THE EFECT OF ICT CURRICULUM SUPPORT ON THE MEASURED SKILLS LEVELS OF LEARNERS OF TWO SUB-PROJECTS OF THE KHANYA PROJECT

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ABSTRACT

The Western Cape Education Department (WCED) launched the Khanya Project in 2001 to address the growing crisis in education in South Africa through the use of Information Communication Technology (ICT). Khanya was derived from the Xhosa verb "ukukhanya", which means to brighten or to enlighten.

The goal of the Khanya Project is to promote learning and maximise educator capacity by integrating the use of appropriate, available, and affordable technology into the curriculum delivery process, and the initial focus was on schools from poorly resourced areas of the Western Cape. The project uses facilitators to support educators in the integrated use of Information Communication Technology (ICT) in their everyday classroom practice and they are a key success factor to the project.

In secondary schools, Mathematics Higher Grade results and shortages in suitably qualified educators to teach critical subjects like Mathematics and Science were the main concerns. The Mathematics Higher Grade (HG) intervention was implemented as a sub-project in 2001 and was the first pilot project undertaken by Khanya. The aims were to improve both learner enrolment and results in the external grade 12 examinations for the subject. An independent assessment agency, from the University Cape Town (UCT), was appointed to investigate the success of the project and some additional internal assessment was done. The formal assessment was done with quasi-experimental design and, although the results were studied for Standard Grade alone, proved a qualified improvement in results.

The informal assessment proved that schools taking part in the intervention improved their enrolment by 31.5% (weighted average) and their pass-rate by 42%. The quality of the passes, i.e. the symbol attained, also improved significantly for Mathematics HG. (For A-symbols the weighted average improvement was 116%).

To address rising concerns over numeracy and literacy in primary schools a Khanya intervention was implemented in 2003 in 60 Khanya Primary schools as a sub-project in the foundation phase (Grade 1 to 3). An E-learning program, with the supporting learning activities, was developed and implemented over 10 weeks in the 60 schools by the Khanya facilitators. A pre-test and a post test, which were based on the principles of the recently applied Joint Education Trust (JET) tests of the WCED, were developed and written in the participating schools. The improved results (9% improvement in the measured numeracy skills and 15% improvement in the measured literacy skills) were very encouraging. Although the tests and interpretation were done internally and acknowledging concerns of statistical validity, it proved very helpful to steer the project objectives.

1. INTRODUCTION

The Khanya Project was launched in 2001 as a WCED initiative, on the authority of the provincial Government Cabinet with the specific focus of making technology accessible to all learners in the Western Cape by 2012. (Khanya was derived from the Xhosa verb "ukukhanya", which means to brighten or to enlighten). Critical shortages of suitably qualified and experienced teachers, especially in certain key subjects, the growing digital divide and the need for urgent redress of the differences in resources between poor schools and privileged schools were some of the challenges facing education in South Africa. The goal of the Khanya Project, as stated in its Business Plan, is "to promote learning and maximise educator capacity by integrating the use of appropriate, available and affordable technology into the curriculum delivery process." [1]

During the last three years, the Khanya team concentrated on providing computer laboratories to schools (in some instances moving computers into class rooms), where the curriculum was then delivered through technology. This report will focus on the curriculum support side of the project and the actual ICT technology roll-out is therefore outside

of its scope. Two main curriculum sub-projects were identified, namely, the Primary School Project, which seeks to support primary school learners in attaining and improving numeracy and literacy skills and the Mathematics Higher Grade (HG) Project, which supports learners offering Mathematics on the Higher Grade (University exemption level). In both sub-projects the goal is to improve the measurable skills of learners in the learning areas/subject through the use of ICT supported curricula.

2. CURRICULUM SUPPORT

Careful study of the academic literature available, as well as similar "failed" projects in South Africa and all over the world, moved the Khanya Project Manager to use "Khanya facilitators" to support schools, management, teachers and learners in the essential "paradigm shift" [2] to use technology in actual syllabus based teaching and learning practise. This unique approach supports operational sustainability and ensures long term success.

In an article written for the Cape Town University Monday Paper [3] the student Health and Welfare Organisation (Shawco) felt that supporting and training teachers was essential for successful integration of ICTs in teaching and learning. "*We have found that there are computers at schools, but because teachers do not have the skills to use them, the computers are just sitting there.*" The literature study further suggested that adequate ongoing support is crucial if the project is to be successful in the long term. The SEIR- TEC report [4] further points out that an ICT project should "*Begin with teaching and learning and not with hardware and software.*" For the Khanya project success does not merely mean successful delivery of technology, but sustained use of the technology in daily teaching practise.

Lundall et al [5] proved a high correlation between positive attitudes towards ICT, which are essential for the success of a project like Khanya, and easy access to professional training. Petrie and Du Toit [6] found the role of school management, teacher buy-in and teacher training to be significant predictors for the success of ICT projects in Western Cape schools. The Web-Based Education Commission [7] in 2000 spelled out clearly to the president and the congress of the United States of America that "*Creating high-tech education tools without training teachers to use them, would be as useless as creating a new generation of planes without training pilots to fly them.*"

The Khanya form of facilitation is a unique application of facilitation, support and training and is a key differentiating factor in the Khanya approach. The facilitators are a team of ex-teachers, all with at least 10 year of teaching experience, including experience in so called "previously disadvantaged" schools and experience in curriculum delivery through ICT. Facilitation starts with hands on, face-to-face ICT skills training of the staff with particular curriculum outcomes in mind. The training is adapted according to the prior learning levels of the educators in the particular school. A brief experiment was done at the onset of the project using e-learning materials to train educators, but this was soon abandoned. Most of the educators needing training have never used a computer before and some have not even seen a real one, which often leaves them feeling threatened by the new technology and extends the lead time for acquiring the necessary skills to use the technology in their daily teaching practise. The trusting relationship with the facilitator is often crucial in changing educator attitudes and overcoming the imbedded fear.

Parallel to the ICT skills training, the facilitators start training on the principles and practise of ICT integration with normal teaching practise and suitable educational software is introduced gradually. Curriculum implementation drives the use of the computer labs and not vice versa, necessitating thorough training in the process. Once the formal training is completed and teachers are confident enough to start taking their normal classes in the computer lab, the facilitator will empower the teachers further through demo lessons and on-going technical - and software support. Just In Time (JIT) training on any new products/software or technical developments is normally part of the weekly visits to schools.

The whole process of facilitation and the related curriculum outcomes with clear project time lines are described in the "e-school project plan" which is drafted by a e-school project manager at the start of the support phase. Once all the outcomes have been reached satisfactorily, the school is viewed as "independent" and visits will become less frequent. The school/teachers can contact the facilitator at any time if they experience problems or need help though, even after they have become independent.

Cuban's research in Sillicon Valley in California, [8] an extremely wealthy, high-tech region in the U.S., found that despite abundant access to ICT in these schools, teachers made infrequent and limited use of computers to deliver curriculum. The main reason given by the teachers was the lack of time available to identify educational software, judge its relevance and try out products in the classroom. This need was addressed by the Khanya content development team, made up of facilitators with particular interest in educational software and lead by a project manager with extensive technical and project management experience. The team was tasked to identify suitable software, pilot its use in schools and even to design and develop educational material for ICT curriculum support where necessary.

It soon became clear that very little e-learning materials/software applications exist that truly comply with the new SA curriculum and a content portal was developed to host e-learning materials developed by the team. Consequently a content creation template has been developed and research on a formal Learning Management System to track learner progress, is underway. The content portal is arranged according to the learning outcomes and assessment standards prescribed by the new SA curriculum. This enables teachers to access materials for use in the computer lab while doing their "normal" planning. As teachers become more confident, the content creation template will be made available to them to create their own learning materials in an effective, time-saving way.

This unique approach has proved very successful and the Khanya Project has received two prestigious awards recognising its success. (http://www.khanya.co.za) The "definition" of success and the debate relating to whether "ICT adds value to learning" requires careful study on the effect of a project like the Khanya Project on measurable skills of learners in key areas.

3. MEASURED SUCCESS

The University of Cape Town Evaluation Team in their report to the WCED [9] came to the following conclusion from studying amongst others, the ImpacT2 and NGFL 2001 programmes in the UK, Apple Classrooms of Tomorrow (ACOT) and ETS National Study of Technology's Impact on Mathematics Achievement in the US: "*Learners who were exposed to ICT (according to a certain model)…obtained higher scores on a standardized achievement test (Stanford9) than learners who were not.*" Some of the results reported were promising (e.g. Impact2 initial findings show 7% increase in A-Cs for GCSE) but in the ACOT programme "*no significant improvement was recorded for performance in Mathematics, reading and vocabulary*".

All the studies took for granted that learners would have at least 2 hours access to ICT as well as access at home. No more than two learners per workstation were allowed and class sizes were indicated to be 25, ideally. In the Khanya target schools learners have little or no access at home and class sizes range from ± 40 to 60. Schools are severely resource challenged and often situated in crime ridden unstable areas like informal settlements. Learners often come from very deprived backgrounds and have to contend with violence and crime daily. Although one to two hours access per learner per week is the aim in the Khanya schools, it limits the use to a few subject areas.

In view of the above, any measurable improvement in learners' skills after being exposed to the Khanya intervention would be significant. The one differentiating factor of the project has been the use of Khanya facilitators and they would have to compensate for many of the factors mentioned above to ensure skills improvement.

The following studies were done to attempt analyzing the effect of the Khanya intervention, which included new and appropriate technology, appropriate software and the support of the Khanya facilitators, on the actual learner skills in the two sub-projects.

1. The impact of the Mathematics Higher Grade Intervention was studied in house and an external assessment agent, The UCT Evaluation Team, was appointed to do an in depth experimental study
2. The impact of the Foundation Phase Intervention (FPI) in the primary schools on learners' numeracy and literacy skills was studied in house. The UCT Evaluation team was approached to do a formal evaluation and the results will be available towards the end 0f 2005.

Both will be discussed in detail below.

4. THE MATHEMATICS HIGHER GRADE (HG) INTERVENTION

The Mathematics HG intervention was the first pilot intervention of the Khanya project and was started in 2001 with 11 schools (called pilot schools). This was extended by another 43 schools in 2002 (second wave schools), another 22 in 2003 (third wave schools) and reached a total of 100 schools in early 2004. The goals were to increase learner numbers offering Mathematics on the HG level and to improve pass rates and general results, as measured in the symbols attained by learners, in the grade 12 external exams. The intervention used a locally designed content rich software application called "Master Maths" and the Khanya facilitators as the training and support element. Schools were instructed to expose Mathematics HG learners in grade 10, 11 and 12 to at least two hours per week in the computer room to ensure even intervention and the teachers were trained by the facilitators to integrate the software with their "normal" classroom practise.

An external assessment body was appointed to do a formal evaluation of the success of the intervention and the Khanya Evaluation Team of the University of Cape Town was appointed through formal tender procedure. The team did an evaluation with quasi-experimental design and published the results in August 2004. [10]

Ten schools were selected for the study sample and a cohort of grade 11 learners (580 learners) was studied for two years. 5 Schools were randomly selected from a list of Khanya schools that had received the Khanya intervention prior to 2003 and 5 control schools were matched to the experimental schools for geographical location, poverty index and school management index. The internal and external exam results of individual learners were gathered and correlated with the strength of the intervention as measured by time spent on the software program Master Maths. The overall finding of the report was: "*there is equivocal support for the effectiveness of the Khanya intervention, in terms of improvement in learners' performance in Mathematics*." Various factors like the differences in standard of the internal school exams used in the study and the extremely small sample (too small to use HG results, forcing the use of Standard Grade results) made it difficult to interpret the improvement/not of learners in the sample and therefore to prove success/failure conclusively.

Further in-house studies were done by the Khanya team to measure Khanya success against the defined goals of the Mathematics HG project, namely, to increase learner numbers offering Mathematics on the HG level and to improve pass rates and general results, as measured in the symbols attained by learners, in the grade 12 HG external exams. Enrolment figures and average Grade 12 Mathematics external results for the schools in the intervention was accessed through the Western Cape Education Department (WCED) for a period of three years before the intervention started and compared to the results of the same schools since the intervention started. Tables 1, 2 and 3 show the results of the study.

Table 1 (Pilot Schools)

HG	1999-2001	2002	2003	%+/- 2002/ AVE	%+/- 2003/ AVE
Enrolment	171	192	194	12	13
Pass	117	132	141	13	21
A	11	25	25	127	127
B	14	20	17	43	21
C	20	29	33	45	65

Table 2 (Second Wave Schools)

HG	1999-2001	2002	2003	%+/- 2002/ AVE	%+/- 2003/ AVE
Enrolment	171	229	238	34	39
Pass	120	170	190	42	58
A	11	27	30	145	173
B	19	16	28	-16	47
C	22	38	39	73	77

Table 3 (Third Wave Schools)

HG	2000-2002	2003	%+/- 2003/AVE
Enrolment	118	152	29
Pass	93	116	25
A	11	12	9
B	11	19	73
C	16	25	56

Definition of terms:

- Pilot schools - The original 11 schools in which the project was piloted. The duration of the intervention had been approximately 2 years during the 2003 grade 12 exams. The original criteria used to choose the schools included a minimum of 85% pass average for the previous three years and the intervention was mainly to reward schools for good results. These school's results were therefore above average to start with and any improvement would be significant.
- Second Wave schools - The next 43 schools to receive the Mathematic HG intervention. These schools were selected by the Education Management and Development Centres (EMDC) and are mostly poor schools that are well managed. The intervention time had been approximately one year during the 2003 grade 12 exams and most schools' results were good or at least average before the intervention. Because of the short time and the high base of the intervention any improvement in results are therefore significant.

- Third Wave schools: - The next 22 schools to be exposed to the Mathematics HG intervention. These learners had been exposed to the intervention between 2 and 9 months during the 2003 exams and any improvement would be highly significant.
- 1999 – 2001 - Indicates average results for those years
- 2003 and 2004 - Indicates the results for the particular year
- %+/- 2002/AVE – Indicates the % increase/decrease implied in the results from pre-Khanya up to 2002 exams. Positive numbers indicate increase and negative numbers a decrease.
- %+/- 2003/AVE – Indicates the % increase/decrease implied in the results from pre-Khanya up to 2003 exams. Positive numbers indicate increase and negative numbers a decrease.
- Enrolment:- Indicates the total number of candidates enrolled for Mathematics in the schools
- Pass – Indicates the number of learners who passed Mathematics on the grade indicated
- A – The number of candidates who passed with a Maths mark between 80 and 100%
- B – The number of candidates who passed with a Maths mark between 70 and 80%
- C – The number of candidates who passed with a Maths mark between 60 and 70%

Enrolments improved significantly for Pilot (13%), Second Wave (39%) and Third Wave (29%) schools. These improvements were above expectations and more than reached the Khanya goal to improve Mathematics HG enrolments.

Pass rates were significantly up for Pilot (21%), Second Wave (58%) and Third Wave (25%) schools. These improvements were very encouraging, especially in the schools where Khanya has been active for more than a year. The results also satisfied the Khanya goal to increase Mathematics HG passes.

Improvement in number of A symbols: This improved even beyond expectations, again especially in the second wave schools where Khanya had been active for more than a year (173%). The total 127% improvement for the Pilot schools, which probably indicates saturation and the 9% improvement for the Third Wave schools, is significant, bearing in mind the time limitation for the latter.

The UCT Evaluation team will do further studies with the same subject as the informal study and the results will published after that. The informal study, albeit with some acknowledged statistical problems, was very useful in identifying the problem -or exceptional schools as well as effective/ineffective facilitation practise. Best practise could be identified, studied and applied.

5. THE FOUDATION PHASE INTERVENTION (FPI) IN PRIMARY SCHOOLS

A consortium of researchers from the Joint Education Trust (JET), the Schools Development Unit at the University of Cape Town and the Educational Research Agency at Stellenbosch University were appointed to administer a Literacy and Numeracy test to the Grade 3 learners in all WCED primary schools in October and November 2002. The researchers' report on the assessment exercises were received by the Western Cape Education Department and results sent to the individual schools.The results of the tests for grade 3 learners showed that a large percentage was functioning at inappropriate levels (too low). Some had not even mastered basic numeracy and literacy skills and some learners had not yet reached Grade 1 level.

In response to these disconcerting figures, the Khanya Project launched a curriculum intervention in the 60 Primary Schools that the project had reached by that time. The goal was to address these skills shortages through e-learning activities hosted on the Khanya Learning Management System (LMS) with the active support of the Khanya facilitators. This intervention lasted for 10 weeks during the last semester of 2003.

A pre- and post test was drafted and written by each learner in grade 3 in the different Khanya primary schools. The facilitators were used to design and develop suitable e-learning activities, to distribute it to the schools and support the teachers in the implementation. They were also used to invigilate and mark the tests to pre-empt any interference by teachers.

Each individual learner, school and district's marks for the two tests were gathered and the improvements calculated. Average improvements were calculated per school. The average improvements for the whole project were: 15% for Literacy and 9% for Numeracy. It is clear from Figure 1 that only one school did not improve (negative value indicates decrease in marks from test 1 = pre-test to test 2 = post-test), 11 schools improved by 25% and 5 schools by even more than 25%. Figure 2 shows that 20 schools improved by 18%.

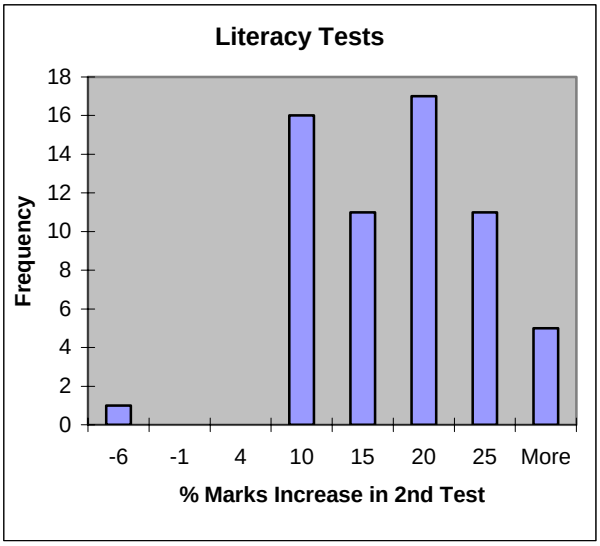

Figure 1

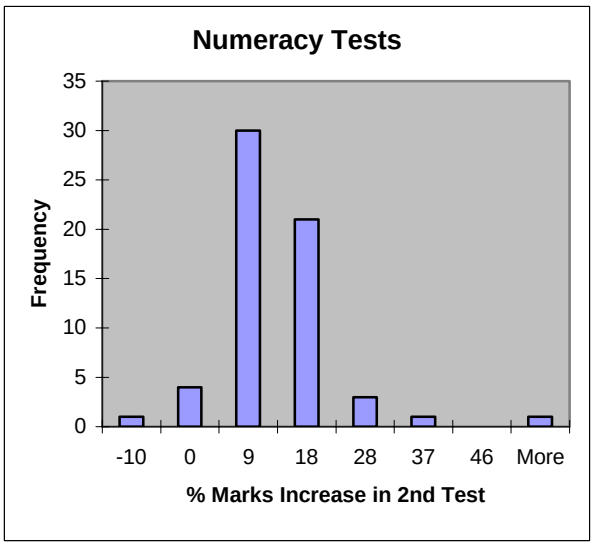

Figure 2

These results were very encouraging, even though the tests and interpretation were done internally and acknowledging concerns of statistical validity, it proved very helpful to steer the project objectives. Further investigation is needed to study the various factors that may have influenced the results, e.g. the skills and success of a particular facilitator, the entry level skills of the learners and the skills of the particular teachers.

6. CONCLUSIONS

The overall finding of this report is that there is enough evidence that the Khanya intervention made a measurable difference in the skills of learners in both the two sub-projects. This proves that the project has been very successful at attaining its particular goals through the use of ICT.

The Khanya intervention implies much more than the use of ICT for curriculum delivery, though. Further study is required into which part of the intervention, i.e. which variables are correlated to the success, or even which variables would be predictors of success, for a project like the Khanya project. The role of the Khanya facilitator, which is unique to the project in this form, could be a determining factor of success.

7. REFERENCES

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