



NEW DIRECTIONS
IN AFRICAN EDUCATION:
CHALLENGES AND POSSIBILITIES

Edited by S. Nombuso Dlamini

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INFORMATION TECHNOLOGY AND THE CURRICULUM PROCESS: STUDENT PARTICIPATION AND THE CHANGED ROLE OF THE TEACHER

Selina L. P. Mushi

ABSTRACT

This chapter discusses students' free and unlimited access to an ever-expanding information base in North America in comparison to limited student access and use of IT in Tanzania. The author demonstrates that in North America, where IT is highly advanced, a major challenge is to make IT accessible to all segments of the population, thus reducing what has been termed the digital divide. The author analyzes the organizational, cultural, and educational values of the Tanzanian society, and shows that emerging IT needs have to be contextualized. She argues that the need for and development of IT expertise must target skills useful for solving practical problems in society, and at the same time, be mindful of practical applications globally. In presenting

new directions for IT development in Tanzania, the author argues that teachers in both industrialized and developing countries need to engage in professional development workshops to hone their skills to empower students in the use of IT for meaningful and independent problem-solving within the curriculum. She also warns that these problem-solving skills must function effectively in the context of the current global society. Then she outlines new directions for Tanzania and other developing countries for determining contextual needs of IT in order for these countries to become active participants in both the production and consumption of IT globally.

INTRODUCTION

Information Technology (IT) has made tremendous amounts of information accessible through computer networks within the industrialized world. The quantities of information available through IT networks continue to increase and the information being accessed by students has changed the traditional ways of school learning while casting important questions on the curriculum process. The traditional perception of students as mere recipients of pre-planned curricula has changed over time to the perception that students are active participants in their own learning. Advancements in IT have made students even more active, self-motivated learners who are explorers of the Internet in search of information of their liking. Students of all ages browse the Internet, websites, CDs – some of which come free of charge, and use e-mail to communicate worldwide. Access to information exposes students to different ideas and notions, which are related both to the curriculum and to everyday life. It is now obvious that IT will continue to influence major decisions made in the school system and in society in general.

More than a decade ago, Cummins and Sayers (1995) predicted that: “In the world of the twenty-first century, decision-making and problem-solving in virtually all spheres – business, science, community development, government, politics – will depend on electronic networks that span diverse national and cultural boundaries” (p. 12). Today, teenagers and college students in North America are

experiencing “life online” (Rainie, 2005) as they easily access and use IT in e-mailing, downloading music files, remixing and sharing music, etc. Discussing the special world of teens and college students and implications for learning contexts, Rainie points out that these students “see the Internet as a virtual textbook and reference library, virtual tutor and study short cut, virtual study group, virtual guidance counsellor, virtual locker, backpack and notebook and a trusted, smart friend” (slide 12).

The fast pace of IT advancements seems to speed up the life of knowledge. While knowledge was measured in decades and probably even in centuries due to the slow pace of its transmission, this is no longer the case in the twenty-first century. According to Gonzalez (2004), the amount of knowledge in the world has doubled in the past ten years, and the life of knowledge is shrinking more and more, meaning that knowledge is being created and simultaneously fading faster than ever before. This evolution in the use of IT calls for new skills at the workplace, and in turn the school system ought to feel the pressure to incorporate IT skills into the curriculum.

Although schools, teachers, and curriculum planners have generally embraced IT as a formal part of learning, it seems the education sector has been slower than other sectors in incorporating IT in the organized curriculum. For example, reviewing Michigan State’s Five Year Technology Plan, Fitzpatrick (1994) saw education as the last major labour-intensive industry to begin to use technology in its day-to-day business. Expressing concern for the State of Michigan, Fitzpatrick pointed out that out of the state’s 524 K–12 school districts only six had a direct connection to the Internet, and of the fifty-seven Intermediate School Districts none had direct Internet connectivity. Eleven years later, White (2005) notes that while information technologies have greatly transformed the practice of business, manufacturing, administration, finance, and the provision of other services, IT has yet to impact on the delivery of education and training in a similar way. Peha (2005) concurs with White’s conclusion and points out that schools have been slow to adopt technology as part of conducting everyday business.

Given the speed of growth of IT, it is close to impossible to determine what changes will be in place five years from now. At the moment, students in Canadian and American schools, like students in other industrialized countries who have easy access to the Internet at

home and at school, are becoming increasingly conversant with various information storage and retrieval systems without formal school curricula having to include those skills. This unlimited exposure to IT interacts with students' experiences in the curriculum process, yet the consequences of this interaction on students' learning and their ability to evaluate and critique what they learn are not well known to teachers and curriculum planners. Classroom teachers, who function as links between the planned curriculum and its actual implementation and evaluation, are challenged by this situation where students' exposure to, and use of, IT may exceed that of their teachers.

While top-down curriculum planning predetermines the goals of schooling in general, bottom-up curriculum processes provide opportunities to examine IT classroom needs at local levels, so that students can get more challenging learning activities at school. In many developing countries, including Tanzania, the top-down approach to curriculum planning is the norm, thus making it challenging to determine IT needs at local levels. As a result of the high accessibility to IT by students, in industrialized nations, studies need to focus more on how IT is affecting student learning. In developing countries, such as Tanzania, the major task involves introducing bottom-up approaches to the curriculum process so that teachers can determine contextual needs for IT at local levels to supplement the dominant top-down curriculum process. What follows is a discussion of the digital divide found within a given country as well as between different countries. As well, there is discussion of the IT lessons that developing countries can learn from the industrialized world. A more important discussion centres on the need to contextualize IT needs for Tanzania while ensuring that Tanzanians are both active consumers and producers of IT.

DIGITAL DIVIDE WITHIN NORTH AMERICA

The education industry versus the business sector

Effective teaching is not “delivering education”; rather, it involves providing students with opportunities to create, own, develop, and

use knowledge to solve problems in their school learning activities as well as in their daily lives. Students have to be given opportunities to connect learned IT skills to problem-solving in real life contexts. Siemens (2004) suggests *connectivism* as a learning theory for the digital age. There are no pre-packaged solutions that can be delivered intact to students or teachers and work for all students in all situations. While there is a big push to make the education industry adopt technology quickly and in similar ways as the business sector, effort needs to be spent on why and how the education industry is different from other sectors where the goods processed are not human beings. Furthermore, the education sector needs to be considered in its own right rather than in comparison to other sectors where uniformity among goods is assumed. Teachers need to develop appropriate and conducive opportunities for students to seek out new ways of creating contextual knowledge, skills, and dispositions that will enable students to learn effectively as individuals while collaborating with other members of society in the effort to improve the quality of human life. Effective learning and use of IT skills within the curriculum cannot be mass-implemented since teachers' knowledge of individual students' learning patterns and utilization of IT skills is necessary. Due to the nature of the education sector, therefore, teachers need to be effectively involved in making decisions about teaching and learning processes that can make IT a positive experience for students. In the United States, the effects of the digital divide in the curriculum include discrepancies between the education sector and business sectors, student accessibility to computers, and assessing the learning of IT skills, among others.

Student accessibility to computers

Children in their teen years and younger constitute the generation that has grown up with computers in their households in most parts of North America. This generation is embracing IT as a normal part of life. However, there seems to be a considerable discrepancy between IT skills offered and utilized in school curricula and IT skills that children already have when they begin school. There is need for the organized curriculum to realistically assess and include students' already acquired IT skills in their learning, in order to close the gap between what students learn at home and what they learn in classrooms.

Secondly, computers are not evenly distributed in North American schools. In the United States, while most students in some communities own MP3 players and engage in constant instant messaging and downloading from the Internet (Tetlegah & Hunter, 2006), and while students from higher family income levels have early access to computers and show significantly higher levels of full-spectrum technology use (Ching et al., 2005), other students from lower income families lag behind (Kalyanpur & Kimani, 2005; Ching et al., 2005). School boards and districts strive to provide appropriate IT access to all educators and students. However, it is evident that a significant digital divide still exists in the United States. Poor communities in urban areas are often poorly equipped when it comes to digital media (DiBello, 2005).

Since schools are organized into school districts, parents' choices of schools where they can send their children are limited, as they are determined by the school district to which they belong. If the families cannot afford home computers, then the children will be lagging behind because their schools will most likely not have enough computers either, since the socio-economic status of an area tends to predetermine the economic situation of the school. In other words, children of poor families go to poorly equipped schools, which then limit students' chances of accessing and developing IT skills, thus threatening the efforts to narrow the digital divide within the same country that is technologically advanced. Other factors such as age, gender, disability, and culture also determine the extent to which students in the United States access and utilize computer technology (Ching et al., 2005; Kalyanpur & Kimani, 2005).

Assessing the learning of IT skills

In the United States and Canada, assessment and evaluation of learning outcomes are typically done in a bottom-up fashion where internal evaluation may carry more weight than external evaluation. In standardized testing, however, schools are evaluated according to pre-established goals and strict standards. It is unlikely that children in poor neighbourhoods will achieve the pre-determined IT standards if their homes and schools have few or no computers. To evaluate students more effectively, student and family input is necessary so that the entire context of living and learning is evaluated, rather than just the products of school learning.

Where the curriculum includes IT skills as standards to be achieved by students after a prescribed program, anecdotal information indicates that, on the one hand, some students come to the IT programs already proficient in most of those skills, while, on the other hand, other students cannot even achieve the expected skills by the end of the program, due to lack of, or limited access to, computers outside school. Research has indicated that some families cannot afford to buy home computers, leading to their children only getting exposure to IT at school. This has led to what some researchers refer to as the “digital divide” (Graham, 2002; Campbell, 2001; Looker & Thiessen, 2003). The effect of this “divide” will be long-lasting in individual learners, families, and communities if the problem is not addressed seriously and in a timely manner.

THE DIGITAL DIVIDE BETWEEN INDUSTRIALIZED AND DEVELOPING COUNTRIES

In developing countries, the situation is very different from that of industrialized countries in that mere communication through electronic mail, for instance, is still a new phenomenon in many schools today. E-mail use, which is widely accepted because of its time-saving nature, is only common in cities. People can use it to arrange meetings, or even discuss important issues, therefore cutting down meeting times. However, only a few people have easy access to e-mail such as, in the case of Tanzania, professors in universities and other high-ranking professionals in government offices.

In Tanzania, computer literacy is rare in primary schools and teacher preparation colleges. In fact, traditionally, if a college or university student was not being prepared to work as a secretary, there was no perceived need for that student to acquire typing skills and, more recently, computer literacy, including word-processing. In Tanzanian academic communities, it is still generally perceived that mental work or thinking skills are superior to the how-to knowledge of using tools like calculators or computers to simply ease the operational tasks. A scholar is seen as someone whose role is to engage in mostly mental work; that is, reason and think in order to create new

knowledge relevant for problem-solving in his or her area of specialty. Those people who are charged with less thinking responsibilities can then utilize the knowledge created by the “thinker,” using any tools available to them, including computer technology. In the recent years, however, these “thinkers” have begun to develop computer interest and are acquiring computer skills such as word processing and use of statistical packages and graphics. Time will tell what impact the growing reliance on technological skills will have on these traditionally powerful academic minds.

The introduction of general technology tools such as calculators and computers has left parents concerned about the education their children receive in schools. For instance, in some cases, parents have shown concern for their children doing mathematical operations using calculators, rather than processing the arithmetic mentally in order to understand the reasoning behind the mathematical operation. Teachers and parents believe that students have to understand the reasoning first, before they strive to make the task easy to carry out. Once the thinking and rationale are in place, then the student can use shortcuts like the calculator or the computer to get the answer. Moreover, in lower levels of schooling, availability as well as the utility of specific IT skills determines the emphasis put on learning those skills. The utility of IT is one major factor that will determine the needs for learning IT skills in Tanzania. At the post-secondary level, such as at the University of Dar es Salaam, students have access to fully equipped computer labs, and they select the tools they need to do their academic work. Most students teach themselves how to use e-mail because of its utility, i.e., efficient communication. Worth noting is that most of these computers were obtained from industrialized countries such as Sweden, Norway, the Netherlands, and the United States; therefore, sustainability of IT access is an issue worth immediate attention.

As a result of the limited number of computers, it is quite possible for a Tanzanian student to go through primary school, secondary school, and university education without learning IT skills such as word processing and e-mail, which are taken for granted in industrialized countries. When students from Tanzania come to study in North American universities, they face the centrality of IT and its challenges in both their intended disciplines and as a necessary means for enhancing their learning in order to successfully complete

their programs of study. Interestingly, Tanzanian students as well as other students from developing countries quickly catch up with the computer skills needed to successfully complete their programs of study, since they immediately realize there is high utility in learning those skills.

When I began my doctoral program in 1990, I sat in front of a computer for the first time in my life. I had gone through the system of education in Tanzania, had successfully completed a master's degree, and I had been teaching at the University of Dar es Salaam for three years. At the University of Toronto, I had to cope with the technology environments just like other students who had had opportunities to use computers from childhood. My program of study involved participation in online credit courses, thus the need to successfully pass those courses resulted in high energy and motivation to acquire the necessary IT skills.

For international students, financial sponsorship is intertwined with academic success; the consequence of failing a course is scholarship withdrawal. The challenges that international students face are much more intense than those faced by native students, who often have alternative financial resources. Furthermore, the need to catch up with the technological world is overwhelming for international students because of the pressure to succeed due to the sacrifices made by family in the country of origin to create an opportunity to study abroad. Therefore, it would be useful for the hosting universities to put resources in place that will help students arriving from developing countries around the world. Such resources will help the students to acquire at least proficient word-processing skills before they start their academic programs.

Recent curricular changes have been planned to introduce, at the primary and secondary levels, a new subject, TEAHAMA (short for "Teknolojia ya Habari na Mawasiliano;" which translates to "Information and Communication Technology" (Ministry of Education, 2005, p. vi). This new subject will help Tanzanian students learn computer skills for their everyday activities, as well as provide them with opportunities to use technology in advanced educational programs. This is a positive move that deserves effective implementation and evaluative follow-up.

SOME LESSONS FROM INDUSTRIALIZED COUNTRIES

The growth and spread of IT in industrialized nations provide some useful lessons for developing nations. Countries like Tanzania can draw important lessons at their early stages of embracing and using IT at different levels of the school system. The lessons include: how unlimited access to information relates to the curriculum process, the way some philosophical issues in teacher preparation are modified by the use of IT, the changed role of the teacher, the funding and management of IT programs in schools, and changes in ways of assessing students' performance.

Information access and school learning

The search for knowledge and new information has always been an integral part of school learning. The classroom teacher as the traditional primary source of knowledge was always looked up to for the provision of pre-sorted, well-organized information that was directly related to the school curriculum. Oftentimes, the information was related directly to portions of the curriculum on which evaluation of performance in the form of examination questions was likely to focus. Oftentimes teachers face the challenge of choosing between teaching for the standardized examination on which the quality of teaching and students' learning are judged and teaching to help students learn how to function in everyday life and professional situations. It is difficult to make a reasonable and completely acceptable choice between these two functions since one would facilitate the students' immediate survival (to the next stage of schooling) and the other would increase the students' chances of being productive members of society.

It takes careful screening and selection of information to sharpen the focus on the prescribed curricula geared towards achieving good grades. There is a gap between learning in school and learning how to interpret one's reality in order for an individual to function in self-relevant ways and at the same time contribute to society's well-being. School learning is often based on experiences of past generations of students, teachers, researchers, writers, and curriculum planners; therefore, it becomes a challenge for students to fulfill this interest and to focus on the *here and now* – *and the probable*. Until school learning becomes relevant and informs students how to adjust to,

evaluate, and critique society, it will not be of immediate interest to students; thus, it will always lag behind IT in capturing students' interests. Teachers will have to continue to motivate students to learn in school, and one way to do so is to selectively incorporate IT into day-to-day problem-solving classroom practices, which in turn requires teachers' high competence in IT.

Philosophical issues in teacher preparation

When information technology started booming in the 1980s, teacher education in industrialized countries had been in place for about a century. In traditional teacher education, the school curriculum goals and objectives and the means for achieving them were predetermined and rigidly defined. Needless to say, it was difficult to dynamically reflect and take advantage of IT within the design of teacher preparation programs, due to the uniqueness of the industry. Providing more bottom-up opportunities for needs assessment and implementation of the curriculum goals and objectives has prompted changes in the way teacher education is evolving in Canada and the United States. There is no universal set of standards that teacher preparation programs can impress on new teachers to make them teach effectively at all times and in all places. However, Tanzania and other non-industrialized countries can learn from this factor and begin to open up for more bottom-up opportunities for teacher candidates and their educators to determine their IT needs locally and link them to the national curriculum. Importing technology from industrialized countries without modification will be a big mistake, since there is no package that can work out of context.

As discussed by Willis and Mehlinger (1996), within teacher education, computer-mediated learning has erroneously been perceived as a behavioural approach to teaching and learning. The behavioural approach to teaching and learning tends to condition the learner by use of reinforcements, both positive and negative, for specific behaviours. Positive reinforcements are rewards that encourage the learner to engage in certain behaviours, while negative reinforcements distinguish behaviours that are not preferred by the teacher, instructor, or program. The behavioural approach is problematic in that it overlooks the learner's intrinsic motivation to learn, namely, internal drive to learn and personal standards that the learner might want to achieve, in favour of often standardized teacher or institutional goals

for learning. Utilization of present-day IT should look beyond these behavioural models, which resulted from the wave of programmed learning in the 1960s and 1970s (Willis & Mehlinger, 1996). Several computerized instruction packages have been developed that assume that teaching is a systematic process of solving problems. Schon (1991) referred to this as the “technical rationality” model. Developing IT needs locally will be more time-consuming but more effective in the long run. Contextually appropriate IT skills have to not only encourage higher-order critical thinking, but also call for, help develop, and support analytical skills to define and solve problems as part of the learning process.

Funding and management of IT

In the past decade, Information Technology was fraught with management problems such as deciding who is to maintain and update information in a timely manner and who will create standards (Langenberg, 1991). While this problem may no longer exist in North America, the problem of screening the information accessible to young children is a growing one. It is now an undisputable fact that there are unwanted types of exposures and information easily available to students at a young age. In some cases, for example, youngsters have learned on the Internet how to commit crime. It will be irresponsible for teachers, parents, and curriculum decision-makers to assume all information accessible on the Internet by young learners is constructive.

Funding has been identified as one of the most important problems facing the use of IT in teacher education (Willis & Mehlinger, 1996). Teacher education was (and still is in many cases) typically the least funded of professional programs in higher education in the United States. The old assumption was that teacher education did not require specialized laboratories, computers, and modern equipment available to other professional training programs. Willis and Mehlinger (1996) noted that some public schools were better equipped than the colleges in which their teachers had been trained. It is interesting to see that teacher education, irrespective of the nation’s level of industrialization, has been lagging behind in terms of funding, and whenever it is necessary to cut funding, teacher education becomes the first victim. This tendency to cut funding in teacher education is also common in Tanzania and probably in other African countries as well. There

is a Kiswahili proverb that explains this tendency. The proverb goes: “*ivushayo mbovu*,” meaning, after using the means to cross over to safety, that same means is deemed useless (or broken). Government officials and funding agencies need to keep in mind that each and every bureaucrat in a funding decision-making position must have been given at least some of the foundation for success by the school system which is nurtured by teacher education.

There are two major reasons to reasonably increase funding to teacher education programs. The first is to facilitate high quality teacher education programs with up-to-date access to computer and other IT equipment, so as to adequately prepare IT-competent teacher candidates who are capable of providing students the IT knowledge they need in order to have meaningful life opportunities. The second reason is that schools are now faced with a challenge to graduate students who have IT skills to use in everyday life. At the beginning of the twenty-first century, more and more individuals find IT skills a necessary tool for survival in, for example, running their own businesses. Concerns of funding are always a feature in discussions of improving education at all levels in Tanzania. However, it is now evident that the Government of Tanzania and the Ministry of Education need to step up and fund programs that aim to prepare the young population for life-sustaining IT skills. More and more primary, secondary, and university graduates in Tanzania are likely to engage in small businesses since the government sector can no longer absorb most graduates into the already saturated work force. It is important to study the core causes of differential funding, and the resulting consequences and possible appropriate approaches narrowing the technological gaps at the different levels need to be explored.

Validity of assessments

The purpose of conducting assessments is to use the resulting data to make informed decisions about learning needs, credentialing, and funding. Information collected for the purpose of determining how well learning outcomes have been achieved presupposes successful teaching. The teaching involves opportunities to interact with ideas, notions, materials, equipment, and guidance in order to achieve the intended learning outcomes. If certain groups of learners have not had these opportunities for learning, then, obviously, the learning outcomes have certainly not been achieved. Testing such groups of

learners for the sake of comparing performance to that of other learners who have had rich learning opportunities is actually an ineffective way to test the effects of teaching since it fails to uncover the deprived students' learning contexts and is therefore invalid.

Secondly, there is a need to distinguish between assessment of students' competence in using IT skills and assessment of students' competence in the core content learned with or without IT. Ignoring this important distinction will render assessment data invalid for decision-making. Such considerations are important for developing countries as they introduce IT into the curriculum and, at the same time, aim to minimize the digital divide.

The changed role of the teacher

The teacher's role has changed and will continue to change as technologies advance and as the younger generation of students joins the profession. The fact that students are already accessing information based on their own interest has necessarily changed the role of the teacher, and teachers are likely to find themselves in tricky situations if they stick to the old curriculum that does not match students' ways of learning within context. Students can access information from their homes (sometimes under parents' supervision), in libraries, in cyber-cafes in search of enjoyable information that often does not relate to the homework they are expected to do in a timely fashion. This suggests that teachers must provide structures for processing the information that interest students and relate it to classroom content in interesting ways, which will result in effective learning. There is a need for the teacher to develop and constantly adjust structures for understanding the information accessed by students in ways that lead to coherent learning.

To guide students to learn, teachers themselves need to be informed about IT. North American teachers attend workshops and training in the use of different types of software, which helps hone their IT skills and develop the confidence they need to guide learners. Teaching and learning therefore go hand in hand and this is more so now due to IT advances. It is very unrealistic for teachers to assume they can continue teaching students who are much more technologically advanced than themselves, without engaging in IT in-service training.

Teachers who have, for the most part, been implementers of school curriculum will now assume the role of curriculum designers – a curriculum that addresses the needs of their local communities and students. This is not the same as narrowing down a topic or teaching according to the level of difficulty, as teachers have always done. It is a process of continually blending learning experiences with technological advances, while at the same time focusing on the important aspects of the school curriculum and on students' IT skills.

Core curriculum documents used by teachers are prepared by curriculum planners who need feedback from schools in order to revise the curriculum from time to time. The feedback will no longer be the teachers' personal comments on the process of implementing the curriculum; rather, it will be the teachers' suggestions for modifications based on the actual classroom process, in response to students' individual learning and relationships with technology. The teacher will need to continually moderate the curriculum to satisfy students' learning desires, and to incorporate changes curriculum planners see as necessary nation-wide. In these instances, the teacher becomes an important curriculum moderator, not just an implementer.

Teachers have always evaluated students' learning processes. However, what needs to be evaluated is changing. Instead of trying to judge who remembers more of last week's lesson, it might be more useful to ask what has been learned, how useful has it been, what other facts have been found, and what knowledge needs to be updated. In order for students to participate in such discussions, they have first to evaluate their own perceptions and understandings of previous learning experiences. The teacher will have to encourage learners to search, share, and evaluate information related to class content. Factual information will have to be continuously updated as students present their findings. The teacher's role as an evaluator of classroom learning thus will involve overseeing students' discussions and exchange of ideas, and the synthesis of these ideas, as well as the evaluation of their own learning processes. The teacher, in this sense, becomes a meta-evaluator.

TANZANIA: ORGANIZATION, CULTURES, AND THE EDUCATION SYSTEM

African societies have demonstrated different ways of life, compared to western societies. First, the typical African family is not defined by two parents and their offspring; rather, it is defined by a larger network of relationships and mutual understanding that is constantly being negotiated. In Tanzania a “family” can include up to three or four generations in the same homestead, different religious beliefs (especially through intermarriages), and also individuals from other bloodlines who have been accepted into the “family.” Every member of the network has a role to play, and that role gives the individual a place and usefulness in the network, which creates unique relationships that are difficult to globalize. The ways in which IT is evolving in African countries, and in Tanzania in particular, are different from the ways it evolved in industrialized countries. Individuals see IT as a way to help them connect more strongly with their family members and society, on the one hand, and as a tool for connecting with the outside world academically, professionally, or in businesses, on the other.

Some African societies are highly organized from the grassroots to the national level. Tanzania offers an example of a highly organized society, where it is literally feasible for each individual to be well known starting at the family level throughout the hierarchy to the national level. This structure is a modification of traditional societal organization typical of pre-colonial times. The communication technology then ranged from mouth-to-ear to drumbeats or other kinds of sound-making devices, depending on the distance being covered by the communication. These information technologies kept societies connected and informed as was necessary for survival. Beginning in the 1960s, the Tanzanian rural society, which is about 64 per cent of the entire population of 36 million (United Nations Population Fund, 2003), has been organized according to a “Ten Cell” leadership, the village level, the communities, the district, regional, zonal, and national levels.

Every ten families make up a ten-cell unit of leadership with a leader known as a *balози* (ambassador). The *balози* is responsible for keeping order, resolving conflicts, communicating necessary information, and providing advice and general leadership within

the unit. In this sense, any unwanted act in this unit is easily identified and acted upon accordingly. The dominant level of information technology used here is person-to-person, made possible by physical proximity. Radio and telephone are common outside media – not used to communicate from person to person within the ten-cell unit. Television sets are only additional and considerably rare tools used for *bringing in* information. There is no ten-cell-based radio broadcasting. Computer technology falls in this category of one-way, incoming information. This situation calls for developed IT skills to reciprocate communication.

Several of the ten-cell units make a village that operates under a village chairman, the *Mwenyekiti wa kijiji*, who keeps close contact with the ten-cell leaders. Information technology at this level includes mouth-to-ear (one-on-one, village meetings, leadership meetings, etc.), radio for news from higher levels in the organizational hierarchy, and sometimes telephones. At this level some villagers may have relatives who live in cities or in foreign countries and have learned how to communicate by e-mail with their family members who, in very limited cases, may also have a computer at home (in the village) and know how to retrieve and send e-mail. However, such communication from outside the village, and especially from a foreign country, is usually not about the village; it is about the outside world, outside culture, and outside values, which are, understandably, of secondary importance to the villagers.

Several villages make a *kata*, while several *kata* make a *tarafa*. At these levels of the organizational hierarchy, schools, health centres, security services, adult education programs, etc., are managed. Current information technologies at these levels include telephones, radio, e-mail (in rare cases), and television. It is common to see on national television that a certain *tarafa* has the highest harvest of corn, rice, wheat, or any other food or cash crop grown in that area. Information *originating* from the *kata* and *tarafa* is valuable in the sense that it is *owned by the people* of those places and also *shared with other Tanzanians* and beyond. The people are therefore not mere consumers of information, but also originators and communicators. It is important to note that information coming from a *kata* or *tarafa* will actually be from a specific village and maybe even a specific family. The organizational unit at this level needs to keep abreast of the functioning of schools within the area and maintain continued communication with all teachers. Some important decisions are made

at this level regarding the running of schools; therefore, computer technology needs to be available both at the organizational unit and in the schools.

The districts and regions are much higher levels in the organizational hierarchy. Several districts report to one region. These levels include cities, schools, colleges, businesses (local and international), hospitals, police forces, etc. Districts are considerably self-managing in some areas, while in other areas they report to the region. Information technologies at these levels are mainly telephones, e-mail, some access to websites, internal computer networks, the Internet (typically a receiving-only utility), national television (a receiving and sending utility) external television (a receiving-only utility). There is relative anonymity of individuals living in large cities like Dar es Salaam, Morogoro, Dodoma, Arusha, Moshi, Mwanza, Mbeya, etc. This “weaker” internal connection between individuals makes it more likely to connect to the outside world through modern IT, where they become *consumers* of IT, mainly from the western world. To strengthen use of IT skills at these levels, the focus needs to be on schools and colleges. Due to city culture and the relative anonymity, Internet cafes are likely to be currently available where students and the general population learn some e-mail and word-processing skills. Individual cities and schools will have different needs, depending on what is already available.

There are seven zones in the hierarchy of the Tanzanian system of education. Each zone has several regions. Zones report to the national level, mainly in terms of educational decision-making involving secondary schools and colleges of teacher preparation. Since highly qualified professionals work at this level (secondary school teachers, high school teachers, college professors, doctors in referral hospitals, etc.), the need for, and likely use of, highly developed IT is unquestionable. Zones are also key units for teacher training in Tanzania. Currently, computer technology is available to differing extents, and equipment and training are provided by different organizations from some industrialized countries like Sweden, Norway, and Germany. There is need to train more educators in schools and colleges in order to strengthen IT skills for teachers and students. Training can be done locally and from external sources, where available and appropriate.

The national level is the highest organizational structure in Tanzanian society. Most sectors are highly centralized – education,

agriculture, policing, etc., and bottom-up reporting is required. The need for advanced IT at this level is evident. Universities have advanced equipment for internal and external communication through computer networks. Universities are considered national and international institutions; therefore, the IT within these institutions is comparatively highly developed to the extent that even students have access to fully equipped and up-to-date computer labs.

These six organizational levels provide important contexts for analyzing the need, utility, and growth of IT in Tanzania. The Tanzanian society is very purpose-oriented from the individual level up to the national level. The utility of IT, as seen by the individual and also as seen in relation to that individual's level of functioning in the organizational hierarchy, will drive the need and priority for IT access and use.

NEW DIRECTIONS FOR TANZANIA

As pointed out by Mushi (1996), the classroom teacher will most likely remain central in educating students, despite developments in IT. Teaching is influenced by many factors, some of which are the classroom, the type of students (some more knowledgeable and some less knowledgeable than the teacher), and the location of the classrooms and the nature of facilities within and outside classrooms. Among all these factors, the teacher is the classroom authority who can work to make students appreciate learning. To bring about effective learning and use of IT skills, teachers must engage in IT-based professional development workshops to make learning interesting and meaningful for students.

There are certainly significant positive developments in the availability and use of computer technology, such as academicians being more computer literate and efficient users, and administrators using computer skills in their daily work activities (word-processing, e-mail communication, etc.). Another major trend taking shape now is the use of e-mail communication among the younger generations, even in the non-academic endeavours. E-mail users are motivated by the high utility value of sending and receiving information efficiently.

The name of the Ministry of Education and Culture has also changed to “The Ministry of Education and Vocational Training” to signal more emphasis on vocational and technical education than in past years. The Ministry of Education and Vocational Training needs to work closely with institutions of higher learning in the country (colleges and universities) and information technology experts in order to embark on a strong footing in making modern computer technology an integral part of learning at all levels. One hindrance that has repeatedly occurred is the donation of old computers and outdated technology by foreign countries to Tanzania. Old computers and outdated technology only drag back Tanzania’s efforts to build a modern, computer-literate society. In some cases the government pays a lot of money to ship the old computers and the accompanying “expert” to install them, instead of using the money to buy up-to-date computers (no matter how few) and use local experts to install them. The Government of Tanzania needs to make sure this practice of dumping old computers and outdated technology into the country while using up the little money available for technology improvement does not continue.

In order for Tanzania to embark on contextually meaningful ways of making IT a tool for effective school learning and practical problem-solving in society, the Ministry of Education and Vocational Training has to initiate discussions at different levels of the school system about the IT needs to be incorporated into the curriculum. There is need for a clear policy commitment on the part of the Tanzanian government to promote and develop research on IT needs, starting with the infrastructure and reliable supply of electricity. A clear policy of self-reliance and better allocation of available resources will help Tanzanians begin to realize IT goals that are planned realistically, instead of relying on foreign aid and donations that are not necessarily matched to the most burning internal IT needs. The following questions are suggestions about the issues that should be considered in these discussions, which will help Tanzanians focus IT contextually:

1. What level of IT is currently in use, where, and for what purpose?
2. How is the IT in use making life better for the people using it?

3. What are the strengths and weaknesses of the current level of IT being used in schools, colleges, and universities? How can these be addressed from within, and what supplemental help can be obtained from other countries?
4. In what creative ways can IT be used to advance self-identities, communities, and the entire Tanzanian society?
5. What mechanisms can be put in place for schools to make IT part of their daily functioning and problem-solving?
6. How can Tanzanian youth be guided and nurtured to be producers of IT rather than mere consumers?

Given the challenges of funding, Tanzania needs to start on the right footing by encouraging zonal, regional, district, and lower organizational units to develop short-term and long-term plans for acquiring computer equipment on their own and motivate the development of IT specialists and leaders by providing additional computers as well as training. Minimizing the digital divide right from the beginning is extremely important because if not addressed the problem can quickly accelerate to unmanageable discrepancies. All levels of the organizational hierarchy need to work to come up with the most important IT needs and ways to obtain computer equipment and get trainers. It will be a challenge for the Tanzanian government to provide computers and training professionals to all schools in all organizational units; therefore, self-reliance is an invaluable way to motivate people to start defining and solving their own problem and only ask for help when they have established a base.

The Tanzanian education system puts a lot of emphasis on learning of content, with or without IT skills. While IT skills make learning of content easier, they may not and should not take the place of specific content areas such as mathematics, language skills, physics, chemistry, biology, history, geography, etc. If the content area of focus is Information Technology, then IT skills should dominate the evaluation procedures. However, if another content area is being assessed, care should be taken not to confuse myths with facts regarding the role of IT in school learning.

The following table lists some myths and facts that can be used in making decisions about managing IT in Tanzanian schools:

	MYTH	FACT
1.	Anything to do with IT is useful learning.	IT is only a tool to facilitate useful learning – one must first know what he/she wants to learn.
2.	Ability to browse through the Internet is in itself high-level learning.	Ability to browse the Internet is one way to look for information, which may or may not be useful for intended high-level learning.
3.	A primary school child who can use the computer to do math or science projects is gifted.	A primary school child who can use the computer to do math or science projects may or may not be gifted – the child has only learned to click in the right places.
4.	A word-processed essay has superior content to that of a hand-written essay.	A word-processed essay is easier to read – it may have lower, equal, or superior content to that of a handwritten essay.
5.	E-mail makes communication easy.	E-mail makes communication easy among computer-literate parties.
6.	Students in schools that have enough up-to-date computers experience more effective learning of intended content than students in schools without any computers.	Students in schools that have enough up-to-date computers <i>may</i> experience more effective learning <i>of computer technology</i> – depending on their motivation and probably intended content – than students in schools without any computers.
7.	Computers are the highest priority in today's schools because they make students smarter by providing easy access to information.	Computers may be the highest priority in today's schools that consider information surfing and use of software as "smartness."
8.	Teachers have to learn IT fast to catch up so that they can be ahead of their students and teach IT to their students.	IT grows and changes so fast that any teacher focusing on being ahead of her students will have to spend her lifetime doing just that, with little success. Teachers have to provide carefully developed structures to guide their students in using IT, where appropriate, as a tool for effective learning.
9.	African students are lagging behind in learning school content because they do not have any computers in their schools.	African students are lagging behind in surfing the Internet for easy access to information, so they are forced to think of other creative ways of problem-solving in learning school content.
10.	African schools need computers as a matter of emergency so that the schools can begin to reduce any disadvantageous division of learners because of their access to digital IT.	African schools need computers in addition to the high quality content teachers as a matter of emergency so that teachers can use those computers as tools, where appropriate, to provide contextually relevant education for problem-solving and advancement of self-identity at personal and societal levels.

The Tanzania Institute of Education (TIE), the Ministry of Education and Vocational Training, the National Examinations Council, and the Faculty of Education of the University of Dar es Salaam need to work together to find effective ways to: (i) monitor validity of assessments in light of the IT era versus learning of content; (ii) motivate Tanzanian software engineers to develop varieties of relevant software for Tanzanian students to self-assess in content mastery and in competition for higher levels of education; and (iii) sustain interest and motivation for Tanzanian software engineers working in foreign countries to participate in enhancing IT learning and utilization in Tanzanian schools and communities.

Information technology is a tool for learning, problem-solving, and making life better at individual and societal levels. It is extremely important to ensure that use of IT in Tanzania serves the needs of the Tanzanian people, as perceived and evaluated by the Tanzanian people. The organizational hierarchy of the Tanzanian society has held the fibre of the different cultures together so successfully for so many years because of the interconnectedness of families and cultural groups. The hierarchy facilitates transparency throughout the education system, empowers individuals with a sense of belonging and a sense of purpose, and also provides mechanisms for academic, professional, political, and societal upward mobility, depending on one's effort. Motivation for schooling and for working hard (in small businesses) to advance one's academic and economic/professional life is intense.

To make IT relevant to the day-to-day lives of villagers, the village organizational unit has to embrace IT as an additional tool to better understand and define their problems and develop local solutions. The *Mwenyekiti wa kijiji* has to have access to a computer and have the skills to retrieve and act on relevant information. As a leader, he or she will need to communicate with other village leaders and his or her own people for informed joint decision-making on matters concerning their village. Schools are important units within villages. Some decisions about the functioning of schools are made at village levels, as long as they do not contradict higher levels in the organizational hierarchy. Accessibility to IT must involve both the schools and the village leadership. Tanzanian schools and communities must use IT as a means to strengthen this organizational hierarchy. Among other questions, schools, villages and communities need to ask: "who

are the possible individuals, private sectors, companies or non-profit organizations that can work with our schools and community to help in conducting IT needs assessment, guidance, and, where possible, financial support?" One way to motivate the organizational units to work towards wiring schools and obtaining computer equipment is to hold annual competitions. If villages, Kata, Tarafa districts, regions, and zones compete in starting, sustaining, and advancing use of IT skills, major milestones can be achieved. Even though 38 per cent of the Tanzanian population lives below the Basic Needs Poverty Line (National Bureau of Statistics, 2002), the Tanzanian government, starting with the school system, needs to set the direction for realizing the technological advancements necessary for the twenty-first century, albeit gradually.

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