Creating a learning culture in rural schools via educational satellite TV broadcasts

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Abstract

Globalisation is increasingly placing greater pressure on economies of countries to become competitive and to develop a higher levels of skills. In order to compete effectively on a global level, education and development must be based on a good foundation. Although formal education in South Africa is presently reaching the majority of children between the ages of seven and fifteen years, actual educational attainment is low. According to the Third International Mathematics and Science Study, South African pupils performed poorly in Mathematics and Physical Science compared to other participating countries.

This low attainment could be addressed by stimulating a learning culture through the medium of telematics. There have been a number of such nationwide initiatives aimed at transforming the country into a "knowledge-based society" through the use of ICTs. One such initiative is the University of Pretoria's "TeleTuks" educational satellite broadcasts to schools.

This article concentrates on the benefits of tele-education for schools participating in TeleTuks as perceived by teachers and by learners. This study was also done to determine to what extent schools are able to participate in the various ICT-related options available; and what problems participating schools are experiencing. It was found that satellite TV is effective in supplementing classroom education by fostering an interactive learning culture, although it has not been utilised and implemented widely enough.

1 Introduction and problem statement

Over the last few decades an increasingly relevant issue for debate among scholars has been the information and communication technology (ICT) revolution in the world that is said to be resulting in the transformation of societies from industrial to information societies. Obviously this varies from country to country, because those in the developed world and those in the developing world are at different stages in the transformation process. Many countries in the third world are still approaching the infancy stages of an information society. Because of the process of globalisation, however, economies are increasingly being forced to stay competitive in order to survive

A major concern that is increasingly being raised in globalisation dialogues is the lack of human resource capacity on the African continent. Contributing to low human resources development is limited Internet access, as access is restricted to mainly the elite who has a good education. Although South Africa's Information Communication Technology (ICT) industry and use of ICT in the economy is considerably better than the rest of Africa, it still lags behind most industrial countries. South Africa has a good telecommunications infrastructure, but there is inequality in telecommunications access (Hodge & Miller 1997). Access to Internet is mostly in major cities, sidelining 70% of people in the rural areas. Only 48,3% of black households have TV sets, compared to 96,5% of white households (SAITIS 2000:22).

ICT could play a significant role in improving skills and productivity, while constraints on IT production may have a pervasive impact on the growth of an economy (United States National Research Council 2000). South Africa is one of the countries in Africa that has a strong technological infrastructure, and a strong skills base (however small), and is well positioned to develop a software development industry.

However, as a result of factors such the brain drain, poor Internet access (particularly among the majority of the population with low levels of literacy and education), this goal is seriously obstructed. To succeed in a knowledge-based world, highly qualified human resources are required (Naudé 1998). A culture which fosters the development and effective use of ICT, provision of funds, and adequate skills training need to be priorities.

The *White Paper on Education and Trainin*g (1995) highlighted the importance of education and training and especially in Mathematics and Physical Science. As a result of the emphasis placed on formal education in South Africa by the White Paper, formal education is presently reaching the majority of children between the ages of seven and fifteen years. More than 94% of children in this age category attend school in South Africa. However, actual educational attainment among those that attend school tends

to be low (Hirschowitz, *et al,* 2001). The number of school-leavers with university-level passes is way below target (Hall, *et al,* 1998). There has been a 23% decline between 1994 and 2000 in the number of school-leavers with university entrance passes (Kane-Berman 2001:276).

In 1994 the HSRC conducted the Third International Mathematics and Science Study (TIMSS) among 15 000 South African students from more than 400 primary and secondary schools. According to this study, South African pupils performed poorly in Mathematics and Physical Science compared to other participating countries, including two other African countries as well as other developing or newly developed countries. South African pupils indicated that they experienced a lack of *qualified teachers*, and a lack of *equipment* and *facilities*. About half of the schools indicated that instruction was seriously hampered by a shortage of materials, equipment and facilities (Howie 2001). On the whole, however, it was found that South African pupils were *positive* towards both Mathematics and Physical Science. The report indicated that there is an urgent need for programmes to be put in place, that will nurture this positive attitude towards the subjects and to build up pupils' fundamental knowledge and understanding of the basic concepts as well as that of the teachers.

The Schools Register of Needs Survey (2001) indicated that over 70% of schools in South Africa lack a computer, though the number with computers increased from 2 241 in 1996 to 6 481 in 2000 (Kane-Berman 2001:274). A CPL survey has indicated that black candidates who have been educated at private schools and from the old model C government schools are more likely to be employed in the ICT sector than those from rural or township schools. This is ascribed to a better grasp of the English language and 'easier sociability' into the industry (SAITIS 2000:111). Unless there is widespread access to computers and computer studies at school-level it is unlikely that the ICT industry in South Africa will see the required resource base in the near future.

Countries with large resource bases are obviously much better placed to take advantage of the educational benefits arising from using ICTs in teaching and learning than countries with few resources. However, even the countries with large resources experience problems in this regard, as continual technological change, combined with public education's limited financial resources, results in deployed educational technology that is often obsolete. This makes it difficult to use currently available resources to teach students about technology (United States National Research Council 2000). In a developing country like South Africa there are even greater constraints and very limited use of ICT in the pedagogic process, except at well-endowed private schools. The extent of access to ICT provided within schools in South Africa is very low by industrial nation standards (Hodge & Miller 1997).

There is a shortage of between 4 000 and 12 000 teachers in mathematics and natural science, according to the Department of Education (2001). As financial resources are

limited, existing educational resources should be maximised in order to improve the low attainment in schools. This in not an easy problem to resolve, but it is a problem that should be worked through in order to ensure that access to ICTs is opened up to marginalized communities in innovative and cost-effective ways (James 2001).

New technology has the potential to foster a learning culture and supplement classroom teaching, even in remote rural areas (Dubery, *et al,* 1999). Through telematics (e.g. satellite TV broadcasts) the role of distance education can be extended and more learners can be reached at a reduced cost (Rensburg 1996). The University of Pretoria, *inter alia,* took initiative in addressing the problem of educational marginalisation. The telematic learning schools programme (TeleTuks) of the University of Pretoria is a community-based project that provides a free educational satellite TV service to secondary schools. The TV broadcasts, supported by Internet and telephone feedback links throughout the country, are aimed to supplement the teacher's lessons and not to replace teachers. The programmes assist schools in problem areas of subjects such as Mathematics, Physical Science, Biology, Accounting, English, Geography, and career guidance. Specialists in these subjects, who are experts at teaching their subject content, present these programmes. Through this ICT-learning methodology, a wider base of learners can be reached than through the one-teacher one-classroom approach.

This study focuses on the TeleTuks educational initiatives as it is used in certain rural schools of the Northern (Limpopo) Province; and asks the question: How effective is this initiative perceived to be by the local users of the broadcasts? More specifically, the problem statement is:

- to what extent are schools able to participate in the various ICT-related options available
- in what way are participating schools perceived (by teachers and by learners) to be benefiting from the initiative
- what problems are being experienced by participating schools?

2 Aims of the study

The University of Pretoria was one of those that took the initiative to alleviate the education situation in the country. In 1999 the HSRC undertook a case study by carrying out fieldwork at randomly selected schools with access to TeleTuks in the Northern Province (Limpopo). This study was a follow-up to that study, and aimed to conduct interviews with pupils and teachers in the schools in order to:

- *monitor the success* of the satellite service in its contribution to interactive and participatory learning; and
- determine the *perception* that teachers and learners had of the *benefits and problems* with regard to the satellite services.

In the long term, if proven successful, the satellite services can eventually contribute to best practices guidelines and the alleviation of the critical education situation in the country.

3 Methodology

3.1 Fieldwork

Fieldwork was done during October 2000 at nine schools in the *Northern Province* (now *Limpopo*) that had access to TeleTuks broadcasts. The results of the study cannot necessarily be generalised to other schools, although at that stage about 62 schools in the country were tuning in regularly to the broadcasts. In Gauteng there were about 13 schools, in Mpumalanga, 5 schools, in the North-West, 8 schools, and in the Northern Province, about 36 schools that made regular use of the TeleTuks programmes.

Two years previously a similar study had been conducted by the HSRC among a number of randomly selected schools in the Northern Province that were the first to receive TeleTuks broadcasts via satellite. The current study was a follow-up to determine any changes or developments in the Northern Province. Initially, ten schools in the Northern Province (Limpopo) were targeted, but one of the schools (Mbilwi Secondary School) had only started tuning in to the broadcasts a few weeks before the commencement of the fieldwork and as a result, was excluded. Grade 11 and Grade 12 pupils were the target group. At least five pupils in each school were interviewed and about two teachers / administrators per school were interviewed.

3.2 Questionnaire

Two questionnaires were developed. One questionnaire targeted the teachers/administrators, while the other targeted the learners. Both questionnaires contained questions on background information. In addition, the learners' questionnaire asked more personal questions regarding viewing patterns, while the teacher's questionnaire was more focused on the viewing patterns of the school as such. Both questionnaires had questions on possible educational benefits, non-educational benefits and attitude towards the TeleTuks broadcasts. The questionnaire for teachers also had questions on statistics as regard to the success of the broadcasts.

3.3 Participating schools in the Northern Province

The schools that initially tuned in to the TeleTuks broadcasts, were situated in the Northern Province (Limpopo). These schools in the Northern Province were the target group, as indicated in Table 1.

At the time of the survey, one school, namely ME Makhato Secondary School, had access to TeleTuks broadcast for about *3 years.* Six of the schools had access to the broadcasts for about *2 years,* while two schools had access to the broadcasts for *one year* only.

Table 1: Schools in the Northern Province that were interviewed

School	Town where situated	Period of access to broadcasts
Mabogopedi Secondary School	Thabazimbi	1 year
Tabudi Secondary School	Soekmekaar, Pietersburg	1 year
ED Rampola	Potgietersrus	2 years
Lebowakgomo Commercial College	Lebowakgomo, Pietersburg	2 years
Morokalebole Secondary School	Ga Nkwana, Pietersburg	2 years
Nape A Ngwato Secondary School	Groblersdal	2 years
Sekhukhune College of Education	Nchabeleng Village	2 years
Thasululo Learning Centre	Thohoyandou	2 years
ME Makhato Secondary School	Seshego	3 years

4 Results

4.1 Information & communication technology (ICT) infrastructure available at participating schools

The University of Pretoria's TeleTuks initiative makes use of studio broadcasting to teach many students at the same time. Programmes are transmitted from a broadcast-quality studio on the main campus of the University. Remote-controlled cameras are used in the studio, while computers and a variety of videotape formats are used to enhance the visual quality of a broadcast.

In 1997 the University acquired a digital satellite channel on the Panamsat 4 satellite. Since than the signal from the studio has gone via the 34 Mbit/sec fibre optic line to the uplink site in Randburg. The uplink has enabled the University to broadcast programmes all over Southern Africa.

In order to receive the programmes, each participating school needed a digital satellite television (DsTv) decoder and a television set. Students could ask questions during live broadcasts via standard telephone lines. However, only *three* of the participating schools had interactive broadcasts via telephone, while the rest had one-way broadcasts only. If

interaction was not possible during broadcasts, the opportunity was there to communicate with the presenter via e-mail, fax or telephone at a later stage. However, none of the schools that were interviewed, had e-mail connections available to learners and two schools only had e-mail and web connections available for teachers.

4.2 TV channels to which schools had regular access

The nine participatinge schools in the Northern Province had regular access to various channels:

- DStv.
- SABC1, SABC2, SABC3, & e.tv.
- One school indicated that had access to the BBC (British Broadcasting Centre), and
- One school had access to MNet.

4.3 Equipment that was available at the participating schools

Most schools had just the bare necessities needed in order to participate and access the programmes. As can be seen in Table 2, all the schools had a satellite TV decoder and a TV set in order to access TeleTuks. Some schools had in addition, between one and two TV sets for other use also. Most schools had at least one videocassette recorder / player, although ED Rampola Secondary School had up to 12 videocassette machines. Five of the schools had PCs for use by teachers, while three schools only had PCs available for learners. Lebowakgomo Commercial College and ME Makhato Secondary School were the only two schools that had e-mail and web connections available for teachers. None of the schools had e-mail connections available to learners, although Lebowakgomo Commercial College had one web connection available to learners.

Three schools - Mabogopedi Secondary School, Nape A Ngwato Secondary School and Thasululo Learning Centre – had telephone links that added an element of interactivity to the satellite broadcasts. All the other schools – ED Rampola, Lebowakgomo Commercial College, ME Makhato Secondary School, Morokalebole Secondary School, Sekhukhune College of Education, and Tabudi Secondary School - had *one-way broadcasts* only.

Table 2: Equipment available at the participating schools

Equipment	Schools								
	1	2	3	4	5	6	7	8	9
Satellite TV decoder	1	1	1	1	1	1	1	1	1
Video cassette recorders	12	2	1	1	1	1	1	2	3
TV sets for TeleTuks	1	1	1	1	1	1	1	1	1
TV sets for other use	2	2	0	1	0	1	0	1	2
PCs - teachers	0	6	3	2	1	0	0	0	1
PCs - learners	0	50	0	18	0	0	0	0	5
E-mail - teachers	0	1	0	1	0	0	0	0	0
E-mail - learners	0	0	0	0	0	0	0	0	0
Web - teachers	0	1	0	1	0	0	0	0	0
Web - learners	0	1	0	0	0	0	0	0	0
Type of access	One-way	One-way	Interactive	One-way	One-way	Interactive	One-way	One-way	Interactive
Interactive via			Telephone			Telephone			Telephone

1=ED Rampola 2=Lebowakgomo Commercial College 3=Mabogopedi Secondary School

4=ME Makhato Secondary School 5=Morokalebole Secondary School 6=Nape A Ngwato Secondary School

7=Sekhukhune College of Education 8=Tabudi Secondary School 9=Thasululo Learning Centre

4.4 Technical expertise and technical training opportunities that were available at participating schools

A study by Ndandani (2001) indicated that 'Handwork', which used to be part of the lower grade curricular programme, should be revisited, restructured and continued into middle school and later merge with the Technology Learning Area at high school level, as Handwork forms the foundation for technology education. Technical expertise and training, however, were not readily available at the schools in this study. Only four out of the nine schools that were interviewed, had technical staff available, as indicated in Table 3. Thasululo Learning Centre had three technical qualified staff members, Sekhukhune college of Education had two technical qualified staff members and Lebowakgomo Commercial College and Nape A Ngwato Secondary School each had one technically qualified staff member.

Three out of the nine schools indicated that they had technical training opportunities available for learners. At Thasululo Learning Centre there were seminars from time to time on how to operate, maintain and repair computers. Morokalebole Secondary School idicated that there were training opportunities for learners in technical drawing, while Lebowakgomo Commercial College had training for learners in electrical engineering theory and motor mechanics (N1). None of the nine schools in the

Northern Province provided any technical training opportunities for teachers. This is, however, not surprising, as it was found by Shturman (1988) that rural school leavers leave their home communities to provide cheap labour in town and cities as soon as they have undergone educational training, instead of staying and helping out in their own communities, while effective computer-using teachers work in schools that have extensive technology resources (Brady in Cannings & Finkels 1993). The Department of Education needs to address the depressing environment of schools in the rural areas in order to attract better teachers.

Table 3: Technical expertise and technical training opportunities available at schools

School	Number of technically qualified staff	Technical training opportunities for *teachers*	Technical training opportunities for *learners*
ED Rampola	0	None	None
Lebowakgomo Commercial College	1	None	• Electrical engineering theory, • Motor mechanics (N1)
Mabogopedi Secondary School	0	None	None
ME Makhato Secondary School	0	None	None
Morokalebole Secondary School	0	None	• Technical drawing
Nape A Ngwato Secondary School	1	None	None
Sekhukhune College of Education	2	None	None
Tabudi Secondary School	0	None	None
Thasululo Learning Centre	3	None	• Seminars of how to operate, maintain & repair computers

4.5 TeleTuks attending patterns

4.5.1 Topics/lessons that schools attended via TeleTuks transmissions

- All the schools attended lessons in Mathematics.
- Eight out of the nine schools attended lessons in Physical Science.
- Six out of the nine schools attended lessons in Accounting and Biology.
- Four out of the nine schools attended lessons in English.

4.5.2 Rate of attendance

The attendance rate for learners as well as teachers was low. Out of the total number of pupils in the nine schools (6 221 pupils), about 6% attended the broadcasts. The highest attendance rate by learners was 13%, which applied to two of the nine schools. Out of the 246 teachers in the nine schools, 11% attended the broadcasts. The highest attendance was 33%, although at one of the schools only. At one of the schools none of the teachers attended the broadcasts.

4.5.3 Frequency of participation

Although the rate of attendance was low, those that attended, were keen and enthusiastic to participate. Most of the schools (6 schools) tuned in four times a week (the maximum number of broadcasts per week). Two of the schools tuned in three times a week, while one of the school tuned in once a week.

4.6 Benefit of the broadcasts

Four types of benefits were investigated: Educational benefit as experienced by *learners,* educational benefit as experienced by *teachers*, other more indirect benefits as experienced by *learners*, and indirect benefits as experienced by *teachers*.

4.6.1 Educational benefit as experienced by learners

The school performance of those that viewed the broadcasts improved, but the attendance rate in the schools was low and it was thus not possible to draw any meaningful conclusions regarding the total pass rate of the participating schools. However, the pass rate of five of the nine schools that received the broadcasts, improved over the three years that the broadcasts took place. In total, the average pass rate of the nine schools increased with 4% during these three years. This is in line with previous research that found that the use of computer-assisted learning improved the academic performance of below-average and average students in the middle school (Becker 1986). Computer assisted learning can enable students to receive the needed feedback, to repeat experiments and learn at their own pace. The integration of computer assisted learning into existing curriculum of heterogeneous classes in which learners are at different cognitive stages, holds a promise to improve their academic achievement and their motivation, and is recommended for studying science (Huppert *et al.* 2002. It is possible that the positive attitude of learners that viewed the broadcasts could have had a ripple effect in cultivating a learning culture amongst all in the school, but further research will be necessary to confirm this possibility.

Although the attendance rate for the schools was low, those learners that attended the broadcasts were very positive. The presentations especially had educational benefits as regard the subjects Mathematics, Physical Science, Accounting, Biology,

Geography and English. The educational benefits that learners stated that they derived from the broadcasts included:

- Information supplementary to information received in the classroom.
- Contents of subjects was made more accessible to learners.
- Improved performance in school.
- Interest in the subjects was stimulated as a result of the audio-visual nature of the presentations.
- Interaction was encouraged.
- Most important aspects were highlighted.
- Experiments and demonstrations (that could not be performed as well in school laboratories), contributed to better insight.
- Different approaches to the same problem were taught and this encouraged independent thinking.
- A broader background in the subject at hand was obtained.
- The way to approach an examination paper was taught.
- Revision for examinations helped to improve pass rates for those who attended broadcasts.
- First-hand knowledge from experts was available.
- Although the presentations were done by specialists in their fields, it was presented at a level that learners could follow.

4.6.2 Educational benefit as experienced by *teachers*

- Different approaches to the same problem enriched learners as well as teachers.
- Teachers gained presentation skills.
- The presentations supplemented the work done in the classroom.
- Presentations emphasised and complemented important points made by teachers in the classroom.
- Pupils who attended, performed better.
- Pupils who attended broadcasts, had a more critical, questioning approach in the classroom, although in a positive sense.
- The audio-visual presentations enhanced comprehension.
- Learners that attended, were better motivated.
- Subject matter was embedded in a wider content that enhanced insight in the real world.
- Presentations were presented at a level that learners could follow.
- Experiments gave a more practical input in addition to the more theoretical classroom approach.
- Learners were encouraged to question and take a more critical and enquiring view.

4.6.3 Other indirect benefits as experienced by *learners*

- Learners gained presentation skills.
- Language skills of learners in especially English improved.
- Learners were encouraged to ask questions as opposed to listening only, which helped to improve their self-confidence.
- Creative thinking was stimulated.
- A problem-solving approach was taught as opposed to a memorising learning approach.
- Technology proficiency improved.
- The broadcasts helped with career guidance by opening up a world of occupations that learners were unaware of.
- Learners were keen to learn more, because the programmes stimulated their thinking.
- Teaching skills of school teachers improved as a result of the broadcasts.
- Learners were made more aware of, *inter alia,* HIV and AIDS.

4.6.4 Other indirect benefits as experienced by *teachers*

- Broadcasts promoted a learning culture.
- Learners that attended the broadcasts had a more positive attitude.
- A technological awareness and interest were stimulated.
- Learners became part of a virtual environment.
- General knowledge of learners improved.
- Learners gained an entrepreneurial orientation, as topics like ownership, business and financial skills were incorporated.
- Discussions and interaction were stimulated.
- Communication skills of learners improved.
- New presentation methods were learned by school teachers.

4.6.5 Implications of findings with regard to benefits

According to the Pearson Correlation coefficients that were calculated to investigate the linear relationship between various response variables in the questionnaire, there seemed to be a high correlation between the perceived educational and non-educational benefits on the one hand and the attitude of the viewers towards the TeleTuks satellite broadcasts on the other hand. The attitude of learners and teachers as regard to the broadcasts, the presenters, subjects, technology and learning, correlated high with benefits they experienced. The sample, however, was too small to make any meaningful statistical conclusions.

The findings of this study with regard to benefits are, however, in line with the benefits that were found by other studies. For example, Bransford, Brown and Cocking (2000)

also found that computers showed a great potential to enhance student achievement, but only if they were used appropriately, as part of a coherent education approach. Lederman, as cited by Esquembre (2002), found that young people are interested in topics related to the real world, and need to succeed early to maintain a positive attitude towards science. Early experiences in physics should emphasise observation, data collecting and the draw of conclusions.

Sheth (2002:591) also found that while textbook problems has no noticeable effect on building strong problem solving skills, computational physics does introduce the necessary skills. Telematics can give students access to remotely controlled real experiments, as equipment is prepared so that students have a reasonable capability of reconfiguring it. They can run the experiment, sometimes remotely watching it using a web camera, and then collect the results from it for local analysis (Esquembre 2002:17). Huppert (2002) found that with computer simulation the concretisation procedure of experiments, simplified by the computer could enable students to receive feedback needed in order to find out if they proceeded correctly with simulation steps. By performing many simulations, repetition of the same experiments under different controlling factors in a consistent manner is possible. By trial and error students can learn at own pace (Huppert 2002).

A Russian psychologist, Lev Vygotsky, found that, for most individuals, learning is most effectively carried out via *social interactions* (Redish 1998). A group of physicists that conducted important physics education research over the past two decades found that *Interactive Engagement* is teaching methods that are designed to promote conceptual understanding through interactive engagement of students in heads-on and computer hands-on activities that yield immediate feedback through discussion with peers and/or instructors (Hake 2000). The advantage of interactive methods of teaching and the contribution of computer technologies in establishing an interactive environment of teaching, are something that has been broadly appreciated by a majority of educators (Blackmore & Britt 1993, Fox *et al.* 1995). For instructors, computers are an opportunity to escape from unsatisfactory methods of science teaching (Trumbull & Kerr 1993). For students, although they stressed difficulties stemming from low familiarity with the use of computers, ICTs is more preferable for teaching than oral lectures in various disciplines (Dechsri *et al.* 1997, Escalada & Zollman 1997, Fox *et al.* 1995, Harwood & McMahon 1997). Pictures are more easily recalled than words (Dechsri *et al.* 1997, Escalada & Zollman 1997). Telematic tools can thus be used to a pedagogical advantage and link students not only to peers, but also with professionals. However, other methods of teaching cannot be totally discarded. Research has shown that textbook-based lectures have, in fact the advantage of explaining and sufficiently analysing concepts and provide a good background (Korfiatis *et al.* 1999).

4.7 Problems experienced with the broadcasts

The attitude towards the TeleTuks broadcasts was positive on the whole, although some problems were experienced:

- Interaction was hampered by an insufficient number of available telephones, insufficient access to e-mail and fax facilities.
- The pace of presentations at times was too fast.
- Development of satellite timetables should be done in consultation with the schools, as broadcasts and school classes sometimes overlapped. An alternative to overlapping would be after hour broadcasts.
- Broadcasts did not always coincide with the contents that was taught at a given time in school.
- Venues for broadcasts were not readily available and the ones that were available did not have enough room and were stuffy.
- Some experiments were artificial in the sense that the smell and touch senses were not made use of as in a live experimental situation.

Redish (1993) found that, in addition to obstacles such as these, a main constraint often was that students come with strongly held ideas about how the world works, many of which seriously conflict with what is being taught and it is a challenge to change these misconceptions. However, it was also found by Clerk and Rutherford (2000:715) that language problems do sometimes masquerade as misconceptions. While language plays a role as a confounding variable in the diagnoses of misconceptions, the extent of the problem is not indicated.

5 Conclusion

In a knowledge-based society, quality education is crucial. Formal education in South Africa is presently reaching the majority of children between the ages of seven and fifteen years. However, actual educational attainment is low. Financial resources are limited and existing educational resources should therefore be maximised in order to improve human resource capacity. South Africa has experts in all fields of study and subjects, as well as an advanced telecommunications infrastructure, such as for example at the University of Pretoria to address the problem of financial constraints and unavailability of teachers, especially in the rural areas.

The survey has found that distance education with the aid of satellite TV is perceived by teachers and learners involved in the initiative to be effective in supplementing classroom education. However, the general attendance rate was low. Although the attendance was low, there was a positive attitude among those who did attended. The most prevalent educational benefit of satellite TV education seems to be the fostering of a positive and interactive learning culture. In addition to educational benefits, satellite TV education was also perceived to contribute to non-educational benefits such as

improvement in technology proficiency, an opportunity for learners to become part of a virtual environment, improvement in general knowledge, the development of creativity and an entrepreneurial orientation, improvement in communication and presentation skills of both learners and teachers, an improvement in self-confidence, career guidance, and *inter alia*, an awareness of HIV and AIDS.

Although the potential is there to give everyone the opportunity to gain access to quality education, it has not been utilised and implemented wide enough in order to reach all disadvantaged communities. The survey has indicated that there are problems to be addressed and challenges (like changing misconceptions) to be met. Firstly, however, the Department of Education should address the deplorable structural conditions in the rural schools. Equipment, for one, should be improved at schools to especially increase interaction and feedback opportunities. The attendance rate could increase with the provision of adequate equipment, as the attitude of both teachers and learners are positive. The performance of learners that viewed broadcasts improved, but the total pass rate of schools could be improved if more pupils can be exposed to the TeleTuks programmes presented via satellite television.

With better equipment, schools could provide opportunities for creating learning environments that extend the possibilities of old technologies (such as books, blackboards) and teacher-centred approaches that emphasise rote learning by individual students. However, academic achievement is only optimised if inquiry skills are developed through feedback, repetition of experiments under different controlling factors and at students own pace via computer assisted learning. The integration of computer assisted learning into existing curriculum of heterogeneous classes, in which learners are even at different cognitive stages, holds a promise to improve their academic achievement and their motivation. New technologies can bring exciting curricula based on real-world problems into the classroom. They could also serve as vehicles to enhance learning, enhance feedback, build global communities, and expand opportunities for teacher learning.

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