

Chapter 6

Summary of the findings of the study, conclusions and recommendations

6.1 Introduction

This chapter presents a summary of findings and conclusions drawn from the study. It proposes recommendations for action and areas for further study, to improve upon utilization of ICT in education in the WorLD schools and other ICT in education projects in South Africa, in particular, and Africa, in general. The findings and conclusions are generalized to the WorLD study population of learners and educators.

The purpose of this study was to investigate the utilization of ICT in WorLD programme schools in South Africa and to provide strategies aimed at achieving or improving utilization to achieve school ICT educational outcomes and impact (Figure 6.1). The following research questions guided the study:

- How successful was the training provided to teachers and students in WorLD schools (in terms of enabling them to utilize computers for collaborative school projects)?
- What is the literacy level of WorLD school pupils in terms of reading, accessing and using information in the English language?
- To what extent are South African computer teachers able to handle school computer projects, attend to computer systems and attend to their normal school lessons?
- How far does the existing pedagogy in WorLD schools support computer-based teaching?
- What information resources (computer laboratories, Internet, libraries, multimedia centres) exist in the schools and do the schools have media teachers?
- How far can multimedia fill the gap in utilizing ICT in South African WorLD schools?
- What other factors contribute to the success or failure of the WorLD programme in South Africa?

6.2 Summary of findings

This section presents a summary of findings established by this study from the previous five chapters, with respect to the purpose, objectives and the main research questions that guided the study. Insight from the literature is also presented.

6.2.1 From the literature it has been established that:

1. Information and communication technology (ICT) was not only an educational tool but also a driving mechanism for socioeconomic development in a globalizing knowledge economy.
2. ICTs can contribute to improving the quality and delivery of education
3. ICT utilization in education and school networking is not new to schools in South Africa. Nevertheless, a large majority of schools previously excluded have no access to these modern educational tools.
4. ICT in education is new to education administrators, educators and learners in previously excluded schools, especially in the rural areas of South Africa.
5. An organization called SchoolNet South Africa is in place to integrate national ICTs policy in the education system of South Africa.
6. The World Links for development (WorLD) programme is an attempt by the World Bank to provide ICT education for the future generation of developing countries, including South Africa, to enable them to sustain their economies.
7. It is imperative that evaluation studies such as this are conducted to provide information that will guide stakeholders to move to extend access to more schools and improve upon utilization.

After a detailed and an elaborate investigation of the World Links for development programme in South Africa, this study established the following:

6.2.2 Training of educators and learners

1. Educators in the WorLD schools in South Africa have been adequately trained in

computer application programmes and collaborative school projects, but not in database systems and programming.

2. Educators were satisfied with the time allocated to the training and each teacher had a computer to practise skills acquired during training.
3. The study found that technical training of educators was unsatisfactory and no teacher was trained in programming and the UNIX operating system.
4. Lack of training in the UNIX operating system is considered a handicap for the project, because the E-mail system was based on the UNIX operating system.
5. Lack of technical training for educators cast a shadow on the success of the programme, because WorLD computers were predominantly refurbished and required constant maintenance.
6. Lack of technical training prevented the programme from proceeding to the levels of integrating ICTs into the teaching and learning process and schools would have to outsource the technical functions of ICT to private service providers, which have high cost implications for schools in impoverished environments.
7. Many teachers in WorLD schools in South Africa are doing their best to equip themselves, on their own, with IT knowledge and skills. Teachers' enthusiasm and zeal in embarking on private IT tuition bodes well for the WorLD project, in particular, and for ICT utilization in education in South Africa as a whole.
8. Training of learners was found to be unsatisfactory. More than a third of WorLD learners had not been trained at all and close to half of those trained were not trained well enough. Learners spent less time during training than teachers did.
9. No training had been provided to learners in database systems, programming and information skills.
10. Training of learners was unsatisfactory because teachers did not have enough time outside their normal duties to deliver the training, as they had to attend to their normal teaching duties.
11. WorLD learners in South Africa had not acquired sufficient skill and confidence in using ICT during the project pilot phase, as only a limited number had access to a computer to practise after training sessions.

6.2.3 ICT pedagogy in WorLD schools

1. Apart from the project team and research-based teaching methods, WorLD educators in South Africa are not familiar with or trained in, nor do they use, teaching methods that support the utilization of ICT in education.
2. Educators have not been trained in the majority of the required pedagogical methods for the implementation of the WorLD project itself.
3. The existing pedagogy in WorLD schools during the pilot phase (1997-2000) did not support computer-based teaching, for the following reasons:
 - The previous professional training of teachers which did not recognize modern pedagogies.
 - Prevailing in-service training does not integrate ICT into curricula design and training.
 - The lack of cognitive resource-based learning environments, including the non-involvement of media teachers in the integration of ICT into the curriculum.
 - The preponderance of a *chalk and talk* pedagogy found to be prevalent in rural South African schools where this study was conducted and where cognitive education resources, such as libraries and computer laboratories, are lacking.

6.2.4 School Information resources

1. Though a strong correlation exists between the technology and other resources for teaching and learning, recommended as pre-requisites by the resource model (Appendix 1), the majority of WorLD schools in South Africa during the project phase had less than the minimum requirements of the pre-requisite information resources (computer networked laboratories, Internet access, libraries/media centres, media teachers and multimedia centres).
2. The marginalization of the role of the school librarian creates difficulties in the integration of ICTs into the curriculum in schools.
3. The number of functioning computers at WorLD schools and Internet access during

the project made it impossible for effective collaborative projects to take place.

4. Other technology - television, video machines, radio and overhead projectors - which support technology-based education, exists in the majority of the schools.
5. The information resource situation in previously un-resourced rural South African schools, in general, though gradually improving, were not adequate to support ICT education and therefore needed massive improvement.

6.2.5 Teachers' capacity to deliver on WorLD projects

1. There was hardly time for educators to deliver on WorLD projects, even though teachers had acquired the skills and confidence.
2. Project activities affect educators' normal teaching duties negatively, because they were not full-time and dedicated and were engaged in the projects on a voluntary basis.

6.2.6 Literacy effect of the WorLD project on learners

1. The majority of WorLD learners could read, that is access the content from books, and write without assistance.
2. Reading problems were, however, acute where they existed.
3. Only a few learners could access information from the Internet without assistance and just about half of them were able to read from the Internet.
4. Learners' inability to read and access information from the Internet is attributed to the lack of resources at the learners' homes and schools.
5. The use of the local language as a means of instruction and communication also played a significant role in limiting reading and accessing of information from the Internet, which uses the English language.
6. Lack of information skills were identified as the major barrier to the ability of learners to access and use information from the Internet.

6.2.7 Multimedia filling the gaps

Even though many WorLD educators and learners have used a multimedia computer system and are very positive that the tool can assist in ICT education, none of the schools had the minimum ICT requirements to utilise such a system.

6.2.8 Success factors

1. Educators and learners in WorLD schools have been equipped with new skills and modern insights into education.
2. Learners have been equipped with skills which they will utilize in work situations and further education.

6.2.9 Challenge factors

1. The number of functioning computers in a WorLD school is considered a serious limitation to the project.
2. Lack of Internet access, resulting in inability to engage in collaborative projects and inability to integrate ICT into the educational system, meant that the project did not achieve a major outcome.
3. Cost is an issue that seriously impinged on the success and sustainability of the project.
4. The project was found to be an expensive venture and maintaining the computer system may be out of the reach of the schools in the future.

6.3 Conclusions

The conclusions of this study are based on the findings of the study and project outcomes from expectations of the WorLD evaluation research model (Figure 6.1). Achievements and failures, with respect to the expected outcomes and impact of the project, are:

6.3.1 Achievements

The study concludes that the World Links for development programme in South Africa achieved limited outcomes and impact on ICT education in schools during the project pilot phase between 1997 and 2000. This was because educators who were project co-ordinators in the schools did not have time outside their normal working schedules, they did not have the required technical skills to repair frequently non-functional computers, the Internet was not available in the majority of the schools and support from both school administration and the project was minimal. Nevertheless, modern insights into education have been gained and new approaches to education developed in the schools, as well as new challenges. Educators have been provided with additional skills, including the ability to utilise many computer application programs.

Marginal outcomes were recorded in certain areas of the project. International collaboration with peer learners, for example, were developed in the few schools that had Internet access and engaged in collaborative projects. Access to the World's maze of information was available at schools with Internet access. Teachers utilized a few new methods for teaching, at least during the WorLD projects.

6.3.2 Failures

On the whole, however, the project failed to achieve a great proportion of its outcomes and impact (Figure 6.1), which include the following:

6.3.2.1 Learners skilled in computer application systems

This study concludes that South African WorLD learners, the ultimate beneficiaries of the project, had not benefited from the skills acquired by the teachers. This was against the backdrop that 77% of them have never been trained to use a computer and 89% did not have a computer at home. It would be fair to say that less time and effort than required was

devoted to the training of learners by educators for the WorLD project. Learners were not skilled in the computer application systems because educators did not have the time beyond their normal teaching schedules to teach them the systems.

6.3.2.2 Teachers' use of technical skills

It is conclusive from this study that WorLD teachers could not use technical skills effectively because they had not been trained sufficiently and there was no time for them to utilize whatever skills they had acquired through their own training efforts.

6.3.2.3 Teachers' use of Internet resources for education

Though teachers had acquired skills for the use of the Internet they could not utilize the Internet for education purposes because the Internet was often not available. This study therefore concludes that the Internet facility provided during the WorLD project in South Africa was unreliable and did not support the programme during the pilot phase of 1997-2000.

6.3.2.4 Teachers utilize new methods for teaching

The study showed that teachers were not able to effectively utilize new methods for teaching in WorLD schools, because many were not trained in and familiar with the majority of the new methods and there was hardly enough time and Internet access to utilize any new methods that they had acquired.

6.3.2.5 Learners use of Internet resources

South African WorLD learners' use of Internet resources during the project pilot phase was very limited and non-effective. This is because of the lack of training in information skills, the Internet often not being available and educators having little time to teach, guide and supervise learners. This study concurs with the SAIDE Report (1998), that, unless resource

backlogs in schools were addressed, programmes seeking to exploit and implement ICT projects would be marginal or have no effect. Again, it would have been ideal for the project to utilize Internet-based compact discs (CDs) during the project pilot phase, as was done in Uganda, or as is the case with SchoolNet South Africa Educators' Development Network (EDN) CD. The present study argues that the non-involvement of the school media teacher where they existed in the project frustrated the use of the Internet because the use of the Internet is the domain of the school library media teacher.

6.3.2.6 Learners' interactive, collaborative and communication skills developed

This study concludes that South African WorLD learners interacted only to a very minimal degree with other learners across the globe, as was required by the project, and therefore did not benefit fully from collaborative and communication skills, because the Internet was often not available in schools and teachers did not have the time to supervise and assist the learners.

6.3.2.7 Integration of ICT into curriculum

Throughout this study, it has become apparent that one of the most important objectives of the WorLD project, which is to integrate ICT into the curriculum, was not achieved during the project pilot phase. Though the literature has made it abundantly clear that it was the aspect of ICT utilization in education that would take a long time to be achieved, South African WorLD educators and learners believe that the introduction of computer studies as a subject in the schools will help improve ICT integration into the curriculum. It is supposed that the introduction of computer studies will make provision for a full-time (dedicated) teacher and provide capacity in terms of time and personnel for ICT education in start-up schools such as the WorLD schools.

6.3.2.8 Learners engage in collaborative projects

This study showed that learners in the WorLD project were not able to fully utilize ICT for collaborative projects. Data provided by this study indicated that, although the majority of them were involved in at least one collaborative project, only 6% were involved in two projects and as few as 3% in three projects, during the pilot phase. The Internet was often not

available; in any case, to support collaborative projects and teachers did not have the time to help learners in the process.

6.3.2.9 Learners think through school projects and develop knowledge

The literature and available research data has shown that the general school resource and pedagogical situation in WorLD schools did not provide the requisite environment for learners to effectively think through school projects. The study also concludes that the impact of the project on schools has been minimal, given the dire resource situation, as well as the educator capacity situation in which the projects have been carried out, especially the lack of time and technical skills of the teachers. Learners' ability to think through school projects and develop their own knowledge was not introduced by computers. The non-involvement of school librarians, where they existed in the project, is again seen as a setback to the project.

6.3.2.10 Learners' critical thinking skills developed

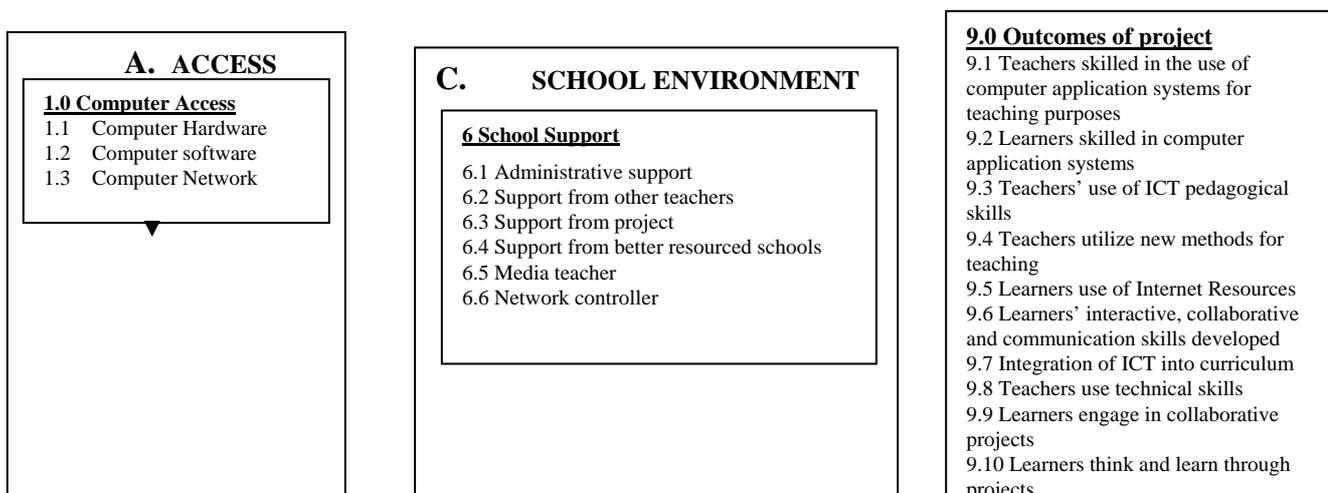
As learners think through their own research projects and use their own acquired information they develop their own knowledge and a critical thinking skills process. This has not been fully developed in this project, in view of the information resource situation in schools and the lack of regular Internet access.

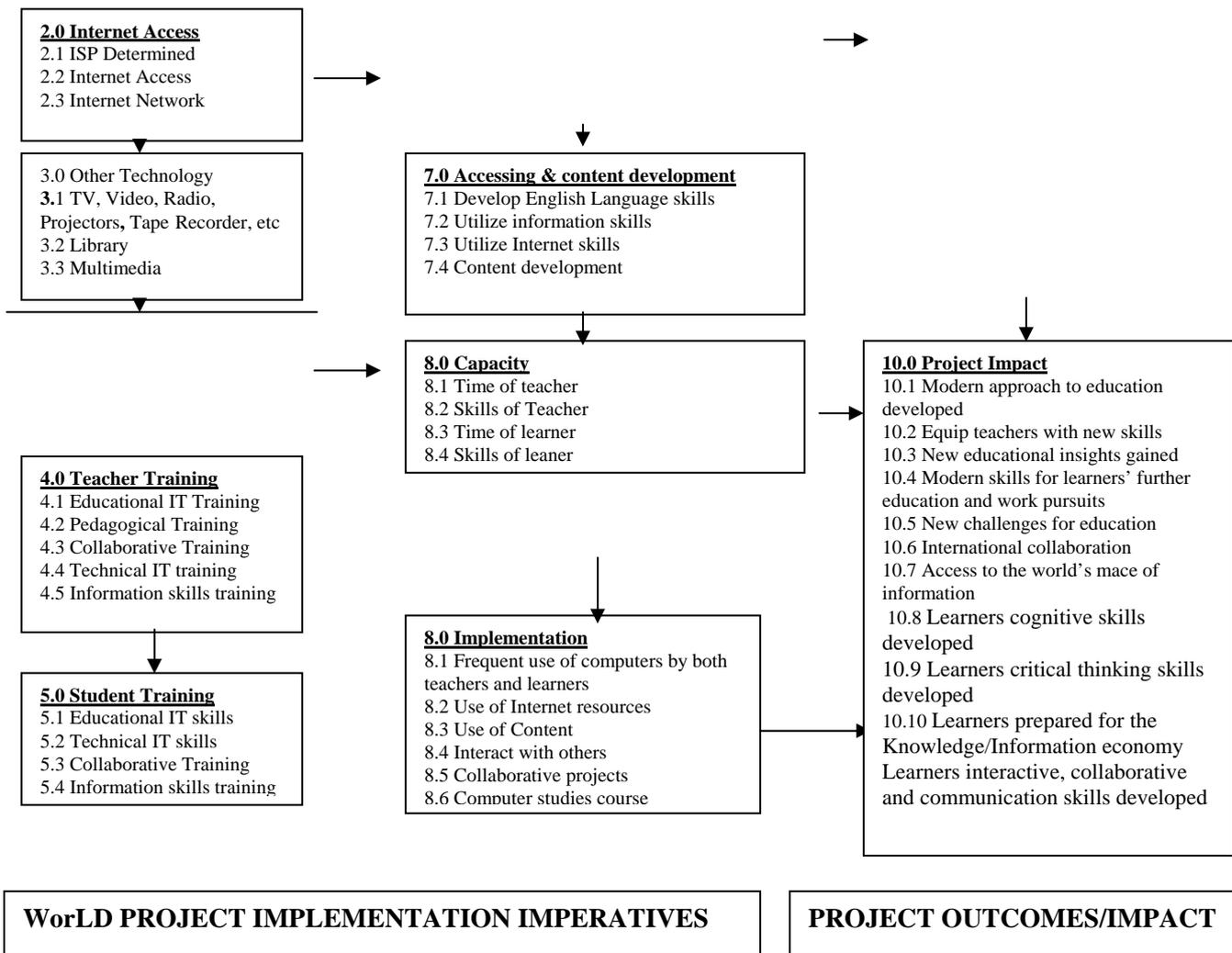
6.3.2.11 Learners prepare for knowledge/information age economy

Ultimately, the aim of the WorLD project was to prepare learners in developing countries to conveniently integrate into the knowledge and information age economy, where prompt access to information or knowledge enables individuals to play worthwhile roles in life. This study concludes that such an aim though very laudable was not achieved because the project did not make adequate provision for the educator and the resource environment. An evaluation model upon which this study was based is presented in Figure 6.1.

Figure 6.1

An Evaluation Model of The WorLD Project in South Africa





This model details an implementation process of the WorLD project hence this study. It begins with the two principal issues that form the core of the study, namely, access to computers and training of educators and learners to utilize ICTs for education. The school environment is an important factor, without which implementation and use of ICTs could not be attained. The model, adapted from the World Bank (McGhee 2000) can be adopted for the evaluation of other ICTs projects not only in South Africa but other African countries.

6.4 Recommendations

The WorLD projects were located in rural South African schools, where the bulk of its population resides, to address the rural-urban ICT education divide and provide useful lessons for a future national roll-out. It has become apparent throughout this study that lessons have been learnt and useful insights gained to guide present and future start-up ICT education projects and processes. The recommendations presented relate to the specific

findings of the study and to a broader policy perspective.

This study recommends that, for an ICT education project to be effective in rural areas in South Africa and the rest of Africa, and to meet its outcomes and make the required impact, the following are crucial:

6.4.1 Training

A national technical ICT strategy for educators must be developed, similar to the SchoolNet South Africa Educators' Development Network (EDN) pedagogical course, being run at the time of writing. Teachers will proceed to an online technical training from the limited face-to-face training they had acquired. It is argued that the limited technical training provided during the WorLD project and what is currently being pursued by SchoolNet South Africa does not provide educators with the knowledge to be able to engage the helpdesk with the right information and confidence to solve hardware and network problems. This situation leads to many school computer laboratories not being able to function to their optimum level, more especially as many schools currently do not have network administrators.

It is recommended that the WorLD project, or the start-up process of any school ICT project in Africa, should make provision for a highly motivated and dedicated ICT teacher, who should be adequately trained in pedagogical, as well as technical skills, to train learners and other teachers on the staff and be able to attain project outcomes in a particular school.

This study recommends that teachers are supported with face to face-to face training in the use of a particular ICT until they are familiar with it, master its use, develop the required confidence and can use it on their own. Taking into account how teachers were trained in the past, it will be difficult to embark on an online training course to master application or technical skills where the rudiments have not been achieved. Nevertheless, this study endorses the new online pedagogy course being provided by SchoolNet South Africa.

Teachers viewed school ICT projects in this study as additional, unremunerated duties. It is therefore important to involve district education officials, school principals, heads of departments, participating teachers and the community in project design and implementation. With such an holistic and inclusive approach schools will be more receptive to ICT use and development, because the education managers in the districts with the communities endorsed the projects. Ntutule & Perold (2001) found that principals who were originally cautious of ICT projects became more co-operative once they knew regional and district managers were involved. With the involvement of school managers and administrators in the planning and implementation of school ICT projects teachers will be able to see the urgency and adjust their time to accommodate the project. They will then not be in danger of losing their jobs. Closely related to this is the recommendation that ICTs in schools must be integrated with the school administration, which requires that the principal and administrative clerk of the school must be trained. Perhaps the model of the WorLD project in Zimbabwe, where project teachers were relieved of all teaching responsibilities and made to manage school tele-centres to serve as school and community information and education centres, could be explored and implemented in South Africa, as well as the rest of Africa.

It is recommended that all persons intending to become teachers should be provided with a pre-service ICT education training in universities and colleges, before they are certified as professional educators. Teachers will be more skilled and confident in a pre-service training environment and it will be less expensive to train them than when they are in service.

6.4.2 The provision of information resources to schools

This study has demonstrated that for a successful ICT education to take place in schools a strong correlation should exist between ICT and other information resources. It is recommended that information resources should not be seen in isolation, but from a holistic perspective. The WorLD information resource model in Appendix 1 must be strictly adhered to. School librarians should be involved in ICT projects at their schools and trained in Internet information retrieval skills, so that they can guide learners with information retrieval and can use library resources to augment their knowledge.

To avoid “dumping”, a national policy on refurbished computers is recommended, to standardise computers donated to schools. Again, the school library and media teacher is a prerequisite, not only to the utilization of ICT in education but, most importantly, for the integration of ICT into the teaching and learning process. As ICT projects cannot take place in schools without the Internet, it is recommended that the cost of Internet access, which is predominantly the cost of a telephone line, be fully explored and discussed with role-players during the project planning phase before the start-up process, to avoid accumulated phone bills and the cessation of Internet access. It is also ideal for school ICT projects to utilize Internet-based compact discs (CDs) during the training phase of projects. Such an approach would not incur Internet costs, but assist in providing the required skills. The current Internet access rate of 50% for schools in South Africa bodes well for school ICT projects and must be examined for other African countries. What is, however, required is that the cost of the telephone helpdesk service be halved, if not eliminated altogether.

6.4.3 Government school ICT policy

Teachers, schools and the entire country of South Africa stand to benefit from a national mission statement on the introduction of ICT to schools. This statement should come from government, along with financial policy support for the use of new technologies and strategic partnerships with industry, the private sector and non-governmental organizations (NGOs). Policy direction is required to strategically incorporate ICT into education and to encourage teachers to use new technologies in their classrooms, nationally and especially in the rural areas of South Africa. A national ICT policy framework for education should aim at:

- Mobilising human and material resources nationally, with incentives for rural schools
- Addressing a holistic school information resource situation, to include school libraries, media teachers and multimedia centres
- Developing human resources among educators in ICT and management skills
- Exploring and deploying appropriate, affordable, but non-specific, ICT for schools in rural South Africa and Africa, including satellite technology in wired, wireless or a combination of wireless and wired network environments.
- Rural infrastructure development, with regards to telecommunication and electricity
- Addressing issues relating to universal access and service in Africa

- Providing pre-service ICT technical and pedagogical training to all teachers
- Determining a model that will integrate the school as a learning centre with a community information resource.

The present study recommends that the South African Department of Education utilises a model which will involve the school community to augment the provision of computers by the WorLD and other projects and be thoroughly discussed during the project-planning phase. Provincial efforts such as “Gauteng online”, of the Gauteng Provincial Department of Education and the Khanya project of the Western Cape Department of Education³⁸, are commended and must be emulated by other provinces.

6.4.4 Integration of ICT into school curriculum

The integration of ICT into the curriculum is a complex and long-term process. It involves the availability of a full-time, well-trained, experienced and motivated educator and the involvement of the school library media teacher. The present work recommends the need to introduce computer studies at all stages of the curriculum and computer science and programming at senior level. They should be examinable subjects so that learners can derive the full benefits of being educated with computers in schools.

The integration programme must create mechanisms and structures to support teacher and learner collaboration after both have mastered sufficient skills. This should be an effort which should create more time for teachers to plan together and train and collaborate in the integration of ICT across disciplines (Ntutule & Perold 2001). Integration of ICTs into the curriculum can only begin if there is less emphasis on the passing of examinations and the pressure of teachers’ work is decreased.

It is recommended that content usage and the integration of ICT into the curriculum should begin with the mastering of applications programmes and the application of information literacy, which should then be followed by questioning skills. The spirit of enquiry, devoid of

38 Information on these initiatives can be found at: <http://www.schoolnet.school.za>

a *chalk and talk* approach to education in African communities, must be inculcated in learners and the learning process. Skills gained from this inquiring approach can be used in specific projects such as collaboratory projects with learners in subjects such as mathematics, English, science and social science.

The idea of integrating ICT into teaching and learning must be conducted in such a manner that educators and learners see mastering of application programmes and learning of specific subjects as one complementing the other. As seen during the WorLD project, learners and educators had regarded themselves as benefiting from computer skills for use in other aspects of life and not for education purposes. ICT in the curriculum must be combined with educators' administration duties in mind. For example, using Excel for designing school and class timetables or mark sheets, which are used by teachers in their day-to-day education activities. It also fosters the holistic approach mentioned earlier.

Care must be taken when recruiting teacher trainers for in-service training, as non-educationists would not be conversant with teachers' roles and would relate training to other uses of ICT, thus missing the holistic approach. A mechanism must be put in place for monitoring the uses to which educators put the skills they had acquired. The tendency to use ICT for other purposes provided grounds and temptation for teachers to leave the classrooms for other services, where their demand is high. In the present study, at least one teacher mentioned pursuing other goals outside teaching, after gaining ICT skills.

The present study recommends that the programme managers educate WorLD school principals on the role of ICT in education, as motivated teachers who see their roles being appreciated by principals will, in turn, encourage their learners. This is critical in school ICT projects, which are considered as added-on jobs, with no extra remuneration. Of course, if these issues are addressed during the project planning stages, such problems will not arise.

6.4.5 Imperatives for the success of the project

It is recommended that a thorough base scan should precede school ICT projects. This should be discussed with schools and followed by a thorough needs analysis of the educators.

Learners should show some signs of cognitive learning skills in a library/media centre before

computers are introduced into the schools. In many instances this was not the case in selected WorLD schools. Media teachers did not, therefore, form part of the project.

Establishing a sense of community, by using electronic mail (e-mail) (asynchronous communication) and “chat rooms” (synchronous communication systems), are essential and considered an important social outcome of ICT implementation programmes in schools. ICT will encourage both educators and learners unconsciously to learn skills fast. Care should, however, be taken to provide guidance on issues of interest concerning communication, to foster focus-group discussions.

It is recommended that steps be taken to consolidate project outcomes and successes prior to expansion in subjects or to the community. Issues such as the following are crucial:

- The adequacy of ICT infrastructure at the school
- Technical support from the school and from outside sources
- School management support
- Consolidated and continuous training
- Practising of new skills
- Motivation of participants

6.5 Recommendations for further studies

The focus of this study has been the monitoring and evaluation components of the WorLD programme. Determining the success or failure of a project and hence value for money is crucial to that project. It is therefore recommended that the evaluation model proposed by this study be tested to prove its efficacy, with regards to evaluating ICT education projects being sponsored by schools, communities, funders and governments.

It is also recommended that, with the advancement of technology and the emergence of nascent ICT products that could foster more affordable and sustainable computer access and connectivity, research be conducted into the use of new technologies such as wireless,

satellite and open-source software in schools in South Africa and in the rural areas in general.

It was indicated in the literature review for this study that one of the most formidable challenges to the use of ICTs in developing countries, especially in Africa, was the challenge of ownership of knowledge and knowledge products. This study recommends that research be conducted to establish the extent to which Africans are being alienated from their way of life or otherwise because of their lack of control of the knowledge systems and products that are being used in the name of globalisation and a knowledge economy. Perhaps the question to investigate is, to what extent are African communities, and particularly those in South Africa, thinking global and acting local?

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