

Effective Use of Assistive Technologies for Inclusive Education in Developing Countries: Issues and challenges from two case studies

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ABSTRACT

Developing countries face many obstacles in the process of implementing inclusive education (IE). Effective use of assistive technologies (AT) can help governments in developing countries achieve inclusive education by helping children with disabilities in schools. Despite the importance and positive impact of AT, prior research on the use of AT in inclusive education especially in developing countries is limited. To fill the research gap in this area, this paper investigates the research question of, How can AT be effectively used for IE in developing countries? To address this question, we conducted an in-depth case study of two developing countries, Bangladesh and Tanzania, and thoroughly reviewed existing IE projects around the world and other relevant literature. Three experts in the field and 18 informants of the two selected countries were interviewed in person, by phone or by email. The analysis of findings from interviews and literature review shows that obstacles to effective use of AT for IE come from three different levels – school, national, and network. Because AT is only part of the equation for a country to achieve IE, a high level national perspective is required and other related factors also need to be considered. We recommend governments in developing countries adopt a systematic approach in tackling obstacles at each level and pay attention to five management challenges: establishment and maintenance of professional networks; identification and maintenance of knowledge and expertise; funding management; coordination among ministries, and implementation, maintenance, and monitoring of a national program. Overall, governments are suggested to adopt a “network” approach that includes a constructive view of development drawing on incentives-based cooperation from all stakeholders. The results of this research shed light on the status quo of the use of AT for inclusive education in developing countries and provide useful guidance to parties who are interested in using assistive technologies to achieve inclusive education.

Keywords: *Assistive technologies; Development; ICT4D; Inclusive education; Information and communication technology*

INTRODUCTION

Inclusive Education (IE) refers to the ambition, and goal, that all children regardless of ability or disability should be educated in mainstream classes in their district schools, receiving education and support as required by their needs. The idea of inclusive education is important because it is defined by the United Nation as a human right in The Convention on the Rights of Persons with Disabilities (UN, 2006). Inclusive education should be adaptable to different styles of learning so

that it suits all learners, in particular children (UNESCO, 2002a; 2002b). According to the UN, there are some 200 million children with disabilities (CWD) in the world (UNICEF, 2009).

Prior research in inclusive education predominantly focuses on success stories in developed countries in North America and Western Europe (Arnsen and Lundahl, 2006; Kearney and Kane, 2006; Meijer et al., 2007; Norwich, 2008; Roberts et al., 2008; van Kraayenoord, 2007). The general conclusion is that developed countries have made significant progress in inclusive education (e.g., Ferguson, 2008). On the other hand, examination of the status of inclusive education in developing countries in Africa, Asia or Eastern Europe typically focuses on the history and difficulties of inclusive education (Charema, 2007; Chitiyo, 2007; Chitiyo & Chitiyo, 2007; Singal, 2006; 2008). Among the long list of barriers to successful implementation of inclusive education such as the limited involvement of the education ministry, limited government support, ineffective policies and legislation, inadequate funding, shortage of specially trained teachers, political instability, and economic crisis, ineffective and inefficient use of assistive technologies is a major obstacle (Ellsworth & Zhang, 2007; Singal, 2008).

Assistive Technologies (AT) is a broad concept, covering virtually anything that might be used to compensate for lack of certain abilities (Reed & Bowser, 2005) ranging from low-tech devices like crutches or a special grip for a pen, to more advanced items like hearing aids and glasses, to high-tech devices such as braille and computers with specialized software for helping dyslectics to read (WHO, 2009). Despite the positive impact and advancement of AT over years, prior research on the use of AT in inclusive education is few and limited to developed countries. For example, a Canadian study examines how one can help students with special needs for assistive technologies to smoothly transit from elementary to secondary school (Specht et al., 2007). Similarly, a Norwegian study examines how environmental factors as well as Braille and assistive technologies affect the learning and literacy of 11 severely visually-impaired students (Vik, 2008). To fill the gap of research in this area, this paper investigates the following research question: How can AT be effectively used for IE in developing countries? To address this question, we conduct an in-depth case study of two developing countries, Bangladesh and Tanzania, and thoroughly review existing IE projects around the world and other relevant literature. Because AT is only part of the equation for a country to achieve IE, a high level national perspective is adopted and other related factors are also considered. By combining information from many sources to a holistic perspective and giving that perspective an empirical test through our field studies, this paper contributes to the literature of AT and IE and provides useful guidance to developing countries who aim to use AT more effectively in IE.

The remainder of the paper is organized as follows. The following section presents the method used. It is followed by the findings, which are presented in three parts. The first part describes in detail the use of assistive technologies and other IE-related issues in the two case study countries. The second part discusses three general "issues" related to IE implementation as they were identified in our case studies and in the literature. The third part presents five challenges faced by governments in developing countries in IE implementation with recommendations which correspond to the identified issues from a holistic IE perspective. The Conclusions section discusses potential applications of the checklist as well as further research.

METHOD

This study adopted the literature review and the case study approaches to gather data. Interviews and observation were conducted in two selected developing countries. Bangladesh and Tanzania were selected cases for this study because of the specific requirement of the sponsor of this project, SIDA (Swedish International Development Cooperation Agency) through its affiliate SPIDER (Swedish Network for ICT in Developing Regions). Three experts in the field and 18

informants of the two selected countries were interviewed in person, by phone or by email between July and November 2008, some at more than one occasion. A large number of aid organizations were contacted, mainly via email, for discussion and information exchange, but not formally interviewed during the same period. Field visits to Bangladesh and Tanzania were made in November 2008 to gather first-hand data.

The first step of the research started in July 2008 and it involved a thorough review of IE and AT related research through academic databases such as Web of Science and search engines such as Google Scholar. The objective of this step is to examine how many academic studies on the use of AT for IE have been conducted to date. Search results show that while there are examples of how one could use AT, the majority of literature was case studies and implementation experiences of IE in general only and few provided empirical data on effects of AT.

In view of the limited results from step one, the subsequent step of the research went beyond the search of scientific studies and focuses on searching projects and example cases as well as organizations that are active on the topic. The results of the second step show a number of cases and numerous IE-relevant organizations. However, those cases were typically only described in short reports or on web sites. Therefore we contacted a number of organizations and individuals involved to get richer descriptions as well as experiences and lessons learned. In total, 65 organizations – 28 in Tanzania, 32 in Bangladesh, and 5 international organizations – were contacted. Many of them responded and sent information by email, and eventually 21 individuals representing 20 organizations were interviewed, by telephone or in person (see Appendix 1). These organizations were mainly non-government organizations (NGOs) who run AT/IE projects. NGOs differ in nature and size. The driving forces behind them vary; religious, political, philanthropic, social, or simply entrepreneurial.

Based on the findings from this and the previous step, we compiled a structured list of issues and advice which was used as the foundation for two field trips to Bangladesh and Tanzania. The list includes obvious items such as teacher education, resources, and sharing of resources across schools. It also covers more complicated and less obvious issues such as the efficiency of governments in implementing policy across departments, attitudes towards disabilities, and donors' ability to address issues of IE and AT use in a changing situation. The objective of the field trips was two-folded. First, we collected first-hand data about the use of AT in IE in the two countries by observation and interviews of stakeholders such as government officials and school teachers. Second, using the first-hand data, we updated the list we developed from steps 1 and 2. This list is a set of good practices as experienced by people in organizations active in the field. The trips to Bangladesh and Tanzania lasted for one week each in November 2008 and a number of organizations were visited, including governments, NGOs, the Swedish embassies, and local schools. In total 44 people were interviewed. Data collected from the field visits confirmed the information we had already gathered from other sources. Moreover, they added more details and provided good examples of education projects organized by NGOs.

RESULTS

DESCRIPTION OF CASES

This section briefly describes the situation concerning IE and AT in the two countries where case studies were made, Bangladesh and Tanzania. (Acronyms are used for names of NGO in the following sections; see Appendix 1 for the full names.)

Bangladesh

The Bangladeshi government clearly stated the rights of persons with disabilities in the Disability Welfare Act of 2001. The Act not only defines 'disabilities', it also states that persons with disabilities should have "Equal opportunities for participation in education, training, employment opportunities" (Asia Disability, 2008). The Act is divided into ten action areas: prevention, identification, curative treatment, education, health care, rehabilitation and employment, transport and communication, culture, social security, and self-help organizations. The policy also aims "To review the existing policies of the Government to protect and safeguard the rights and dignity of the persons with disabilities [...] and to recommend corrective measures; or if needed be, put suggestion(s) for formulation of a newer policy to this effect, in consideration of the prevailing realistic situations related to the issues" (Asia Disability, 2008). There is also the National Policy on People with Disabilities which states that persons with disabilities should be provided with AT when needed, and that "Training on how to use assistive devices shall be provided by related centers and organizations" (Borg, 2004).

The Second Primary Education Program (PEDP II) is the current program for funding different projects aiming to improve IE in Bangladesh (ADB 2008). It is funded by the European Commission (EC), and the outcome is measured by the number of CWD enrolled in primary and secondary schools, the number of special teachers that are trained in educational needs of children with disabilities, and the number of schools that are adapted to children with disabilities. Also behavior among parents and local community towards children with disabilities is monitored (The Danish Bilharziasis Laboratory, 2004).

In 1993 the National Coordination Committee (NCC) was established. The committee has become part of the constitution since 2001. It is constituted to implement the statements in the Disability Welfare Act. The committee is empowered to seek all governmental ministries for assistance when necessary (Borg, 2004; The Danish Bilharziasis Laboratory, 2004). NCC includes representatives from the Bangladesh government, NGOs and DPOs (Disabled Peoples' Organizations). The committee also works with the National Forum of Organizations Working with the Disabled (NFOWD). With some 140 member organizations, the NFOWD is the main organization for coordinated work regarding disability in Bangladesh. In the national government the ministry of social welfare is responsible for the rights of persons with disabilities in education, rehabilitation etc (Khan, 2006; APCD, 2001).

NGOs are active in Bangladesh and many of them are involved in IE-related programs. For example, Action In Development, by means of home visits, assess the needs of individual children with disabilities and, if needed, refer them to other organizations which can provide them with proper rehabilitation (CSID, 2005). Bangladesh Protibandhi Foundation has been running IE systems in several schools since 1998. The Centre for Rehabilitation of the Paralyzed (CRP) established a special school in 1993 primarily for children with cerebral palsy. CRP recently combined these special needs classes with classes for children from CRP's mainstream school into inclusive classrooms. Bangladesh Rural Advancement Committee (BRAC) provides training for teachers on inclusive practice and positively encourages CWD to attend their non-formal schools through raising awareness in communities. Currently there are approximately 14,000 children with a variety of disabilities in their classes alongside their able-bodied peers, making BRAC the largest service provider for children with disabilities in the country (PEDPII, 2008). Initiated at the University of Dhaka, the Underprivileged Children's Education Programme (UCEP) runs a number of inclusive schools in urban areas targeting the poor, not just disabled children but also those who have had to leave school early to work to make a living. For all these programs, typically teachers did not receive any specific training on assistive technologies (CSID, 2005). CSID also notes that "Currently the inclusive education initiatives in the country are

operating only with nongovernmental funds from a very few donor organizations and self-funds from national organizations.” (ibid, p v)

Despite NGOs’ effort, inclusive education in Bangladesh is far from being successful because inclusion is still the exception rather than the norm in the country (CSID, 2005). This is acknowledged also in government documents, “Providing education for children with special needs in Bangladesh is still in an early stage of development” (PEDPII, 2008, p 16). Nordström (2008) also comments that coordination among donors in the field has been “working poorly so far” with “only two meetings during 2008” and “unstructured meetings and unclear goals” and “without participation of government”.

Improvement of classrooms is the issue which so far has been mostly dealt with in the country. The improvement is done by government as well as several NGOs. Main issues are accessibility (e.g. ramps) and toilets. Some NGOs, such as UCEP, CRP, CSID, have addressed further issues pertaining to adaption of classrooms for hearing and visually impaired, such as arrangements for better lighting and noise reduction. Nevertheless, so far only few schools are adapted to meet the needs of these two groups of students. One major hindrance to classroom improvement is the existing national building legislation which allows buildings to have corridors and ramps that are inaccessible to wheelchairs or lighting that is unsuitable for the visually impaired students (Borg, 2008; Nordström, 2008). Neither is legislation on buildings enabling, even to the extent it actually defines requirements, as accessibility often can be neglected without punishment.

As shown above, many issues pertinent to IE issues are addressed in Bangladesh at the national level. However, the scale of the efforts so far is limited, considering that the country has some 150 million inhabitants, half of which are under 20 years of age. The number of disabled is not clear as no complete survey has been done. However, if the percentage is assumed to be the same as in Tanzania (approximately 10 % by international assessment), there should be around 15 million disabled people in Bangladesh.

In short, Bangladesh has approved reasonable legal preconditions for IE, however implementation is lagging. Most existing IE education is provided by NGOs while national coordination is underdeveloped. Small islands of good examples exist but they need to be scaled and coordinated before IE can be implemented throughout the country.

Tanzania

Similar to Bangladesh, Tanzania has a relatively developed legislation on IE but national level coordination is lacking. Because a smaller number of NGOs are active in the country than in Bangladesh, IE initiatives are limited. It should be noted that IE development in Tanzania is uneven. In particular one of the regions, Zanzibar, is way ahead of the rest of the country in inclusive education. The below description covers different aspects of the situation in the country but does not try to define an average situation.

Similar to many developing countries, an accurate estimate of the number of disabled in Tanzania is unavailable. A survey conducted by the Basic Education Statistics in Tanzania (BEST) estimates that there were about 24,000 children with disabilities in 2007 (Mmari et al., 2008). This number is much lower than the 3.5 million estimated by NGOs, UNESCO, and even the Ministry of Labour (Rujwahura 2008; Batasa 2008). Tanzania does not have any specific policy that explicitly expresses the government’s standpoint for IE. Although the 1995 Education and Training Policy and the 2002 National Disability Policy (NDP) do state that inclusion in education as a goal and all children, including vulnerable groups, should have access to basic education, the overall policy fails to live up to the definition of IE used in the discourse of today and no guidelines are available to illustrate how IE should be implemented in the country (Mmari et al.,

2008). For example, the policy mentions neither Braille, sign language nor any other form of alternative communication in the discussion of language options in education (Zanzibar MoEVT, 2006).

Despite a lack of clear national policy for inclusive education, there is a unit for Inclusive Education within the Ministry of Education and Vocational Training (MoEVT) (Zanzibar MoEVT, 2007) which is responsible for implementing a pilot IE program in primary schools (Seya, 2008). The definition of “children with special needs” adopted by MoEVT is quite broad. The term includes “those with different kinds of disabilities, slow learners and those who are exceptionally gifted” (Zanzibar MoEVT, 2006: 18). The goal of MoEVT is to educate children with special needs alongside their peers at the local schools (Zanzibar MoEVT, 2006). The ministry has cooperated with NGOs such as ZAPDD, MKEZA and WHY to promote IE in mainstream schools. (Zanzibar MoEVT, 2007). Over 1,500 children with special needs have been registered in these projects (Zanzibar MoEVT, 2007). Together with NGOs, the unit also tries to involve communities in the IE implementation process (Zanzibar MoEVT, 2006). For example, forums on special needs education (SNE) with teachers, parents and community leaders were arranged by MKEZA (Aga Khan Foundation, 2007). Funding of special needs programs is available from the Tanzania government. Institutions, typically NGOs or local schools or municipalities, provide a budget of planned actions to Ministry of Community Development. The ministry would then consider incorporating the proposal in the governmental budget.

Currently children with disabilities in Tanzania receive education mainly through integration in mainstream classes. The term ‘integrated’ instead of included implies that while CWD attend ordinary classes, their special needs are not catered for. IE is rarely covered in the teacher training colleges so teachers typically do not have the skills to cope with education for the CWD outside of the mainstream curriculum (Mmari et al., 2008; Mboya et al., 2008). According to the MoEVT in Zanzibar there were only seven schools with classes adapted to children with disabilities in 2004, with a total of about 2,000 children with special needs. One of these schools, the Patandi Practising School, provides children with Braille materials and has rooms equipped for education of children with disabilities (Mboya et.al, 2008; Zanzibar MoEVT, 2006). Special Needs Education is mainly provided in urban areas of Zanzibar, and even there inclusive education is not practiced on a large scale or to a substantial degree (Zanzibar MoEVT, 2006). There are two schools in Zanzibar, the Patandi and Morogoro teacher colleges, that train teachers in special education (Zanzibar MoEVT, 2006). In cooperation with the Ministry of Education, three colleges also offer courses adjusted for the visually-impaired (Seya, 2008). On the mainland, the University of Dar es Salam offers a few IE elective modules in the teacher education (Mboya et al., 2008).

Regarding infrastructure, currently schools that are physically equipped for children with disabilities are scarcely available in Tanzania. Similar to Bangladesh, accessibility is an issue that has been addressed but with less than complete success. Building codes are not strict, “There is a new Construction Bill prepared but it is not decided. And it does not include accessibility anyway” (Rujwahura, 2008). Even so, implementing building codes is difficult because of a lack of coordination between ministries and, as claimed by government, because “contractors are conservative, they do like they always did” (Kulwa, 2008), meaning they are not too attendant to new specifications. Information and communication technologies (ICT) are used in some private schools but not in any government schools. The Tanzanian government does not have the capacity to analyze the needs or to develop technologies that are appropriate for CWD; however, there is an ICT for Basic Education Policy (Mmari et al, 2008) which specifies that MoEVT should ensure ATs are provided to CWD (MoEVT, 2007). However, basic technologies or aids pertinent to special needs education such as glasses, crutches, and Brailers are lacking (Mboya et.al, 2008). Access to special materials for education of CWD also appears to be insufficient (Zanzibar MoEVT, 2007). Not specifically aimed at IE, general efforts are being made to use the Internet for

alternative teaching and learning resources as a part of the Education Quality Improvement Program (EQUIP). However, in 2006 only 12 schools in Zanzibar had Internet access (Zanzibar MoEVT, 2006).

To facilitate inclusive education, alternative curriculums have been developed by the Tanzania Institute of Education (TIE) which is responsible for pre-school, primary, secondary and teacher education curricula. A special curriculum exists for the mentally impaired as well as training for "simple trade skills." In 2006, there were 13 centres with alternative learning serving about 500 learners with special needs (Zanzibar MoEVT, 2006).

Attempts have been made to change the general public's negative attitudes toward children with special needs through deeply-rooted religious institutions such as Youth with Disabilities Community Program in Tanga, Tanzania (Civil Society Support 2008, Youth with Disabilities Community Programme 2010). The awareness raising approach used in Zanzibar by the MKEZA program has reached over 4000 persons of different demographic characteristics (Aga Khan Foundation 2007).

In short, many IE issues are addressed in Tanzania on a small scale. However, national level coordination is missing and there are strong disagreements even as to the number of disabled people in the country.

IE-RELATED ISSUES IN DEVELOPING COUNTRIES

IE is a holistic view of education. We discuss it here in terms of three distinct but interdependent "levels". The first is obviously the *school level* that concerns pedagogic methods, classroom design and equipment, and the relations between schools and the surrounding community including parents and voluntary organizations as well as local government. The second is the *national level* where the agenda is set for many important ingredients of IE, such as curriculum, inclusion goals, and mechanisms for implementing policy. The third is what can be called the *network level*. IE requires support of both equipment and skills, and the resources required to cater for disabilities can be expensive and scarce. For example, some CWD require regular medical care which can only be provided by experts. Others require special teaching methods in which only a limited number of teachers have the expertise (e.g., fluency in sign language). Yet other cases require expensive equipment such as computers with specialized software or electric wheelchairs. Such equipment is sometimes so costly that it cannot be provided at each school "just in case." Therefore, the equipment is typically shared through pools even in developed countries. Sweden is an example where there is an elaborate system for sharing resources on a needs basis. Costs are shared among different authorities and parents depending on many factors related to both the character of the need and the different responsibility agreements among authorities (Olsson, 2008). The network level is clearly dependent on the national level as legal regulation promoting IE is an important driving force, but networks can also be locally or regionally constructed to extend the national legislation. For example, local governments may make agreements among themselves and/or with community organizations to share resources such as in Tanzania where there is an attempt to provide all children with school lunches in cooperation between local governments and the local communities (Kulwa, 2008). NGOs may build their own networks within or across local community borders.

School level

In Norway, two national surveys were compared to assess the impact of a national teacher training program focusing on inclusive education (Tangen, 2005). Results show that not only more teachers are trained and become more knowledgeable of learning difficulties, but also

teachers now pay more attention to the needs of CWD and collaborate with colleagues on that matter. However, the success of the training program is found to be hindered by rigid school culture and resistance from school administrators.

In developing countries, AT in most cases are not used at all in ordinary schools because of two important issues. First, education of children with disabilities (CWD) is contested in itself in developing countries. Hence the focus is mainly on identifying these children and making them go to school. The low CWD attendance rate is a huge problem in developing countries. For example in Tanzania it is estimated that only 1 % - or even less, numbers are uncertain and disputed – of the CWD go to school (Rujwahura, 2008; Batasa, 2008). Second, technologies in general are seldom used in the schools. This includes not just ICT ATs but also physical devices such as glasses.

The most commonly used AT are low-tech and low-cost solutions such as slate, stylus and paper for manual writing, white canes, wheelchairs and similar. Brailers that do not require electricity are available but expensive. More advanced AT (ICT-based) are used mainly in pilot schools. These schools are mainly located in urban areas where the capabilities required for AT usage – human as well as technical – are more likely to exist. Our search showed several examples of successful use of ICT-based AT in developing countries, such as the Kilimani Primary School in Kenya and the Mwereni School in Tanzania (Cullen, 2006).

Most developing countries face challenges in providing education in general and do not provide a comprehensive education for children with severe disabilities (World Education Forum, 2000). Children who are educated in private or pilot schools (inclusive or special) are either lucky enough to have been invited to participate in some donor program or have wealthy parents to be able to pay for such special education. Schools that involve CWD in mainstream education exist, but are very rare, in Bangladesh and Zanzibar. Currently, Tanzania mainland has none but some are being planned. In Bangladesh there is now a focus to train teachers to tend to students with not so severe disabilities (e.g. by letting visually-impaired students sit in front of the classroom). However, ATs are typically unavailable.

Projects including AT for education most often rely on external donors and rarely receive government funding. A commonly used approach is cooperation of several different NGOs, each with their specific areas of expertise. Another is that individual donors set up their own schools. There are also examples of co-sponsorship from technology manufacturers. For example, the Kilimani primary school in Kenya and the Mwereni School in Tanzania were provided with a specific assistive technology called Sightsavers Dolphin pen, which is a cooperative effort between Sightsavers International and Dolphin. The tool combines text-to-voice software with screen reader and screen magnifier (Kieti, 2008; Dolphin, 2009).

Both in Bangladesh and Tanzania there have been efforts to make schools physically more accessible to CWD. Access ramps and toilets are the two facilities most widely addressed. Progress on improving accessibility has been reported but there are still many obstacles. One of the problems, in both countries, is how to enforce the new standards set by the School Ministry when there is no forceful building regulation in the countries (building regulations are set by another ministry and by local governments).

Regarding the classroom and the learning situation, there is a need for teacher education to address inclusion properly. Teachers should be familiar with techniques and tools that facilitate learning by CWD. Such education, both for IE and AT, is limited in developing countries. In mainland Tanzania only one university offers courses on inclusive education and the courses are not compulsory for students who want to become teachers. In Bangladesh similar elective

courses on IE are available but, again, no regulation requires teachers to take them. Beyond general IE knowledge there is a need for teacher education on specific AT tools.

One constant problem that teachers have to handle is how to address detrimental social behaviour and attitudes. CWD are often hidden by their families and people's attitude towards disabled is often negative. With such negative perception in the communities, teachers need strong support from the curriculum, the legislation and some kind of professional network. All these supports are largely missing in most developing countries at the moment. For countries where legislation has come some way, enforcement of the legislation is yet another challenge.

Use of AT in inclusive education is not commonly seen as a realistic goal in developing countries due to lack of resources. Even low-tech devices such as crutches are expensive for the poor. However there are cases where also high-tech AT has been implemented successfully. One example is Godisa, an organization in Botswana, who manufactures hearing aids that use solar power so that batteries can be recharged without access to electricity (Godisa, 2009). There are also some cases where solar power has been applied to fully or partially power computer labs in schools in South Africa and Rwanda (eKhaya, 2009; Inveneo, 2007; Solar Electric Light Fund, 2009).

Apart from legislation, attitude and infrastructure issues, pedagogical change is another factor for successful use of AT for IE. Teachers need to aim for individualization in the classroom to achieve inclusion. That is, students must be allowed a flexible curriculum to meet their individual needs. For example, students should be able to work at a slower pace than the rest of the class, or focusing more on particular issues crucial to their development and less on other students. Students should also learn to apply constructive learning strategies for themselves instead of blindly repeating knowledge presented by teachers. Most ATs are useful only when they are embedded in a learner-centered pedagogical environment. This includes a flexible curriculum where the learning activities of the students are in focus rather than the teaching activities of the teacher.

Many AT are designed for learner-centred education, intended to make learning a challenging adventure rather than a repetitious task. On the positive side, this means AT can serve as a vehicle to introduce a more learner-centred pedagogical style in developing countries. On the other hand, it also means that implementing AT is not necessarily straight-forward in countries with different pedagogical cultures, for the very same reason. Therefore, introducing AT to developing countries must be accompanied by some degree of pedagogic reform.

Evidence in Sri Lanka shows that such pedagogical change to some extent happens "automatically" as the AT tools themselves entail such change (Andersson, 2008a; 2008b). Nonetheless, one should be careful not to be too optimistic about the pace of change or the odds of it happening at all. It is quite likely that AT supporting a learning paradigm other than the locally prevailing one will not be met with enthusiasm by teachers and even not be used at all if they appear to be too "alien." The Sri Lanka case is a positive example, but it also illustrates the need for special measures to be taken. For example, to address the issue of negative attitudes towards new ways of teaching and "alien" equipment, the African Braille Centre (ABC) not only provided the Kilimany Primary school in Kenya with Brailers but also trained a teacher to be a Braille expert who then became a resource for other schools. This effort helped ease the implementation of these new technologies in order to avoid a feeling of alienation.

National level

Because of the far-reaching impact of education and the requirement to provide education equally to all, national government must play a coordinating role. While many countries have signed the

UN Convention on the Rights of Persons with Disabilities, implementing the ideas of the convention is another matter. Successful implementation of IE is not just a matter of more resources. Our study has shown that many things can be done if governments would be more effective in establishing goals and measurements, and in enforcing policies. Enforcement of policies is a rather complicated matter because implementation of IE involves many ministries. This means that different kinds of legislation with different control mechanisms are involved. Coordination among ministries is hence one important national level issue. In Bangladesh this issue is addressed by assigning one person with the responsibility for coordinating disability issues (not just in education) at each ministry, in total 46 people (a number that in itself indicates the extent of the coordination task). However this is a new effort. At the time of our field visit, this coordination group had yet had only one preliminary meeting. No regulations and work procedures have been set up so the mandate of the group is yet unclear.

Numerous issues need to be coordinated. Generally, when it comes to disabilities both medical and educational expertise is needed to coordinate the health care system and the educational one so that the needs of CWD can be catered for. This means it is necessary to specify responsibilities and communication lines so that problems found in school can be communicated to the health care system. Another example is that because CWD require adjustments to school buildings, there is a need for the ministry in charge of building regulations to modify related legislation – both requirements and enforcements procedures – so that school buildings can be specified and built according to the requirements set by inclusion principles. CWD may also need transportation to get to school. This means involvement of another ministry, such as the transport ministry, is necessary as parents of CWD often have to rely on social welfare for financial support. School lunches are yet another example. In Tanzania the central government tries to persuade local governments to make arrangements with local communities so parents and local governments can share costs.

Developing a national IE plan requires a new general curriculum. The development of the curriculum must of course start at the Ministry of Education, but it also requires coordination with other ministries to have it successfully implemented. First, schools are often run by local governments, and /or by NGOs. Therefore, many parties need to get on board in developing a new curriculum. The new curriculum needs to be founded in inclusion principles, take into consideration international experiences and research on inclusion, and adapt to local providers' capacity. Because IE involves a change of attitudes in addition to investment of new resources, its implementation is a challenge to national leadership and coordination. Beyond local communities and NGOs there is a need for professional networks among teachers and resource centers. IE is not a fixed state of art but an approach to education which has to evolve with opportunities and experiences. This requires the assistance of vivid professional networks. Some NGOs run professional networks on a small scale (such as the Action on Disability and Development in Bangladesh), but national coordination is required to both draw on these providers and extend them to reach a national coverage.

Teacher training is a field where much development needs to be done. While some basic teacher training is generally available in developing countries, overall it needs to be expanded to cover IE-related issues, such as social and community based rehabilitation (CBR) issues, and assistive technologies-related issues. Apart from training of new teachers, training of existing teachers is touted as the most important issue in a short-term perspective by all stakeholders we met during our field studies (NGOs, teacher educators, government). Teacher training can be done in many ways. Formal training is one option. Currently, some NGOs provide such training on a small scale. For the training to be scaled up to cover whole countries it is necessary that universities and teacher training institutes also include such courses in their programs. Practical training as part of participation in CBR programs is also a feasible method that is provided on a small-scale by some NGOs currently.

In relation to teachers, Ghere and York-Barr (2007) examine the extent and impact of turnover of paraprofessionals, that is, experts who assist teachers to provide educational services to CWD, on schools and students in six schools. The interview results show that high turnover rate of paraprofessional hinders the implementation of inclusive education program and exerts strain on special education teachers. The primary reasons for the high turnover were low wages and poor benefits.

Network level

Beyond the coordination among ministries and teacher training at the national level, a successful implementation of IE requires the development of resource/knowledge centers and networks based on specialists and special schools. Identification of experts and development of knowledge hubs/networks has seldom been done in developing countries on a large scale. Bangladesh and Tanzania have plans to build resource centers but so far the projects are still under development.

There are many local and regional resource networks set up for different, typically limited, purposes. Examples include the Bangladeshi organization ADD (Action on Disability and Development) that organizes self-help groups for local capacity building in several districts. Another example is a school run by the Protibondhi Foundation in Dhaka, Bangladesh. The school is not only inclusive in itself (50% of the 360 students are CWD); it is also a hub in a comprehensive network involving medical care professionals as well as government schools, and the local community. The school cooperates with a specialist clinic at a local hospital where disabled children are identified at birth. The clinic keeps in touch with parents to teach them how to best care for their child during the pre-school age. At grade one, CWD are mixed with other children who are recruited among the poor in the district (another dimension of inclusion). Pedagogy is inclusive; children without special needs help the CWD and there are teachers with special expertise in, for example, hearing problems. The school has small classes and the class size is variable depending on tasks. Beyond the core subjects the school also engages the children in collective activities; music and dance serve both as a pedagogical tool and as a way to achieve social inclusion. When the children go to ordinary government schools after the fifth grade, the Protibondhi teachers continue to help them by giving support to teachers in the government schools and by continued monitoring of childrens' progress. There is also continued medical service and advice to parents.

The Protibondhi School is a good example of inclusive education. Required expertise is at hand when it is needed, peer assistance is provided both as a goal and a means, and support is organized in a systematic manner to provide care for the children from birth all through secondary school. Technologies used in the Protibondhi School are basic, such as audio tapes and various physical objects designed to aid certain activities. The successful example of Protibondhi illustrates the effectiveness of networking. However, as Bangladesh has about 150 million inhabitants, half of which are under 20 years old, there is much room for improvement. The challenge of the "network level" is to ensure all required expertise and resources are at hand when and where they are needed and are organized in a systematic manner to provide care for CWD.

CHALLENGES IN MANAGING NATIONAL IE

As shown in the previous sections, there are many stakeholders involved in IE. Coordination among them has to be organized and stakeholders have to be motivated to work together. Pedagogy-related issues cannot be delegated to schools or teachers only. They require a national coordinating curriculum, systems for sharing scarce resources such as medical

expertise, special school teachers and technical equipment, and evaluation measures and methods. In the Prothibondi example we saw a microcosm in which all this was present. In a national system, the task to make sure efforts are concerted best possible obviously becomes huge, but basically of the same nature. In this section we briefly describe five challenges that we have found to be the most important.

Challenge #1: Establishment and maintenance of networks

IE requires constant professional learning from teachers. Unconnected professionals – common in education, not least in rural areas – lose contact with new knowledge, good examples, practical advice and a supportive network of peers; all of which are necessary for improvement. Therefore, it is important for national government to set up national professional networks that maintain connection between government and other stakeholders and local social networks that connect family and community with dedicated professionals. Although some local networks exist in Bangladesh and Tanzania, they are often small and largely disconnected from one another. The challenge is how to make best use of existing networks, connecting them to one another so as to cover the whole country, developing new ones as necessary (for example around new technologies), and opening up for international contacts.

Challenge #2: Identification and maintenance of knowledge and expertise

Successful implementation of IE requires a central authority that carefully evaluates and charts the needs of CWD across the country as a whole. The focus of developing countries so far has been on identifying CWD and improving the physical infrastructure of schools. While such efforts are still far from being completed, there is a growing demand for the central authority to take a further step to enhance the quality in education in both skills and social perspectives. This amounts to setting up a knowledge infrastructure such as professional networks and knowledge centres on which specific actions can be based. A combination of local, regional and national resource centres and local, regional and national professional networks can provide the required knowledge of pedagogical methods and assistive technologies. To some extent these networks can be ICT-enabled. Although Internet access rate generally is low in developing countries especially in rural areas, it is still possible to access the Internet at least at some places. These access points can be used to keep local professional networks in touch with national and international ones. For local networks, there are SMS-based community tools, such as Frontline SMS (<http://www.frontlinesms.com/>) which only require a mobile telephone network. Connecting professionals is one of the keys to sustainability of IE initiatives.

A prerequisite to connecting professionals is to identify not only recognized national experts on various disabilities or technologies but also local experts who can serve as a local hub for knowledge and/or action. The major benefits of involving the local experts are that more resources can be enrolled than would have been the case if only those officially acknowledged as experts would have been included, and that local ownership and enthusiasm can be supported. Besides, some expertise may be quite limited to specific tasks, such as a particular software or pedagogical method pertinent to autistic children. Therefore, the use of both national and local expertise is important to keep IE initiatives rolling.

Challenge #3: Funding management

To make IE feasible and sustainable, it is also vital for a country to properly manage the funding process. Donors, including both countries and various NGOs have different long-term goals and short-term priorities, both economic and political. Ministries also have own agendas. Issues can easily get astray among all the agendas if not properly defined and discussed. Hence, one most important issue regarding funding concerns coordination of donors and mediation of political

disagreement. Structured discussions on IE between donors and ministries is necessary so that ministry officials can be given a clear overall picture of what an ideal situation would look like, what steps should be taken, and in which order. A contemporary trend is that national donors cooperate in a recipient country focusing on budget and policy support rather than specific projects. In this relatively new situation practices are still evolving and it is not clear how proactive donors should, and can, support specific issues, such as the IE implementation process. This is a major reason why we compiled a list of advice - "The IE/AT checklist" (excluded from this paper for reasons of space, available from the authors). Unless issues are well defined and clearly listed, they are not easily handled in a complex process of negotiations that often emerges from today's situation.

Challenge #4: Coordination among ministries

By definition, inclusive education falls within the domain and responsibility of the education ministry in any country, but they nevertheless require involvement of many other ministries. For example, specific expertise on disabilities required typically is found under the Ministry of Health which is in charge of treating people with severe disabilities. CBR programmes act locally and hence need to involve the Ministry for Local Government, school buildings require cooperation of the Ministry of Infrastructure, school buses may be handled by the Ministry of Transport, and so on. This means there is a coordination challenge which involves, first, making expertise and resources available and charged with proper mandate in various ministries, second, shared knowledge among them so that eventually programmes can be coordinated by concerted actions across all ministries.

Challenge #5: Implementation, maintenance, and monitoring of a national IE program

The final, or rather first as all the other points draw upon it, and the most important challenge any country has to face is to establish a national program for inclusive education. The program should describe goals, measurements, and milestones in details. In relation to the first two challenges described above, the program should include a competence infrastructure that focuses on the development and use of competence to sustain the IE program. The infrastructure should cover resource centres, teacher education, professional development, research, and community development. With so many stakeholders in the field that act based on specific funding opportunities, there is a risk of over-focusing on projects that address issues that can show quick results or can be easily measured. For example, it is not uncommon to focus on the number of computers in schools rather than on quality in education.

To be sustainable the program must also include an incentive structure that can motivate each group of stakeholders to participate on an ongoing basis. Many development projects come to a halt after the project funding period is over. A sustainable incentive structure must be implemented in everyday life and "standard operations" and not be too dependent on specific projects. The incentive structure should include all stakeholders, ranging from frontline people such as teachers and field workers to local government to donors and to politicians. Incentives include not just ongoing financing but also long-term professional development. A one-size-fits-all specification of such incentive programs does not exist because they are highly sensitive to local conditions.

To monitor the national program, there is a need to find a set of usable and reliable indicators of success. It is usually constructive to find quantitative measures for inclusion because that raises attention, but it is also important that these measures reflect the actual situation. For example, dropout rates may be better measures than enrolment numbers. Evidence in developing countries repeatedly shows that a high level of enrolment number often is associated with a high level of dropout; the latter of which is typically attributed to social and economic factors, practical

issues, or low quality in education. In Bangladesh, for example, enrolment at the first grade is quoted at about 98 %. Nonetheless, only 50-60 % of students are still in school when they reach the fifth grade (Nordström, 2008). It is important to use not only indicators displaying effects but also ones that actually indicate the underlying factors. Hence, in an IE perspective, “social factors” may be better measured by the number of local experts enrolled and/or community attitudes towards disabled rather than traditional socio-economic indicators. Similarly, “quality of education” measures such as improvement in communication skills should complement traditional focus on grades.

CONCLUSIONS

This paper set out to answer the research question of, How can AT be effectively used for IE in developing countries? The answer that most clearly emerged from our investigation is “by better coordination”, and we have briefly outlined what kinds of coordination are necessary. Clearly one may argue “more resources” to be a better answer, but we think it is not. Even though more resources would clearly be useful in general, with lack of coordination they may be wasted. Our study has found so many examples of lack of coordination that lead to negative consequences. We are confident in claiming that better coordination alone would go a long way, even though clearly better coordination in combination with more resources would be even better.

The paper has examined the challenges of achieving inclusive education from a developing country perspective. Based on two cases, a number of interviews, and a thorough review of related literature, the paper has provided a comprehensive view of IE to different stakeholders of the issue. We analyzed the situation with three perspectives, local (schools, local communities), national (government) and “network” (various arrangements involving several stakeholders), which all are necessary to implement an IE agenda nationally. However, the analysis does not attempt to measure the specific extent of problems or provide specific solutions to specific problems. While we found some evidence at all levels there are huge gaps to fill. Moreover, for the network level to become effective on a national scale, governments need to take a leading and coordinating role, and for donors to encourage and support them in that role.

At the government level coordination among ministries and between local and central government is most important as many IE-related issues include responsibilities divided among more than one ministry. For example, the School Ministry requires schools to be accessible but the passing and enforcement of relevant legislation is typically within the jurisdiction of other ministries.

At the network level we saw several good examples of local development, typically led by NGOs. But while often well informed and well conducted these efforts are small-scale and need government coordination and endorsement to be possible to scale them up to national systems. First, not surprisingly many NGO activities are only partial, compared to the entire IE agenda. For example they may deal with only some particular disability or issue, such as local community empowerment. Second, to be effective scarce resources such as skill and equipment need to be shared. Therefore, professional networks, resource centers, and clear distinction of responsibilities are necessary. There are currently many voids between the responsibilities of different government agencies, and the activities of NGOs can only to a small part fill them. This paper has provided one example of how a successful inclusive education school may be designed, the Prothibondi school in Bangladesh. This is an example where most of the items in the IE/AT checklist are tackled even if many resources are still lacking such as more advanced AT. In summary we identified five major challenges for national governments:

Challenge #1: Establishment and maintenance of networks

Challenge #2: Identification and maintenance of knowledge and expertise

Challenge #3: Funding management

Challenge #4: Coordination among ministries

Challenge #5: Implementation, maintenance, and monitoring of a national program

We want to emphasize, however, that addressing individual challenges is not enough for successful IE implementation. This is why we suggest a structured approach to using assistive technologies in the perspective of inclusive education, and provided a list of stakeholder responsibilities and tasks. Clearly access to technology is a major problem in itself. But because a relatively new approach to international aid is that donors are coordinating their efforts and giving support to sectors rather than to projects, it is important to go beyond the policy making stage to implementation, and to adopt a structured approach. This paper contributes to that end in particular by providing some empirical insights, emphasizing the focus on the “network level”, and the IE/AT checklist as one practical tool. Future research can examine how other developing countries might benefit from our proposed systematic approach in their process of using of AT for inclusive education.

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APPENDIX 1: IE-Related Organizations

In this appendix all IE-related organizations that have been contacted are listed. We list all here as a service, even though not all are directly referenced in the paper. There are many obsolete lists of organizations on the web pointing to organizations that no longer exist. This list contains organizations that existed and had activities as at November 2008. Also the last table presents some international organizations that are active in inclusive education.

Appendix 1A: IE-Related Organizations in Bangladesh

1. Action on disability and development (ADD)
2. ActionAid Bangladesh
3. Assistance for Blind Children (ABC)
4. Bangladesh Blind Mission (BBM)
5. Bangladesh Council for Child Welfare (BCCW)
6. Bangladesh Dristihin Foundation (BDF)
7. Bangladesh Jatio Andho Kalyan Samity
8. Bangladesh National Federation of the Deaf
9. Bangladesh National Society for the Blind (BNSB)
10. Bangladesh Organization for Disabled Advancement (BODA)
11. Bangladesh Protibandhi Foundation (BPF)
12. Bangladesh Protibondhi Kallyan Somity (BPKS)
13. Blind Education and Rehabilitation Development Organization (BERDO)
14. BRAC
15. Centre For Differently Abled
16. Centre for Disability in Development (CDD)
17. [Centre for Services and Information on Disability \(CSID\)](#)
18. Centre for the Rehabilitation of the Parlayesed (CRP)
19. HICARE
20. INTERLIFE - BANGLADESH (ILB)
21. Ministry of Social Welfare
22. National Federation of the Blind
23. [National Forum of Organizations Working with the Disabled \(NFOWD\)](#)
24. Noakhali Rural Development Society
25. Pally Badhue Kallan Sangstha (PBKS)
26. Society for Assistance to Hearing Impaired Children (SAHIC)
27. SOCIETY FOR RESEARCH DISABILITY AND DEVELOPMENT
28. Society for the Welfare of the Intellectually Disabled (SWID)
29. Underprivileged Children's Educational Program (UCEP)
30. VILLAGE DISABILITY AND DEVELOPMENT CENTRE
31. Village Education Resource Center (VERC)
32. Vocational Training Centre for the Blind (VTCB)

Appendix 1B: IE-Related Organizations in Tanzania

1. Action on Disability and Development ADD Tanzania
2. CCBRT
3. Chama Cha Wasioona - Tanzania League of the Blind
4. Child Development Trust Fund
5. Children in Crisis Africa
6. Community Development for All
7. Free Pentecostal Church of Tanzania
8. Friends of the deaf in Tanzania
9. HakiElimu
10. Improving the quality of learning in Zanzibar (Mradi Wa Kuendeleza Elimu Zanzibar, MKEZA)
11. Information Centre on Disabilities (ICD)
12. INFORMATION CENTRE ON DISABILITY(ICD)
13. Morogoro Early Childhood Development
14. TANZANIA ASSOCIATION FOR THE MENTALLY HANDICAPPED (TAMH)
15. Tanzania Association of Disabled (CHAWATA)
16. Tanzania Association of Mentally Handicapped (TAMH)
17. Tanzania Association of the Deaf/Chama cha Viziwi Tanzania (CHAVITA)
18. Tanzania Deaf Society
19. Tanzania Education Network
20. Tanzania Education Network/Mtandao wa Elimu Tanzania (TEN/MET)
21. Tanzania Episcopal Conference
22. Tanzania Federation of Disabled People Organizations (SHIVYAWATA)
23. Tanzania Society for the Blind (TSB)
24. The League of the Blind
25. World Home for Youth Italy
26. World Vision in Tanzania
27. Youth with Disabilities Community Programme
28. Zanzibar National Association of the Blind
29. ZAPDD (Zanzibar Association for People with Developmental Disabilities)

Appendix 1C: International IE Organizations

1. Blind Children International
2. Close the Gap
3. Computer aid
4. International service
5. Sight Savers International

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