educational inequities at the international level? In particular, we focus on inequities between more developed countries (MDCs) and less developed countries (LDCs), although the sorts of inequities we consider happen within every country and perhaps within most schools and even within classrooms (see, for example, Nolan, McKinnon, & Soler [1] for an analysis in New Zealand; and Becker & Sterling [2] for an analysis in the USA).

There is overwhelming evidence that the country or region in which one is born significantly relates to one's opportunities for educational achievement. From analysis after analysis we can see the conclusion that parental influence and child health are more influential on test scores than school inputs, and that in turn parental influence and child health are directly related to the culture and country in which one lives [3].

With respect to school inputs, not only is much more money spent on education in MDCs than LDCs (in 1980, 50 times more per student), but also the impact of the money that is spent varies enormously between MDCs and LDCs. "Students in developing countries are getting not only fewer years of education, but are learning less in each of those years than students in higher-income countries" [3, p48]. Inequitable textbook provision is seen as a major component in this difference [4]. Also, the likelihood of staff and resource shortages increases and of teachers following prescribed curriculum decreases the more rural the school in LDCs.

Gender differences in primary school enrolment in favour of males occur in all LDCs [5]. "Not only are girls much less likely to attend school, but when they do, they often face discrimination ... due to teaching methods that stem from teacher beliefs about female incompetencies" [5, p161].

Finally, another particular problem area is the lack of relevance between schooling and subsequent employment or even chance of employment [what Selvaratnam [6] documents as rapidly rising levels of "educated unemployment" in LDCs].

CURRENT EXPERIENCES WITH INFORMATION TECHNOLOGY AND THE REDUCTION OF INEQUITIES IN EDUCATION AT THE INTERNATIONAL LEVEL

Can information technology help reduce inequities in educational opportunity at the international level, or are these problems too deeply rooted in historical, economic, and social factors to expect that IT applications in education can make any difference?
Current experiences with IT in education in LDCs

Despite their limited resources and enormous educational problems, most LDCs are actively exploring the implementation of IT in their educational systems. As a generalization however, there is no evidence yet that this expenditure of scarce resources on IT is making any sustained or widespread contribution to improvements in educational equity [7-9]. Partly this may be because what has actually been done is on such a small scale, or so limited to a special project, that it is not surprising no overall benefit has been observed. Or, it may be that attempts to implement national plans have not been able to include a level of adequate teacher training, curriculum development, or teacher support, necessary to enable the impact of IT to appear [8]. More disturbingly, IT may be actually contributing to broadening the gap between advantaged and disadvantaged within countries, in that it is often the private schools and the children of the wealthy or influential within a country who get access to whatever scarce IT resources there may be, thus in effect making the educational opportunity gap even wider within the country [10].

Portability of educational software into LDCs

A particular issue is the origin of IT materials that might be used in a LDC. In particular, educational software is a significant problem for any LDC that wants to use computers in its schools [7]. Less developed (or small) countries do not have the expertise or capital to invest more than marginally in local software development and thus face the issues or cost involved in the acquisition of educational software from outside [11]. The general consensus is that only with strategic, intelligent, careful analysis, and political good-fortune, are software products going to have any chance of portability into a LDC. Wombi [12] and Murray-Lasso [13] give particularly strong analyses of the reluctance of their respective countries, Congo and Mexico, to accept the implications of 'foreign' software in their schools.

ALTERNATIVE APPLICATIONS OF INFORMATION TECHNOLOGIES

What, then, are the possibilities? How might IT become more likely to help reduce inequities in educational opportunity in the international community? We suggest five strategies, each different from what is currently being done with IT in education in most less developed countries.

Increasing resource provision via CD-ROM storage

On first glimpse, the idea of the additional hardware needed to read compact discs (CD-ROMs) on a computer seems ridiculous to suggest in countries with extreme resource problems. But the CD-ROM disc, with its capacity of 640 MB, can contain the equivalent of 1,500 floppy discs, or 200,000 pages of text, or extensive graphic animations, or large numbers of scanned photographs or drawings. A CD-ROM player costs about $600, the cost of originally developing a CD-ROM costs about $2,000, and the cost of duplicated copies of the discs is low. The discs are easy to handle and transport and more tolerant of environmental stresses than floppy discs. Such discs are regularly available in MDCs, containing rich collections of resources and learning materials. As an example, there is a CD available for less than $80 US that is a resource for science education lessons involving the functioning of the human body [14]. On this one disc are hundreds of high-quality, colour anatomical drawings, with interlinked reference and descriptive materials and also software animations showing the functioning of the lung, heart, and muscles. Such CD-stored collections of learning materials are usually inter-referenced. The user of the product can electronically mark what she wants to extract, save selected screen sequences, and print whatever she wishes.
These dense collections of learning materials have portability potential, not directly to the classroom, but to the curriculum leaders or senior teacher trainers in a country, many of whom would be able to do the initial screening of the materials in English (the language of most commercially available CD-stored resource collections), before choosing and extracting a target sample for localization, translation, and distribution through local channels.

These resources could be made strategically available to a few key sites in a country, for example, national curriculum offices and teacher training centres. The cost of equipping these with a computer with CD-ROM player and connected printer, while not insignificant, is not unreasonable. The visual materials could be especially useful to access, as translation would not be involved in their use.

The cost of using desk-top-publishing to print one's own tailored collection of resource materials from a CD-ROM resource disc could well be considerably cheaper than buying textbooks from external sources, adapting them for local use, and then printing and binding them as textbooks. Also, specific efforts to reduce implicit (or explicit) negative images of females and minority groups can be implemented more effectively at the national level than is the case if textbooks are imported or if local (community level) materials are the major sources of instructional communication.

The benefits of this idea - CD-ROM provision in curriculum centres and teacher training centres along with support for extracting, altering, publishing and distributing targeted collections of instructional materials to regional centres or even to schools - could make a significant difference in bringing appropriate and affordable resources into local schools.

As noted earlier, textbook availability, in quantity and quality, is seen as a critical aspect of educational equity in LDCs [4,15]. The CD-ROM resource could make a major contribution, if put in the hands of those responsible for textbook and learning materials development and distribution in a country.

Interconnection to resources via telecommunications

A second way in which IT could have significant impact in LDCs can occur wherever there are telephone lines, and as with the CD-ROM example, this is initially relevant for educational centres, rather than for local schools. Via telephone-line telecommunications lesson materials can be made available and text and visual resources can be circulated among various educational centres. For situations where computers are available for educational use, software can be downloaded. Also, access to large libraries of information in the major university of a country or from other countries can be made available to locations where such access could never physically happen. Certainly this all has a cost - that of using the local/national telephone lines plus the cost of organizing the central node of the on-line system - but this cost could be an appropriate target for outside funding. This may be a more appropriate target for funding than seeking support for some large number of computers to be placed in secondary schools, a type of funding request that now happens frequently.

Another example of telecommunications as a way to bring resources to areas otherwise underserviced is the use of radio or satellite transmission of digitized data and broadcast signals, to bring educational materials to television screens (and computers) in regional sites. This strategy is well developed in China, certainly a LDC, where the entire country is served by a central educational technology centre in Shanghai, broadcasting many hours of educational television per day to a series of receiver stations across the country which in turn use local transmission strategies to bring signals to locally available television and training centres [16].
Distance education and teacher training

Another important contribution of IT relative to reducing inequities in educational provision in a country can be to facilitate local teacher training, so that teacher candidates can avoid a lengthy period of residence at a distant teacher training institution, a requirement that often precludes female candidates who for personal and family reasons are not able to leave their home villages. This way of increasing the supply of teachers can make a strong contribution to reducing some of the most critical sources of inequities in LDCs, those related to limited teacher provision. Promising examples of IT use for distance training of teachers can be found in a number of less developed countries, for example, Sri Lanka, Bangladesh, Kenya, Brazil, Nepal, Chili, Pakistan, Burma, and Zimbabwe [17].

Information handling opportunities instead of programming courses in secondary schools

The examples given so far in this section have focused specifically on key professionals in a country and the improvement of resource provision and professional communication among them through information technology. However, for various reasons (some logical and some emotional [9,18]) even the most disadvantaged of countries will want to continue supporting direct student use of IT, in at least some of their schools. What recommendations can we give for this, relative to the overall goal of reducing inequities in educational opportunity?

As one consideration for general secondary schools, we recommend the idea of making centrally available access to large amounts of information stored on various CD-ROM discs, rather than the standard strategy of acquiring some number of computers, putting them together in a computer room, and trying to set up a "computer course". One centrally located computer with a CD-ROM player, printer, and perhaps (if nearby) a telephone connection to a university library could be a much better investment for a secondary school than a quantity of computers for student "computer literacy" courses.

An additional advantage of the information-access orientation, is that such experiences are a much better preparation for functioning in the current technological society than are the experiences with programming which still dominate computer courses in LDCs [18]. If schools have laboratories of equipment, training in word processing appears to have more transfer value to students than programming and also involves extra practice in reading and writing. Such a literacy emphasis is seen as more important to subsequent employment than programming [19].

Targeted software to maximize portability possibilities

For schools that do have sufficient computers so that at least some of their students can make use of them for instructional purposes, we suggest a national strategy of targeting one type of software, acquiring it and modifying it centrally, developing standard teacher support materials for it, and stressing just the use of this package, at least to begin with, in schools. Countries cannot afford to handle this process for more than a carefully targeted application focus.

We suggest software for English-language drill and practice to be a reasonable candidate for such a "standard bundle" for secondary schools and higher education settings. Most countries at some point in secondary school education wish to begin instruction in English; for example, it is predicted that China by the mid-1990s will have the largest English-speaking population in the world, based on its explicit policy of providing English instruction in schools.
However, teachers, especially away from a capital city, may not be competent to teach English. The use of foreign-origin software may be least objectionable relative to the drill and practice of a foreign language; such packages are widely available and conceptually simple to use, thus avoiding many implementation problems; older students can use them for short periods of time, with little guidance necessary; and the curriculum-fit issue is minimized, in that the content of simple English instruction would be reasonably similar in different countries. Translation of instructions may have to be done into mother tongue, but if the software was targeted to older students already having some English competency, the entire software package could remain in English.

CONCLUSIONS: WHAT IS THE ROLE OF IT AS A TOOL FOR ADDRESSING EDUCATIONAL INEQUALITIES?

We began this paper with the assumption that improving equity in access to educational opportunity within the international community is of critical importance. We reviewed major evidence documenting inequity in access, particularly between less-developed countries and more-developed countries, but also within countries. We saw that inequities are strongly correlated with other socio-economic factors, such as place of residence, parental influence, health care availability, minority status, and gender. We then described certain strategies for IT deployment which may help in the long run to remedy some of these inequities (e.g. bringing more resources into the hands of national educational leaders and the use of telecommunications to connect the educational leaders in a country with each other. We suggested a strategic focus of IT experiences in secondary schools and lower vocational education, focused on practice in information retrieval, on English-language drill and practice and word processing competency.

We can also make other suggestions, implicit from the above list. We suggest LDCs carefully evaluate their current most-typical practices with respect to IT in education - those of putting computer laboratories in a (necessarily small) number of secondary schools, often with the idea of students learning programming; coupled with isolated special projects, usually with foreign support, involving the development of a few (often prototype-level) software packages with a limited range of application or likelihood of broad-scale use. Such approaches, being tried throughout the world, are not only less likely to improve international inequities in educational opportunity, but also could exacerbate them, in that the relatively few students who benefit are often those who are already more advantaged in the overall system (i.e., located near a university, with students from higher socio-economic levels, with principals sophisticated enough to know how to become part of Ministry-sponsored initiatives, or with parents articulate or well-placed enough to influence participation in special initiatives).

REFERENCES


BIOGRAPHY

Betty Collis is an Associate Professor in Educational Instrumentation and also Chair of International Cooperation for the Faculty of Educational Science and Technology at the University of Twente. For more than ten years she has been involved in international studies and projects relating to computer-related resources in education and training. She has served as a consultant for the World Bank, UNESCO, and the International Labour Organization in the area of policy support for effective technology utilization. At the University of Twente she is primarily involved with innovative applications of information technology to educational problems.