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ICT and Teacher Education in East Africa

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Introduction

Let us begin by quoting from a poem by Khalil Gibran:

'Then said a teacher, "Speak to us of Teaching."

And he said:

No man can reveal to you aught but that which already lies half asleep in the dawning of your knowledge.

The teacher who walks in the shadow of the temple, among his followers, gives not of his wisdom, but ... rather leads you to the threshold of your own mind.

The astronomer may speak to you of his understanding of space, but he cannot give you his understanding.

The musician may sing to you of the rhythm which is in all space, but he cannot give you the ear which arrests the rhythm nor the voice that echoes it.

And he who is versed in the science of numbers can tell of the regions of weight and measure, but he cannot conduct you thither.

For the vision of one man lends not its wings to another man.

And even as each one of you stands alone in God's Knowledge, so must each one of you be alone in his knowledge of God and his understanding of the earth.

(Khalil Gibran 1923)

Gibran's viewpoint of teaching seems to be extremely modern even though when he first expressed this viewpoint in 1923, learning was teacher-centred whereas the upbeat and current view is that learning should be pupil or student-centred.

According to Shulman (1987), the knowledge base for teaching can be characterized as consisting of content knowledge, general pedagogical knowledge, curriculum, pedagogical content knowledge, knowledge of learners, knowledge of educational contexts and knowledge of educational ends, purposes and values as well as their philosophical and historical grounds. For purposes of effective teaching, the point should be made that there is a need for an amalgam of content knowledge and general pedagogical knowledge to form or be transformed into pedagogical content knowledge. For instance, if one has to teach a subject such as algebra, according to Shulman (1987:114), one needs not only 'to understand the subject matter but also how students typically grapple with such abstract content'.

Grimmett and Mackinnon (1992) reason further that pedagogical content knowledge as expostulated by Shulman is epistemologically different from the other six categories which he advanced. Even though the six categories are considered important by these authors, they express the view that teachers' pedagogical content knowledge is a product of considered response to experience in the work place. Even though such knowledge is related to knowledge that can be taught in the lecture hall, it is nevertheless usually formed over time in the minds of teachers through reflection. It is thus individualistic and more analogous to 'a craft conception of teaching than to one of teaching an applied science'. Simkins (1981) noted, for instance, that even though resources can be combined in a variety of different ways of achieving similar outcomes, the technology of education, with certain exceptions, is remarkably stable and is essentially a labour-intensive handicraft technology centred on the single teacher teaching a class of pupils or students. Proponents of open and distance learning will certainly disagree but it is, nevertheless, tenable. Houston (1990), Raynolds (1989), Wilson, Shulman and Richert (1987) have all tried to show that 'knowledge base' is a term usually associated with applied science. Wilson, Shulman and Richert (1987) state that:

> ... it refers to the set of rules, definitions and strategies needed by a computer to perform as an expert would in a given task environment. That set of rules is usually rather specific to a particular domain or task …. In teaching, the knowledge base is the body of understanding, knowledge, skills and dispositions that a teacher needs to perform effectively in a given teaching situation.

Teachers' pedagogical content knowledge is thus a product of teachers' responses to experience in the workplace. Even though certain aspects can be taught in a lecture room (for as Gibran has noted, 'the vision of one man lends not its wings to another man'), individual experience is nevertheless unique in some ways. This is perhaps not surprising, given the fact that individual reaction to situations is a function of personality, experience, context and even unknown quantities about

human beings. Even though systematization is often the goal in the workplace, mechanistic regularization is not a desirable characteristic as individual reaction to situations is unpredictable and would be terribly boring if variance can be totally eliminated.

Traditional View of the Teacher

In many countries, teaching as a profession is a product of the last 100 years. Even though there were masters with their followers from the Grecian times, the idea of formal schools was an aftermath occurrence in most developing countries. There were 'universities' even before formal primary or secondary schools became the norm. If one took the Scottish example as a model for the modern era, the system of parish schools came into operation from about 1396 A.D (Adam Smith 1776, various editions) and had been in universal operation for 80 years in 1776 when he wrote his famous book, *The Wealth of Nations*. Adam Smith perhaps made the first major contribution to the field now known as *Economics of Education*. According to him, schools can be cheaply and efficiently run and the expense is '… no doubt, beneficial to the whole society, and may therefore, without injustice, be defrayed by the general contribution of the whole society'.

Nevertheless, in 1776 when Adam Smith wrote, teachers' salaries were low, so much so that he was concerned with the quality of teaching. According to him, poor quality teaching would mean that the money of the parents and what was even of greater importance – the time and not infrequently the talents of the children – could be lost or badly affected from the inexperience and ignorance of their teachers.

Teachers could be of poor quality because the remunerations paid, particularly in developing countries in Africa, are inadequate and compare unfavourably with what others with similar qualifications and experience are paid. Furthermore, inadequately qualified and even untrained teachers are often employed to cut costs, thus negating the high ideals envisaged by Adam Smith and others like him who believe that only the best is good for children if they are to develop their potentials optimally. Even qualified teachers may be incapacitated by practices in urban centres where classes are unusually large such that effective teaching is practically impossible. A class of 120 or more students is not unusual in some public secondary schools in urban centres.

Suffice it to say that teachers in such cases are no more than keepers of the disadvantaged in society. Such a situation may come accompanied with lack of learning materials such as textbooks and, in some cases, classrooms that are totally unsuitable for teaching and learning. This scenario may further be worsened by the poor public image of teachers. Often, society looks down on teachers because they compare unfavourably with other professionals. Landlords have been known to refuse teachers accommodation for fear that they would be unable to meet

their financial obligations as and when due. A male banker would readily find a well-educated marriage partner whereas a male teacher would have to set his sight much lower. These examples may sound exaggerated, but they are real. Furthermore, teaching as a profession seems to have been disadvantaged for a long time because, in many developing countries, it constitutes the single largest workforce and entry has always been open to just any comer. For instance, according to Natukunda (2009), contract teachers can ease shortage of teachers in Africa; yet in the same vein, she admits that there is a large number of trained teachers in Uganda. However, a USAID research on educational quality improvement programme found that only 20 per cent of trained teachers in Uganda take up teaching jobs annually. This scenario is by no means peculiar to Uganda. This writer is aware that many Nigeria Certificate of Education holders and B.A/B.Sc Ed. and B.Ed. certificate holders remain unemployed in Nigeria, yet feverish efforts were made between 1998 and 2001 to train GCE/0L holders equivalent in a crash programme for UPE schools in some parts of Nigeria, undoubtedly because of cost. Why would experts recommend the employment of unqualified contract teachers when many countries in Africa, including Nigeria, have failed to fund education adequately at all levels and have fallen short of the minimum of 26 per cent of the annual budget recommended by UNESCO, which must have based its recommendation on expert advice. Teaching, for a long time, was also dominated by females who were and, in many cases, are still perceived as the most suitable for teaching since they need time to raise their children.

Furthermore, females are naturally better suited to look after children in their formative years. This may explain why more female teachers are found at the lower levels of education while the males dominate at the higher levels. For a long time also, teachers have been usually docile and teachers' unions were not militant, partly because there was a preponderance of female teachers. In addition, it was generally believed that teachers' rewards were in heaven. Times have changed and even females are not even fooled. How is one sure in any event, that as it is on earth, it is not in heaven! After all, poverty is not synonymous with holiness.

In our own times, teachers are generally better educated and more militant, but the issue of comparatively low salaries persists in developing African countries and will continue to be so as long as the population remains youthful with a high dependency ratio. In many countries, south of the Sahara, about 47 per cent of the population is 14 years or younger and the population growth rate is higher than 3 per cent which means that the school population will continue to burgeon. Maseruka (2009) reports that 75 per cent of Ugandans are below 25 years, which explains the high population growth rate, the high dependency ratio and the high fertility rate of 6.9 children per woman. The picture painted here is not peculiar to Uganda. Similar scenarios are observable in other countries in Africa, particularly south of the Sahara. Even, countries with lower growth rate but larger population

base will continue to increase rapidly as long as the population remains youthful. Thus, the population of the East African Community will continue to increase rapidly and the demand for school places and teachers will continue to rise.

Teaching as Craft Knowledge: Teaching and Technologies in Teaching

Ryan and Cooper (1996) observe that the use of technology in the classroom is gaining increased attention as an issue in education. As society continues to embrace new forms of communication, networking and computer technologies, schools will scramble to keep up, at least in the more developed countries. But as these authors also note, the use of technology is not new to the classroom. According to them, in the early 1800s, a technological innovation was introduced to classrooms which eventually had a profound impact on teaching. Advocates termed it 'invaluable' and it was installed in classrooms throughout the United States of America but many teachers had to be encouraged to use it and the newly-formed 'normal schools' even had to introduce courses on its use before teachers integrated it into their lessons. This technological wonder was the 'chalkboard' or 'blackboard' as it was called in many African countries for several decades of the last century. The chalkboard, however, became indispensable when the classroom structure began to evolve from a room orientation to the graded classroom as tit is known today.

The twentieth century brought a variety of technological devices that helped teachers use pictures in the classroom. For instance, after 1980, the filmstrip projector, overhead projector and the motion picture all provided new ways for teachers to integrate visual images into their lessons (Ryan and Cooper 1996). Such changes were considered so significant that Thomas Edison is reported to have stated that, 'books will soon be obsolete in schools as scholars would soon be instructed through the eye'. He envisioned that it would be possible to teach every branch of human knowledge with the motion picture. He foresaw a situation in which schools would be completely changed within ten years. It is now about one hundred years since Edison spoke, but books are even more ubiquitous than ever.

There have been other innovations in the classroom. For instance, educational television was introduced in 1950 as a possible method of handling teacher shortages caused by the baby boom after the Second World War. Since it was possible to bring instruction into classrooms and homes from even the most remote distances, proponents were very excited, but funding could not be sustained, even in the United States of America, and educational television has had relatively small impact. Nevertheless, television and radio have had considerable impact on distance education in many countries, notably the United Kingdom, U.S.A., India and particularly China.

Ryan and Cooper (1996) submit that, in the 1980s, another wave of innovation occurred when microcomputers became affordable. Many software products were introduced to drill students on basic skills and some visionaries even predicted the end of classroom instruction, teacher redundancy and the teaching profession as we know it. But the classroom and school are more than just venues for drilling students in skills and the teaching profession is still very much alive. Technologies will always be available to help teachers with instruction, but not to take over their role.

Over the years, many grandiose claims have been made about the use of technology to revolutionize the instructional process. But the eventual acceptance of the new technology – from the chalkboard to the microcomputer – has been determined more by the needs and demands of the classroom than by the claims of the technology advocates (Ryan and Cooper 1996).One must not lose sight of the teacher as a very essential element in any effort to enhance learning through the use of technology. The teacher's understanding and profficiency with the technology are a very crucial factor in the successful application and integration of any technology. No effort should be spared towards ensuring the adequate education of the teacher in the introduction of innovation and change. Inadequately educated teachers and unqualified contract teachers are certainly not the right kind of candidates for the learning centres of the future if developing countries in Africa are to become meaningful partners in the information age in which others are already operating effectively.

ICT Initiatives in East Africa

There is a great deal of awareness in the East African Community about the use of ICT. Various applications are visible in both the public and private sectors of the economy. Uganda, Kenya and Tanzania have National ICT policies (Centre for Educational Technology 2007). The study cited here is a collection of status reports on ICT in higher education in eight African countries including Egypt, Ghana, Kenya, Mozambique, Nigeria, South Africa, Tanzania and Uganda. The status reports show that Kenya, Uganda and Tanzania had 7.9 per cent; 1.0 per cent and 2.6 per cent internet penetration respectively as at December 2000. Even though there was significant growth in penetration between 2000 and 2007 (1285.2%; 234.2%; 1775.0% respectively), the penetration in each case is still generally low. There have also been various initiatives such as Schoolnet and Connect Ed in these countries but the use of ICT in teaching and learning is still a matter for the future. The potential is high, the awareness is high but there are various challenges to be overcome. One of those challenges is the cost of internet connectivity. In October 2009, the World Bank announced that it was to invest $215 million to build a broadband internet infrastructure in 11 countries – Chad, Democratic Republic of Congo, Equatoria Guinea, Gabon, Niger, Nigeria, Sao

Tome, Principe, Sudan, Cameroun and Central African Republic so as to boost internet connectivity in Africa (Central African Backbone Programme). According to the World Bank, these countries currently offer the worst quality and most expensive internet services on the continent.

The cost of internet service in Uganda is said to be 150 per cent higher than the cost of the same service in the United States of America. In spite of the high cost, the National ICT Policy of Uganda noted that 'most institutions of higher learning, both private and public, offer varying levels of ICT skills training, most as part of their programmes for formal academic qualifications'. Even though the Uganda Ministry of Education and Sports has approved a curriculum for ICT training for secondary schools and some schools are offering ICT training, there is no definite plan to train teachers, whether at the degree or sub-degree level, in the use of ICT and its integration into the teaching-learning process. In fact, the usual practice is to import a computer specialist to teach students while serving teachers remain illiterate as far as ICT is concerned. Trainee teachers at the degree level now have to take a course – Introduction to computers – a very elementary course. What is true of Uganda is, of course, applicable to Kenya and Tanzania.

The implication of the foregoing is that, even though there is awareness of the need to equip teachers with ICT skills and bring the skills to bear on the teaching-learning process, help would be needed from various sources before teacher trainees and serving teachers are equipped with the know-how to integrate ICTs into the teaching-learning process in schools in this sub-region.

Use of ICTs in Retooling Teachers in the Asian Pacific Region

If teacher trainees and serving teachers are to be equipped with ICT skills in this sub-region, one would need to look at what has been accomplished in other places. It is obvious that the task ahead of developing African countries is so enormous that it would need to be tackled in stages. The first major challenge is inadequacy of communications infrastructure. Recently, the first phase of the ICT backbone project in Uganda was completed (Tebajjukira 2009). This is part of an East African project involving several countries.

It is believed that the availability of this infrastructure will bring down the cost of Internet services in East Africa when completed. The next stage will be the provision of other infrastructural services and equipment to universities, schools, teacher training institutions and the training of serving teachers as well as teacher trainees. For instance, Microsoft sponsored the 'Microsoft Partners in Learning Programme' in five ASEAN countries in order to empower teachers with ICT skills. The programme was to train teachers to utilize information and communication technologies (ICTs) in five member countries of the Association of South-East Asian Nations (ASEAN) – Indonesia, Malaysia, the Philippines,

Thailand and Vietnam. What must be recognized as crucial in this programme – Partners in Learning (PIL) – is that the initiative involves corporate and community partnerships in enhancing ICT in education (UNESCO 2007). The five countries concerned launched the programme between late 2003 and mid-2005.

Basic and advanced skills training were given in the different countries. Provision was also made for on-line sharing of lesson plans and teaching materials among teachers and school leaders. School leaders were included as a significant component of effective integration of ICT in education. Modules were included on 'Leadership in the 21st Century' for school leaders. Expert volunteers from institutions in neighbouring countries offered their services free of charge to assist in initial and advanced training for teachers to acquire skills in ICT use.

These five case studies which focused on 'teaching and professional development of teachers' and other facilitators for effective use of ICT in improving teaching and learning were undertaken between 2003 and 2007 by UNESCO with support from Japanese Funds-in-Trust (JFIT). But the case studies were not isolated events, as various programmes had been implemented in the Asian-Pacific region that had focused on the capacity of teachers to use ICT effectively in teaching or that had sought to utilize ICT tools to improve teacher education, or both. Many of such programmes were said to be 'innovative in that they have pioneered this type of training in their country or they had introduced new techniques and training procedures' (UNESCO 2007).

In the African context, there is a great deal to learn from the initiatives in the Asian-Pacific Region. For instance, the publication which documented examples of 'ICT in Teacher Education' shows that the initiatives in the region may not always have been successful and are not necessarily examples of best practice. An examination of such programme initiatives will offer insights into the process of educating teachers to integrate ICT into teaching, the process of utilizing ICT in teaching and the process of initializing ICT tools for training teachers. Furthermore, these programmes provide information about the issues that are often faced in ICT-enhanced teacher education and lessons learned from past experience. Such insights are crucial so that efforts will be focused where they are needed, not on re-inventing the hoe.

It was reported recently also on the National Information Technology Development Agency (NITDA) website that Microsoft opened a partner university initiative in Nigeria on 1 February, 2008 and on 28 July, 2009, Microsoft/Federal Government of Nigeria agreed to partner in order to empower Nigerian teachers. Even though the National Policies on IT in Nigeria and the National Policy on ICT in Uganda, Kenya and Tanzania mention education, none of them actually mention empowerment of teachers. The usual practice is to focus on ICT curriculum for schools but teachers who should be the pivot are nowhere mentioned. So, this clear reference to empowerment of teachers is very welcome.

The Way Forward

The reality on the ground in East Africa, and of course in many African countries, is that there is awareness that ICT could improve the teaching-learning process. But there are many other hurdles to cross before concrete steps can be taken to actualize what is desirable. From studies conducted recently (UNESCO 2007):

> ... it is evident that information and communication technologies (ICT) can help to broaden access to education and improve learning outcomes, Research has also shown, however, that success in the use of ICT in education depends largely on teachers and their level of skill in integrating ICT into the teaching process and in utilizing ICT to provide learner-centred interactive education. Therefore, training teachers to be able to use ICT and to integrate ICT into teaching is crucial for achieving improved educational outcomes with ICT.

Once a technology enters the classroom, the uses to which it is put are affected by what has been described as the technology's level of maturity. As Ryan and Cooper (1996) have observed, in education as in other fields, new technologies tend to go through three stages of application. In the first stage, the technology is applied to things teachers already do. For instance, when microcomputers were first introduced into schools, computer programmes were created to stimulate flash cards for mathematics drill. In the second stage, the microcomputer was used to improve on other tasks done by teachers. For instance, a more sophisticated mathematics software application can provide remedial instruction when a student makes the same mistake more than once. More topics could also be covered using the same procedure. At the third stage of maturity, the technology is used to do things that were not possible before. This is the stage at which teachers, having internationalized the technology, can now use it innovatively rather than just using it to do old things in a new way as in the first stage.

Such applications as word processors, databases, spreadsheets, tele-communication tools, tutorials, simulations, multimedia software, drills and practice programmes can enhance students' cognitive skills. Writing with word processors in language education, learning to read, enhanced problem solving, learning science, interdisciplinary approaches to learning, distance education and special education applications are unlimited. Furthermore, teachers can be relieved from many routine tasks and can focus on higher order evaluation of performance. The leader can properly take on the role of leader and co-learner; from the role of dispenser of information to facilitator of students' learning. Record keeping and administrative tasks are easier to handle and information retrieval makes service delivery very pleasant and satisfying.

Conclusion

Efforts have been made in this chapter to show that teachers will remain relevant and cannot be displaced by technology. Even when new technologies are introduced, the effectiveness of their use will depend on the knowledge and skill of individual teachers to integrate them into the teaching-learning process. The ability of the teacher to domesticate the pedagogical content knowledge is a function of the individual's intelligence, skill acquired through training, personality and experience over time in an environment, and cannot be treated as mechanical. Resistance to the use of new technology is real but it can be overcome if all stakeholders – school leaders and teachers – are jointly socialized and acculturized.

Finally, the greatest challenge in the use of ICT in East Africa is going to be sustainable funding – from provision of infrastructure, computers and software to training of users which must be continuous and renewable, as one has to keep on running to stay in the same place.

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