

Use of Low-End ICT's as a Platform for Teacher Development: An Evaluative Case Study of an Interactive Radio Programme in South African Primary Schools

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ABSTRACT: This paper focuses on the implications of using low-end Information and Communication Technologies (ICT's) in developing countries as a way of providing educational support to teachers at school and classroom levels. It describes the development of the Open Learning Systems Education Trust's "English in Action" programme from 1993 to the present. It first discusses changes in the programme's conceptualisation from a uni-modal distance education model focused on enhancing learner involvement and learner gains to a multi-modal model focused on using open learning principles to improve teaching and enhance learner involvement at school and classroom levels. It then describes the expansion of schools, teachers and learners involved in the "English in Action" programme over a fifteen year period, and highlights the ways in which print materials and low-end ICT's have been used as a vehicle for enhancing the skills of the teacher through teacher support and in-service teacher training. At the end of the paper, implications, limitations and possibilities of using low-end ICT's to support educational change in developing countries are discussed in relation to the experience gained through developing and evaluating this particular programme in relation to the wider interest in radio learning which is emerging both in Africa, as well as more broadly internationally.

Key words: Low-end ICT's, distance education, open learning, interactive radio instruction, teacher development.

Information and Communications Technologies (ICT's) and Education

Both Perraton [25] and Daniel [6] suggest that Open Learning and Distance Education have important roles to play in making education accessible and affordable to large audiences in both the developed and the developing world. Information and Communications Technologies (ICT's) are conceptualised as providing a means of mass delivery in meeting the Millennium Development Goals, enabling open learning and distance education to be used on a large scale for a variety of purposes. These include meeting educational needs, skills development, capacity building, and the training of teachers [6][26]. It has been suggested that ICT's have particular potential in offering cost effective modes of access to high quality education to previously

marginalized learners [1] [19]. This is the case both within formal as well as in non-formal and community educational settings [9] [33].

Whether the strategies of multimodal delivery used in distance education in developed countries (usually based on high-end ICT's such as television or computer-based instruction) can be effective in providing affordable access to education in Africa and Asia is, however, doubtful [4] [10]. While cellphone usage has been expanding rapidly internationally, the digital divide remains a feature separating the developed and the developing world [7] [16] [35]. In many developing countries in Africa, in particular, both infrastructure and abundant connectivity are limited [7] [16].

High and Low-End ICT's in the Developed and Developing World

Introducing high end ICT's (and in particular e-learning) is also a more complex issue than purely providing access to technology [10]. In those areas of the world where infrastructure and abundant connectivity exist, there are many possibilities for use of high-end ICTs for social and educational development purposes [4][35].

While provision of physical access to broadband technology is essential to enabling use of e-learning for educational purposes, this needs to be balanced against evidence that computers and connections are likely to be insufficient if the technology is not affordable, if people do not understand how to put it to use or they are discouraged from using it, or the local economy cannot sustain its use [4]. Given economic as well as infrastructural problems in many developing countries, it is unlikely that high-end ICT's will be able to be used effectively on the scale necessary to bring about the types of educational and social change necessary to achieve the Millennium Development goals by 2015 for Africa and Asia [16] [19] [35] [36].

Radio Delivery and Interactive Radio Instruction in South African Primary Education: A Case Study

This paper focuses on the potential of using low-end ICT's such as radio, as the basis for initiating change processes relating to teacher upgrading and learner

support in developing countries. The development of the “English in Action” programme in South Africa is used as a case study to illustrate the possibilities of introducing affordable low-end technology based on radio and print materials as the basis for enhancing the skills of teachers and learners at the primary school level (i.e. at the base of the educational pyramid). The model suggested is based on the assumption that maximum possibilities for educational development occur where ICT’s are used to enhance the skills of teachers [33], as well as to develop new forms of dialogic interaction between teachers and learners [10].

The South African Radio Learning Programme: Pilot and Initial Implementation Phases

Prior to the first democratic election in 1994, the South African Radio Learning Programme implemented by the Open Learning Systems Education Trust (OLSET) was set up to offer direct support to the South African Department of Education in improving the quality of teaching in primary schools. It targeted the development of English language competencies in the junior primary phase, through the medium of an interactive radio programme called “English in Action” (EIA).

After an initial pilot, 118 radio lessons were scripted in 1993 to support the teaching of English at Grade One level. This programme was implemented with 14 500 learners in four regions of South Africa in 1993 and 1994. This was followed in 1994 by the development of 130 radio lessons at Grade Two level. The lessons were of half an hour duration, and were recorded on audio-tapes.

The programme’s model of implementation during the pilot phase was content-driven, and unimodal in focusing on providing instruction for learners (ie primary school children). It relied on multiple media, in that the radio lesson was supported by printed classroom materials. These included a teacher’s manual, as well as printed classroom posters and alphabet friezes to support the radio lessons [17].

Evaluation over the Initial Developmental Stage: A Shift from Uni-modal to Multi-modal Focuses in Delivery

The programme was subject to formative evaluation from its inception. A multimethod evaluation design was developed based on a process of interaction between the evaluators, community representatives, teachers and the project team. Quantitative data on costs and benefits were gathered from project records supported by field observation, as well as through pre- and post-testing of learners, conducted in 71 schools (36 project and 35 matched comparison schools) [30]. This yielded evidence of significantly better performance on English language tests favouring the project schools ($F = 118,31$ (70); $p < ,0001$; $R = 0,39$).

Focus groups and narrative case studies of the programme in the schools were conducted in all regions in which the programme operated, involving a range of community stakeholders [20] [22] [31]. Additional qualitative data were gathered from school visits, classroom visits and observation of lessons, the reports of teachers, principals and parents concerning pupil progress, observation of teacher support groups, and interviews with project staff and with teachers. An economic analysis was also conducted, projecting the costs of radio learning in relation to different scales of implementation in terms of learner numbers, and comparing these data with alternative forms of instruction [5].

Through observing and documenting the strategies involved in supporting teachers and schools with radio-tape recorders, audio-tapes and classroom print materials, these evaluation requirements introduced a variety of additional levels of interaction between the project team and the teachers. These involved regular school visiting and observation, as well as demonstration lessons involving visits to neighbouring schools [30].

The Development of the Radio Learning Programme 1995-2001: A Model of Teacher and Learner Support at Large Scale

After the USAID grant came to an end in 1996, the radio learning programme was fortunate in attracting generous Norwegian Embassy assistance. Funding was provided to the programme through the NORAD basic education support programme.

Given fixed resources, all available finances were put into the project’s distance education intervention, with priority being placed on supporting schools in poor communities. Given increased demand, the programme expanded into eight provinces, despite having a fixed and inelastic budget.

Increase in Numbers of Participating Schools, Teachers and Learners

In addition to focus on existing schools, there was a continuous pressure and rising demands from teachers in other non-OLSET schools to be included in the programme [21]. This was the case in each of the eight provinces in which the radio learning programme was working.

The growth in teacher and learner numbers was thus initially rapid, but then reached a ceiling in 1998, as will be evident from Table One below.

TABLE ONE: GROWTH IN TEACHER AND LEARNER NUMBERS IN THE RADIO LEARNING PROGRAMME OVER THE PERIOD 1993 – 2000.

Year	Number of Teachers	Number of Learners
1993	319	14 249
1994	995	42747
1995	1440	72 000
1996	2496	125 000
1997	4540	227 000
1998	4297	301 124
1999	6257	312 000
2000	6240	325 000

By the end of 1999, the demand for the programme had outstripped available financial resources. There was a severe impact on the ability of the project team to deliver support to the schools, as the growth in numbers had exceeded the financial resources and capacity of the programme. There were also a number of tensions experienced in the work and school environments due to the rapid growth in numbers of participating schools and teachers [19].

Evaluation Findings relative to Issues of Resources, Organisation and Sustainability

Nevertheless, despite the tension between demand and resources, teachers remained supportive of the programme, as indicated by interviews and focus groups conducted with teachers at different centres around the country [23], by questionnaires [18] [28] and by case studies [32]. In addition, despite patchy support to project schools, data from pre and post-testing indicated significant learning gains among project learners as compared to learners in matched schools not exposed to the programme [15].

By the year 2000, the programme's funding base was too limited to take it to scale. What the programme needed, given favourable international review of its work [26] [33], was the funding and institutional support necessary to support work at large scale in the provinces in which implementation was taking place, and to expand further to national scale working with all educational authorities in the country.

Increased International Funding for Implementation at Large Scale

In July 2001, British Department for International Development (DfID) took the decision to provide funding to the programme on a large scale. A grant was provided to the project in July 2001, with the objective of taking the Radio Learning Programme to scale across South Africa. This implied upscaling the Radio Learning Programme countrywide to accommodate and provide material support to the most remote rural learners and teachers. Encouragement was also given to make the programme's experience in teacher development in South Africa available via the BBC/OLSET Teachers in Action programme to other developing countries.

The funding support provided at this point had the effect of transforming the Radio Learning Programme's way of working, providing it with the financial resources and donor backing to take the programme's implementation to national scale. The funding was directed at facilitating access of teachers and learners to increased OLSET support in eight provinces. Large-scale production of learner and teacher support resources was also possible through the increased funding. These resources were printed, made available for distribution and then disseminated to schools [19].

In addition, increased institutional support from the SABC enabled schools to benefit from an increased radio footprint for daily EIA programme broadcasts. This was provided via five SABC regional Stations.

The Programme's Logical Framework for Implementation at Large Scale

DFID funding was linked to a set of criteria, based on the programme's logical framework. These were linked to specific aims, intended outcomes, inputs and outputs, reflecting the programme's theory of implementation [37].

Within the logical framework, the programme's aims as at July 2001 were to:

- improve the quality of teaching at primary school level
- increase the capacity of teachers to implement the new curriculum
- provide access to educational materials, and
- increase the level of engagement by learners.

The programme's inputs included resources from direct funding, as well as contributions in kind from the provincial education authorities (e.g. contributions by seconded staff to in-service training and support of teachers), as well as from the national broadcaster (eg airtime; access to the SABC's national radio footprint). The programme's envisaged outcomes were to develop and implement both a series of classroom-based interactive radio lesson as well as a curriculum for teacher support. Low-end ICT's (radio and print materials) would be used to provide a platform for teacher support and development. This would involve a number of elements including in-service teacher training workshops, in-school visits by regional teacher training coordinators and teacher support groups [19].

For learners at Grade levels One to Three, the programme would provide one audio lesson per day for a total of 180 school days in a year. The radio lessons would be supported by classroom print materials. There would also be a number of additional specific outputs, including:

- provision of radios to schools
- providing radio broadcasts for mass access to programme content

- training teachers in implementation of the programme
- training teachers in outcomes based education
- integration of radio learning programmes into school timetables
- production and dissemination of complementary teaching and learning print materials
- broadening and deepening of the content of the RadioLearning Programme to accord with the national curriculum
- scaling up to deliver these services to a beneficiary base of 70 000 teachers and 2 500 000 learners over 5 years, primarily in marginalized and rural areas
- engaging with educational officials in the national and provincial departments to achieve the above outcomes.

Developing Partnerships with the Educational Authorities and the National Broadcaster: Evaluation Findings

As at July 2001, it was estimated that 14 500 teachers were involved in the programme and that these teachers and an estimated 680 000 learners listened to the radio programme on a regular basis. The programme materials had been expanded from an original 118 to a total of 180 audio lessons to support implementation at Grade One, 130 lessons for Grade Two, and 180 lessons for Grade Three levels. These materials had been tested over a number of years and substantially revised to align with the outcomes-based format of the South African primary school curriculum [19].

By the end of 2003, the involvement in the programme across these provinces had grown to 30 167 teachers and 1 302 728 learners, in terms of an implementation model in which educational officials in the participating provinces worked side by side with programme staff in providing in-service training and support to teachers at school level. At this point, DFID conducted its summative review of the programme, using an evaluation team of three DFID project officers [8].

The reviewers noted progress made on each output in the Logframe. Certain problems were noted in implementation with respect to distribution of radios and supporting print materials due to problems in the DFID procurement process as well as with shipping. This had knock-on effects into other areas of implementation, and also affected teacher support workshops. Based on their reading of internal and external programme documents and evaluation reports and the observations made by the evaluation team during programme site visits, the evidence suggested that all other outputs had either been achieved or had largely been achieved.

Current Evidence from Evaluation

Since 2004, the Dutch government has undertaken to fund the programme at its current scale. The proposals for funding over the current period focus on the necessity of providing support to South African schools as a long-term as opposed to a short-term commitment. Programme implementation continues to reflect the principles of:

- providing access to the resources provided by the programme, for large numbers of teachers and learners
- focus on under-resourced urban and rural schools
- focus on teacher and learner development
- work on curriculum implementation for both teachers and learners in partnership with the educational authorities and the SABC.

Evidence from classroom observation and interviews conducted in project schools [29][34] indicates that teachers perceive clear links between the programme's materials, the national curriculum, and the types of in-service training and support provided by programme staff. Our data would thus suggest that continuing advocacy is based on the perceived value of both the programme's teacher and learner support curricula. It is also based on the wide-spread needs in South African schools for support and in-service training, which is introduced in tangible and practical terms.

However, sustainability remains an ongoing tension. The programme has been dependent on donor funding since its inception. This is provided for a fixed time period, at the end of which there are inevitable insecurities among project personnel, which affect commitment and in certain cases staff continuity. Summative evaluation also occurs at times near the end of each three or five year funding cycle, when these types of tensions in the programme are highest.

Current Implementation Trends in the Programme

On the basis of large-scale acceptance and usage of the programme at school level, as well as the perceived value of the classroom-focused in-service training and support provided to teachers, a number of provincial departments of education have endorsed use of the programme's learner support materials by teachers as an integral part of their classroom teaching. These departments have also endorsed the ongoing in-service involvement of large numbers of teachers in the programme's teacher support group activities and workshops [31]. The scale at which this has taken place will be evident from Table Two below.

TABLE TWO: TEACHER AND LEARNER NUMBERS INVOLVED IN THE SOUTH AFRICAN RADIO LEARNING PROGRAMME OVER THE PERIOD 2001-2008.

Year	Number of Teachers	Number of Learners
2001	15 557	622 280
2002	21 745	892 989
2003	30 167	1 302 728
2004	52 000	1 820 000
2005	38 782	1 357 370
2006	36 328	1 272 480
2007	34 727	1 389 080
2008	32 530	1 301 200

Note: Figures based on estimates calculated from attendance at regional teacher support workshops organised jointly with the education authorities in all nine provinces..

At time of writing (March 2009), over ten million learners have been involved in the South African Radio Learning Programme's interactive radio lessons in the foundation phase of primary school over a seventeen year period since the programme's inception at the beginning of 1992. At current scale, there are currently an estimated 40 000 primary teachers and 1.3 million learners across nine provinces who utilise the programme's materials annually. The teacher and learner support curricula developed by the programme have been well tested in the field, having been developed, implemented and evaluated in the classrooms of large numbers of teachers [31].

Lessons Learned

Despite the difficulties highlighted in this case study, there are a number of positive lessons which can be learned from this particular programme's experience of working in an African country in which there is reasonably well-developed infrastructure, in terms of roads, electricity and water, telephone lines, hospitals, clinics as well as schools. South Africa has been characterized as both a first and third world country. In this context, we would suggest that it has been the combination of different forms of programme delivery using low end ICT's and the programme's provision of tangible and practical school and classroom-based support, which have contributed to strong advocacy by teachers and principals at school level.

We would also suggest that the emphasis placed on ongoing internal (formative) and external (summative) evaluation has contributed to the programme's ability to analyse and document the processes and tensions involved in its development [14] [21][28] [30] [31]. This has enabled the programme to draw on longitudinal evidence concerning learning gains [15] [30], evidence concerning the ongoing grass-roots support of teachers and principals at school level [23] [32] [34], and evidence concerning the strong advocacy of educational officials and bureaucrats [31].

The lesson learned from longitudinal evaluation of the programme is that acceptance of an innovation involving ICT's is gradual and incremental, and needs to be developed on multiple levels in the educational hierarchy [11]. In the case study we have presented, we

would suggest that multiple sources of evidence have contributed to the perception among educational officials that "English in Action" provides in-service training and support for teachers and learners which is compatible with the policy of the South African educational authorities with respect to outcomes-based education [19] [23] [29].

Our data indicate that there has been particularly firm advocacy on the part of departmental subject advisers, many of whom have worked with the programme staff in teacher in-service training workshops. Given acceptance of the programme by teachers and its partnerships with the education authorities and the SABC, the programme has achieved a certain level of institutionalization [8]. It currently forms an integral part of the educational departmental structures with respect to in-service training and support to schools. Nevertheless, sustainability remains a problem, and the programme remains dependent on international donor support, as opposed to financial support from the educational authorities [31].

Implications

The South African Radio Learning Programme's theory of implementation is based on principles of open learning, in assuming that a platform for teacher development can be created through interactive audio and radio lessons, and through print materials delivered to schools [19]. The sequence of instruction implicit in these materials is conceptualised as a means of providing ongoing support and teacher in-service training aimed at improving teaching more broadly across the curriculum. The aim, as Perraton [25] suggests, is to use affordable low end ICT's as a means of providing access to large numbers of schools, teachers and learners, and, as Bray [3] suggests, to use technology to open possibilities for development and change.

Given positive evaluations and the large numbers of teachers and learners who have been involved in the South African radio learning programme over the past seventeen years [31], we would suggest that the case study we have presented in this paper is relevant to the achievement of the millennium goals of universal primary education as well as universal literacy and numeracy. It would also support the resurgence of interest in radio learning and the potential of radio as a low-end ICT which can play roles in both teacher support and learner development, particularly in the developing world.

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