The Status of ICT Access and use in South African Schools: Comparing the Rural and Urban Schools in the Mpumalanga Province

Nhlanhla B. W. Mlitwa
Department of IT, Faculty of Informatics and Design (FID), Cape Peninsula University of Technology (CPUT)
80 Roeland Street, Cape Town
nmlitwa@gmail.com

Joy N. Nonyane
Department of IT, Faculty of Informatics and Design (FID), Cape Peninsula University of Technology (CPUT)
80 Roeland Street, Cape Town
nkatekojn@yahoo.com
ABSTRACT
In education, Information and Communication Technology (ICT) is considered part of a solution to addressing the changing learning needs of societies. Despite the impressive promise of ICT however, the majority in rural areas lack basic resources such as classrooms, desks, and ultimately ICT resources. This paper investigates ICT resource challenges faced by rural schools in South Africa – by comparison to their urban counterparts. The paper adopts a qualitative, descriptive, and explanatory method of research. It is based on both secondary and primary data sources. A purposive sampling method was collect data through interviews of school officials in the Mpumalanga region. Results show urban schools to be generally well equipped, both in terms of technical and social resources. Rural schools on the other hand, either lack the physical infrastructure, or some have a few computers but lack programs. Theft and vandalism also emerged as a major challenge for most, whilst computer literacy for teachers is a problem for all sampled schools in the province. Where computers exist in rural areas, the numbers are far too small to be useful given their ratio to the amount of learners. A framework to analyse the schools computerisation effort is then used to explain the findings. A lack of coherence in the vision among the leadership between national education, provincial, and school leadership is a contributing factor. A lack of attention to the needs of intended beneficiaries at schools level, as well as efforts to redress social and environmental obstacles such as security, energy, provision of relevant programs, and technical support equally limit the success of the initiative to computerise rural schools. Drawing on the analytical model used, it is recommended that efforts to redress imbalances should move beyond the academic and political rhetoric, into a tangible coherent action by all stakeholders in respective education sectoral levels. Solutions should be embedded with computer skills, technical support for educators, together with measures to protect the infrastructure.

Keywords ICT, e-Learning, computer literacy, technical support
INTRODUCTION

Information and communication technology (ICT) is an important tool for improved efficiencies in commerce (i.e. e-commerce), government and society interactions (i.e. e-government), and in education (i.e. e-Learning, communication and administration) (Mlitwa, 2006).

Networked computers are a tool for conducting business online in e-commerce. E-commerce enables us to conduct banking transactions at the comfort of our homes, pay monthly bills online, and we can market, purchase and sell commodities without setting the foot off our living rooms 24 hours a day, and anywhere in world (Mlitwa, 2007). Similarly in e-Government; ICT enhances interaction between the government and the public, where communities may access government services via the Internet beyond time constraints. The Cape Gateway initiative of the Provincial Government of the Western Cape (PGWC) is a useful example. It is “a government portal aimed at providing information on local, provincial and national government” information, giving easy access to government services (www.capegateway.gov.za).

In education, ICT is considered part of a solution to addressing the changing learning needs of societies (Garrison & Anderson, in Mlitwa 2006). ICT helps improve schools administration such as the registration of learners, the keeping and retrieving of learner records, and enables electronic (rather than manual) handling of marks. Furthermore, it enables teachers and learners to gain easy access to learning and teaching materials online across time divides.

Networked Technology can enable teachers to interact with colleagues anywhere in the world for mutual support and development. Through the use of learning management systems (LMSs) such as the Knowledge environment for web-based learning (http://kewl.uwc.ac.za/) or VULA (http://vula.uct.ac.za/portal/) among others, networked technology enables e-Learning – which gives students access to resources such as online encyclopedia, notes, tests, projects assignments, as well as group interactions. The use of computers, observes Clements et al. (1993, in Yelland, 2001: 16) can further “increase the mathematical achievement of children in pre-school and primary grades”. The benefit of e-Learning is that it enables students to actively engage with the learning content and explore knowledge on their own, and at their convenient time. In this way, students become active participants in the construction (rather than just passive recipients) of knowledge. An example of active participation in learning through computers by students in Catalina High School in Tucson, Arizona, illustrates this point. Students in this school are given self-paced computerised learning environments. Impressive results have been reported, with students improving their grades, self-esteem, thinking skills, literacy skills and developing the ability to learn independently even beyond the high school level (Christensen, 1995).

It has been clearly argued how ICT improves efficiencies in education in preceding paragraphs. In the Problem Statement section below, it is elaborated that despite the advantage offered by ICT, the majority of people in disadvantaged areas lack basic resources that should precede ICT, making ICT a distant luxury that most schools cannot even begin to dream of.
Research Problem

The director of Read Organisation, Cynthia Hugo (in the Mail & Guardian, 2002) reports that “Suburban children performance at urban schools is two years ahead of their rural counterparts” which means that their reading abilities are not the same. “A grade 4 learner reading abilities in the urban area is the same as that of the grade 6 in a township school” (M&G, 2002). City Press (2006) further reports that the Eastern Cape (E.C) province has about “884 mud structure schools, 1279 without water, 177 without adequate sanitation and 1952 without electricity”. Similarly, 251 learners in the Nlovayiphatwa Primary School in the Eastern Cape cram into three crumbling mud huts, with only 15 desks (Sunday Times, 2007). There are many cases where pupils are learning in overcrowded mud huts, outdoors and/or even among pigs. These South African children according to the Sunday Times (2007) dodge the pigs, stand while writing exams, and they have to swim through rivers to get to schools everyday. The problem seems to be nationwide. In the North West, the Sunday times reports cases where “many schools lacked resources such as library books and laboratory equipment, schools are falling down due to poor maintenance…” (George, in SundayTimes, 2007:1). The problem is illustrated in pictures in figure 1 below.

Fig. 1: Examples of poor resourced schooling conditions in remote areas of South Africa

Along with the status quo is an extremely poor quality of education in rural schools. A number of reasons have emerged to explain the situation, ranging from a lack of skilled teachers, high pupil-teacher ratio, a lack of classrooms and a lack of resources including laboratories and ICT. While this problem can be ascribed to the legacy of apartheid, numerous efforts are in place at various government levels to redress the imbalances between well-resourced and underprivileged schools. Persistence of development imbalances however, seem to defy
existing efforts. It is from this background that this study investigates (explores) the challenges that still remain, causes, and possible solutions to a lack of resources in underprivileged schools in South Africa. The Province of Mpumalanga has been selected as a case study.

How the study is conducted, and how this paper is structured, are described under the methodology sub-section below.

**Methodology**

The study investigates ICT resource (infrastructure, skills and technical support) challenges that disadvantaged remote schools are facing. The paper adopts a qualitative, descriptive, and explanatory method of research, based on both secondary and primary data (Babbie & Mouton, 2001). Secondary data consists of academic literature, government policy documents, and print or online media. The primary data originates from direct interviews with officials from 10 schools (5 high/secondary schools, and 5 primary schools of which one primary and one secondary school are in the urban area) selected through a purposive method of sampling. The rest are in rural areas (see table 1 below).

**Table 1. Research samples**

<table>
<thead>
<tr>
<th>Name of School</th>
<th>Location</th>
<th>Primary = P**</th>
<th>Secondary = S*</th>
<th>Official Interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowveld</td>
<td>Nelspruit</td>
<td>S</td>
<td></td>
<td>Deputy Principal</td>
</tr>
<tr>
<td>Klipspringer</td>
<td>Nelspruit</td>
<td>P</td>
<td></td>
<td>Principal</td>
</tr>
<tr>
<td>Mchaka</td>
<td>Cunningmore “B”</td>
<td>S</td>
<td></td>
<td>Principal</td>
</tr>
<tr>
<td>Tiyimeleni</td>
<td>Cunningmore “B”</td>
<td>P</td>
<td></td>
<td>Principal</td>
</tr>
<tr>
<td>James Khoza</td>
<td>Cunningmore “A”</td>
<td>S</td>
<td></td>
<td>Deputy Principal</td>
</tr>
<tr>
<td>Bunny Khoza</td>
<td>Kildare “B”</td>
<td>S</td>
<td></td>
<td>Educator</td>
</tr>
<tr>
<td>N’wakupana</td>
<td>Kildare “B”</td>
<td>P</td>
<td></td>
<td>Deputy Principal</td>
</tr>
<tr>
<td>Saringwa</td>
<td>Cunningmore “B”</td>
<td>P</td>
<td></td>
<td>Principal</td>
</tr>
<tr>
<td>Luka</td>
<td>Croquet Clawn</td>
<td>S</td>
<td></td>
<td>Educator</td>
</tr>
<tr>
<td>J.J Matsane</td>
<td>Somerset</td>
<td>P</td>
<td></td>
<td>Educator</td>
</tr>
</tbody>
</table>

Explanatory notes:
*Secondary school: School catering for formal education for grades 9 to 12
**Primary school: is a level of childhood education for learners from grade R to 8

Given the focus of the study on under-resourced schools which are largely in rural areas, eight (four primary and four secondary) schools were selected from BushbuckRidge and the surrounding rural area. Two (one primary and one secondary) schools were selected from the urban area of Nelspruit.
Qualitative interview questions form a substantial data collection tool. These were transcribed, and qualitatively analysed. The paper opens with a discussion of ICT as a development tool in section in the following section. A contextual framework for a successful implementation of ICT initiatives in social settings which is used in this paper to explain the causes of poor ICT implementation is outlined in the same section. The framework as outlined in fig.2 is drawn reconstructed from the work of Derek Keats (2007), and was selected due to its usefulness in making sense of ICT implementations in socio-technical settings. This is followed by the findings section, which draws on interview data to describe the resource development discrepancies, causes, implications, explanations, and ultimately possible alternatives in underprivileged schools. Limitations of the study are discussed in next, followed by conclusions, references, acknowledgements, and annexes.

SIGNIFICANCE OF ICT AS A DEVELOPMENT TOOL

That ICT is an important tool upon which various aspects of socio-economic developments are based is better illustrated in World Summit on the Information Society (WSIS, Geneva, 2003; and Tunis, 2005) programs of action. In line with the UN Millennium Development goals where all world countries declare a commitment to reduce poverty, improve equitable access to health, and redress illiteracy among the world population by 2015, the WSIS plan commits countries to use ICT to achieve these development goals. WSIS (2003) sets a goal “to connect secondary schools and primary schools with ICTs, to adapt all primary and secondary schools curriculum to meet the challenges of an Information Society” (WSIS Geneva 2003:2 -Tunis 2005).

Connecting education with ICT is not only prioritised at an intercontinental level, but also at continental, regional and national country levels. At continental level, the NEPAD institution for example, sets out an e-School initiative whose priority is to connect schools across its member countries – to ICT. The initiative commits to provide teachers with ICT skills to use ICT tools to enhance teaching and learning, and to provide school managers with ICT skills to facilitate the efficiency of managing and administration of the school (NEPAD e-school, 2004:2-3). Within NEPAD, South Africa (SA) has also embarked on its e-Education initiative. Implemented by the Department of Education (DoE), the e-Education policy declares that “Every South African manager, teacher and learner in the general and further education and training bands will be ICT capable (that is, to use ICT confidently and creatively to help develop the skills and knowledge they need as lifelong learners to achieve personal goals and to be full participants in the global community) by 2073” (RSA DoE, 2004). The DoE partners with the private sector including the “for profit” and the “no-profit” organisations in the implementation of ICT in schools. The Khanya Project (www.khanya.co.za/) of the Western Cape Department of Education, the TuxLab open-source software-based schools’ computing project of the Shuttleworth Foundation (www.shuttleworthfoundation.org/our-work/past-projects/tuxlab), and the SchoolNet SA (www.schoolnet.org.za/) initiative among others, reflect such a mixture of
government and private sector efforts. The problem however is that whilst existing, noble-intentioned initiatives are making a useful contribution towards this objective, many areas in remote locations are still without minimum resources such as classrooms, desks, etc, let alone ICT resources.

The above background clearly demonstrates the computing of schools as a development priority at international (UN millennium development goals, 2015), at continental (the Nepad e-schools initiative), and at national level (SA government’s e-Education policy objectives). It is apparent however, despite various undertakings through indirect (policy declarations) and direct (actual resource provision) initiatives, that rural schools remain on the periphery of the urban-rural technology advancement continuum in South Africa. The question arises as to extent of the divides, and where do the current initiatives fail.

Interviews with educators, deputy principals and principals in rural and urban schools in Mpumalanga were held by the authors of this paper to clarify the status of ICT availability, access and use in and between rural and urban schools in Mpumalanga Province. These are presented in tables 2 and 3 under the findings section below. A framework developed by Keats (2007) is further developed, interpreted and applied to understand and explain possible causes (contributing factors) to the status quo.

A framework for the implementation of ICT programs in social settings

- Clear steps to ensure goal realisation
- Identify & addressing procedural & physical obstacles
- Making the physical & social environment conducive
- Ensuring the physical implementation of initiative at all levels
- Presence of clear policy & commitment to the objective at all levels (national, provincial, & school level).
- Coherence in objectives of policies across initiative levels/ activity points
- Mutually supportive & coherent procedures towards initiative realisation
- Relevance to what intended beneficiaries need
- Addressing social & physical obstacles to the realisation of these needs (attending to literacy, technical support, affordability, safety).
- Actual technology, a relevant & working format, be delivered to beneficiaries.
- Physical environment should support adequate functionality (space, energy, lights, right software, technical support, etc.

Leadership - a central magnet that pulls the four pieces together.

There has to be leadership at all layers: national, provincial, school level – all pulling together towards one vision.

It shapes the vision, makes environment conducive, shapes the process, attends to people needs, physically delivers tools, and coordinate measures for a continuous functionality of the tools for the realisation of the common vision.

A translation of the technology implementation framework by Keats (2007)

**Fig.2: A Holistic Approach to Implementing Technology in Social Settings**
Keats (2007) argues that technology such as computers, Internet, etc is not an end in itself. It is a tool, that when combined with other factors, can be used to achieve a specific objective. Achieving a socio-technical objective therefore needs the presence of, or access to, the tool, but that is just a small part of a bigger puzzle. Other pieces and how they are linked is equally important to achievement of intended socio-technical objectives. Though no linear linkage between the parts of the puzzle is suggested, a “very common mistake” according to Keats (2007) is to focus on one aspect i.e. technologies, and ignore other parts. A vision in terms of policy is useful to articulate intentions and a direction, but a vision and tools do not complete a puzzle towards achieving a goal. What about the process or “putting life” (linking the vision to the tools and objectives) into different parts of the puzzle? Not only the how aspect, but also the question of whether the physical environment supports the realisation of the vision, or how to make it so. Will the tools be safe, is there a physical venue to keep and use the tools, can the tools (computers) be connected to energy to make them work? If a technology is to further a social activity such as learning, it also makes sense to pay attention to the people aspect of the puzzle as well. Who is going to use a technology, for which purposes, will users be safe, what is a conducive social environment (such as financial, technical, and literacy capacity and support) to enable the initiative to succeed? It is due to its emphasis on these factors that framework is considered useful, and therefore used in this study.

At the center of the puzzle is the leadership. Keats (2007) puts forward an argument – which is strongly supported in this paper that all the puzzle parts are unlikely to fit together if the leadership is lacking. It is argued in this paper that leadership, not either at school level, local government or even at national level, but at all levels, should carry and share a common vision if they are pursuing a common objective. It is through their deliberate and mutually supportive effort that such a vision can be successfully pursued. This, of course requires a coherently defined process, in an environment conducive for all leadership segments to pull together (like the magnet) different parts of the puzzle in their environments.

In the following section, data from interviews with teachers in rural and urban schools in the Mpumalanga Province are analysed to assess the status of ICT access and use of computers. Insight from the framework in fig 2 is then used in the final part of the findings to explore explanations to the causes of discrepancies that are cited in interviews.
## FINDINGS

**Table 2. Summary of results on the interviews conducted in the Mpumalanga Province**

<table>
<thead>
<tr>
<th>Schools</th>
<th>Number of Teachers</th>
<th>Number of Learners in school</th>
<th>ICT Resources: Indicators</th>
<th>Learning program/s</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in school</td>
<td>computer literate</td>
<td>Number of Computers</td>
<td>Purpose of use</td>
<td>Technical Support</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Has Internet</td>
<td></td>
</tr>
<tr>
<td>Lowveld</td>
<td>55</td>
<td>20</td>
<td>1175</td>
<td>200</td>
<td>For admin 8 &amp; 192 teaching</td>
</tr>
<tr>
<td>Klipspringer</td>
<td>15</td>
<td>3</td>
<td>333</td>
<td>6</td>
<td>For admin 3 &amp; 3 teaching</td>
</tr>
<tr>
<td>Mchaka</td>
<td>19</td>
<td>5</td>
<td>565</td>
<td>2</td>
<td>For admin 2</td>
</tr>
<tr>
<td>Tiyimeleni</td>
<td>8</td>
<td>0</td>
<td>265</td>
<td>1</td>
<td>For admin 1</td>
</tr>
<tr>
<td>James Khoza</td>
<td>27</td>
<td>19</td>
<td>854</td>
<td>18</td>
<td>For admin 8 and 10 teaching</td>
</tr>
<tr>
<td>Bunny Khoza</td>
<td>29</td>
<td>4</td>
<td>970</td>
<td>21</td>
<td>For admin 2 and rest not used yet</td>
</tr>
<tr>
<td>N’wankupana</td>
<td>15</td>
<td>3</td>
<td>604</td>
<td>1</td>
<td>For admin 1</td>
</tr>
<tr>
<td>Saringwa</td>
<td>10</td>
<td>0</td>
<td>282</td>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>Luka</td>
<td>26</td>
<td>6</td>
<td>800</td>
<td>3</td>
<td>For admin 3</td>
</tr>
<tr>
<td>J.J Matsane</td>
<td>11</td>
<td>2</td>
<td>403</td>
<td>21</td>
<td>For 3 admin and 18 teaching</td>
</tr>
</tbody>
</table>

**Table 3. Causes and implications of access or no access to ICT resources in Selected Schools in the Mpumalanga Province**
<table>
<thead>
<tr>
<th>ICT Resources</th>
<th>Causes</th>
<th>Implications</th>
<th>Source *</th>
</tr>
</thead>
</table>
| Has computers          | • Donations (Dept. sports & Culture, DELL, Telkom, PatCom College, Arise Business College).  
                         • Grants (Spar).  
                         • Own funding.  
                         • Govt. & Transnet. | • Learners are active, independent, and creative.  
                         • Downloading information & researching on Internet.  
                         • Presentation of information properly.  
                         • Save time planning lessons; also saves money.  
                         • Teacher & learner interact more; Learners become computer oriented.  
                         • Connect to areas across the world. | N. Ntimane, W. Steyn, J.D Hogg, C. Khoza, M.P Mabuza |
| Has no computers       | • Lack of funds; No donor contact details  
                         • Basic infrastructure main priority from school funds (e.g. Electricity & classrooms).  
                         • Vandalism & theft. | • Loose out on e-learning; also Low learner performance.  
                         • No access to Govt. services.  
                         • No Computer Science subject.  
                         • No school & community empowerment; also Not cost effective. | M.Mothapo, M.P Mabuza, T. Hlatswayo, B.M Khumalo |
| Has Internet           | • Own funding.                                                           | • Download up to date information.  
                         • Learners & teachers communicate around the world. | J.D Hogg, M.Mothapo, M.P Mabuza, W. Steyn |
| Has no Internet        | • Lack of infrastructure (electricity and telephone lines); Lack of funds.  
                         • Vandalism & theft. | • Lag behind as technology is changing.  
                         • Plan lessons manually. | M.P Mabuza, V.E Nyambi, C. Khoza |
| Comp. Literate Teachers| • Own funding either from (school or educators) at higher institutions (Hoxane College of Education).  
                         • Train each other. | • Plan lessons effectively, do schedules.  
                         • Use rubric software & generate rubrics.  
| Comp unskilled Teachers| • Lack of funds and time.                                               | • No technological interaction with learner  
                         • Poor presentation of lesson | M.P Mabuza, J.D Hogg, T. Hlatswayo |
| Has Technical Support  | • Own funding.  
                         • Provided by company (CMS). | • Easy & quick to fix problem  
                         • Problem with companies; also adds financial strain  
                         • Has policy | W. Steyn, N. Ntimane, J.D Hogg, C. Khoza |
| Has no Technical Support| • Lack of funds, Lack of relevant contacts, poor infrastructure (roads). | • Delay of service  
                         • Time consuming | C. Khoza, M.P Mabuza, V.E Nyambi |

Explanatory notes: * Interviews conducted September 2007 at the Mpumalanga Province.
Discussion of Findings

The aim of this study was to investigate (explore) the status of access and use of ICT in disadvantaged schools, as well as the challenges, related causes, and implications. We asked whether a selected school has computers, in what quantity (relative to the number of teachers and learners), whether they are used for education, whether they have internet connection, whether there is adequate computer literacy, and where this is inadequate whether support programs exist in the school. We asked whether the school has learning programs for teaching through computers, and whether it had technical support in case of computers breaking. For schools without computers, the causes were investigated together with perceived implications with respect to teaching and learning. Purposes of usage, availability of teaching programs, computers skills, and sources of existing resources were also investigated on schools that had computers.

It is clear in terms of the findings that rural schools have limited or no resources, or has resources that are unused due to skills limitations. Urban schools have computers, internet, and technical support, but also face challenges in terms of limited computer skills for teachers.

Rural Schools

The results in Table 2 and 3 show that out of the sample of eight schools in the rural area in Mpumalanga, Mchaka High school had two (2) computers (during the period of this study) which they bought themselves. They use them for administration. There is no internet, no technical support, and no learning programs. Tiyimeleni primary school had (one) 1 computer bought out of own funds. It is used for administration. There is no internet, no technical support, and no learning programs. James Khoza High school had eighteen (18) computers some of which were donated by Patcom whiles some were bought from own funding. Eight (8) of the computers are used for administration while ten (10) were used for teaching. There was no internet. The school has technical support which is provided by a technician. The school has no computer-based learning programs. Bunny Khoza High school had twenty one (21) computers that were provided by Transnet. Two of them are used for administration and the rest are not being used for teaching due to lack of skilled teachers. There was no internet; no technical support, and no learning programs. N'wakupana primary school had only one (1) computer that was purchased from school’s own fund. It is used for administration, and there was no internet; no technical support, and no learning programs.

Luka High school had only three (3) computers obtained from Arise business College and from own funds. All computers are used for administration. There is no internet; but technical support is provided by one of their skilled teachers. There are no computer-based learning programs. J.J Matsane Primary school had twenty one (21) computers obtained from DELL and Eskom. Three of them are used for administration and eighteen for teaching. There is no internet; no
technical support, and the only program being used for learning is Paint. Saringwa Primary school has no computers at all. The reasons range from a lack of funds, to not having the contact details for donors, and not having basic infrastructures (e.g. electricity and enough classrooms). Basic infrastructure rather than computers had understandably become their main priority. Theft and vandalism which threatens the safety of assets is another problem the school has to work around. Of course not having computers for admin and teaching has implications. Implications are that learners loose out on e-learning, there was no quick access to Government services, there is low performance by learners, no Computer Science subjects are being offered, no school and community empowerment and the status quo is just not cost effective as they have to go elsewhere to access other facilities to do admin work.

Reasons for not having the internet are almost similar in to many schools. They range from a lack of basic infrastructure (telephone lines) to a lack of funds and theft of telephone line cables. Implications are that teachers plan and deliver lessons manually, using only chalk and board. They feel that they are lagging behind. Not having technical support in these schools is caused by lack of funds and not knowing the contact details of companies who do technical support. It is also very difficult for the companies to travel due to the poor infrastructure of the roads. Services are delayed in terms of learners having to share computers or not having computers to use for administration work.

Urban Schools

All two (2) schools in the urban sample had computers. Lowveld High school had two hundred (200) computers obtained through own funding. Eight (8) of these are used for administration whilst the rest is used for teaching. There were three (3) computer centres of which, two were connected to the internet. All administration computers were connected to the internet. Technical support is provided by a separate company. The school uses the program like Computer Aided Design for teaching, and uses rubric generators to generate rubrics. Klipspringer primary school had six (6) computers obtained from the Spar Supermarket as a grant, from own funding, and from a donation by the Department of Sports and Culture. Three (3) computers were used for administration whilst the rest were used for teaching. The school also out-sources other computers when needed. All computers had internet connection, technical support is provided by a specific company, and there were no learning programs on their computers during the time of this research. They were using the computer and Internet for downloading information and researching, planning lessons, connect to other teachers and learners around the world, teach learners Information Technology as part of the subjects and it makes presentation of information proper. The teachers get more time to interact with the learner rather than facing the chalk board.
Analysis

The findings clearly show the challenges in terms of the availability of computers in many rural schools. Further, even in schools with computers, they are either of an inadequate quantity relative to the number of learners, or lack relevant programs to put them into educational use. A lack of literacy to use computers is a frequently reported problem in both rural and urban schools. The problem of the security of the environment where computers could be stored and used is reported frequently in many rural schools. Responses in many disadvantaged schools suggest a lack of understanding on the part of the school community in terms of the vision for the implementation of school computing. Some teachers believe that the government does not adequately support their schools towards getting and using computers for education.

Drawing on the model in fig.2 above, these challenges seem to question the adequacy of leadership towards the realisation of the vision at national, provincial, and mostly, at school level. Whilst the national vision is clear (the national e-Education policy), its articulation and implementation is not equally clear at school level, and there is no evidence leadership at national levels engage the school leadership in articulating the realisation of a common vision. A discrepancy in policy and vision in any level may not contribute to a successful realisation of an objective. The framework in fig.2 also suggests that the needs of the people (intended beneficiaries) must be clearly identified and addressed as part of the process to ensuring successful implementations. As the findings reflect a lack of literacy among teachers, a lack of adequate space to store and use computers, and security challenges, it is clear that the people aspect is not adequately attended to as stated in our framework. Our framework in fig.2 further suggests the actual physical delivery of the tools (relevant and functional) to be used in an initiative. A lack of computers in most schools, an undersupply of these in other schools, or the supply of computers without programs to use them for educational purposes suggest inadequacy of tools. From these findings and analysis, conclusions are drawn in the following section.

CONCLUSIONS

It is clear in terms of the findings that disadvantaged (rural, and largely back) schools still have difficulties either in accessing or in using ICT for teaching and learning. They either lack the physical infrastructure or skills for teachers and learners to use computers (table 2) or both. Whether a rural school has a computer or not does not help if the computer cannot be used because teachers do not know how to use it. It emerged clearly in these interviews that computer literacy for teachers is a major problem for almost all sampled schools. Where computers exist, the numbers are not enough compared to the number of learners in the school. In the best case, this often leads to more than five (5) learners sharing 1 computer per lesson which means that a single learner cannot take explorative initiatives without disturbing other learners. In the worst case, it means all learners, and no computers.
It is clear that rural schools don’t have ICT resources that the urban schools have. Implications are that the realization of the United Nations Millennium Goals to enhance literacy and education, the World Summit on Information Society declarations on advancing the use of ICT for education in schools, the NEPAD e-School Initiative undertakings, and the e-Education Policy objectives of the Department of Education (DoE) in South Africa remain utopian for the rural school as due persistent inequity in terms of education resources between urban and rural schools. Our analytical framework in fig.2 suggests a lack of key factors that are necessary for a socio-technical initiative such as the DoE’s e-Education project to succeed. There is a gap in leadership processes between the national, provincial, and school levels. Whilst the e-Education policy as a national policy exists, lack of clarity at school levels questions the adequacy of vision at schools leadership level. To conclude then, a redress of development inequalities should be fast-tracked. It should move from the policy agenda, into a tangible program of action by all stakeholders in respective education sectors. Furthermore, putting ICT resources (infrastructure, skills and technical support) would be less useful without providing solutions to skills limitations for teachers. Solutions should be embedded with computer skills for educators, technical support, and measures to protect the infrastructure if the objectives of the above mentioned institutions are to be achieved.

Limitations of the study

The study could not cover the whole of Mpumalanga, but a limited purposive sample in the Enhlanzeni district. Whilst this is enough to give an exploratory insight into the status quo to date, covering larger geographical areas could have shared more insight into the subject. The other stakeholders (e.g. DoE, Private sector and other foundations) involved could not be interviewed due to time and resource constraints, and a separate study could be necessary to investigate the state stakeholders on the subject in future.

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Interviews

Hogg J.D, Principal of Klipspringer High School
Hlatswayo T., Principal of Tiyimeleni High School
Khoza C., Educator at J.J Matsane High School
Khumalo B.M, Principal of Saringwa primary School
Mabuza, M.P, Principal of Mchaka High School
Mathapo, M. Educator Luka High School
Ntimane, N. Deputy Principal of James Khoza High School
Ntlamu, I, Educator at Bunny Khoza High School
Nyambi, V.E. Deputy Principal of N'wakupana Primary School

Steyn, W. Deputy Principal of Lowveld High School

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ANNEXES

The annexure section is divided into Annexure 1 and 2. The first annexure defines key terms used of the study. Presented in a separate document, annexure 2 presents interview data that is referenced in the body of the text.

Annex 1: Glossary of keywords.

<table>
<thead>
<tr>
<th>ICT</th>
<th>Includes computing systems, networks and telecommunication technologies used for gathering, storing, processing and transmitting information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-Learning</td>
<td>Is associated with online or distance learning on the internet and Information Communication Technologies (ICTs) are used as a way of learning in using ICT.</td>
</tr>
<tr>
<td>Computer literacy</td>
<td>It’s a certain level at which users are familiar with computer operating systems and applications.</td>
</tr>
<tr>
<td>Technical support</td>
<td>Its services provided by an organisation or an individual to deal with technical problems for computer software and hardware.</td>
</tr>
</tbody>
</table>

Annex 2: Research Questions and interview transcripts are provided in a separate document.