

NEW USES FOR OLD TECHNOLOGIES

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by

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ABSTRACT

Radio as an instructional technology has been used in many situations with varying degrees of success, but the evidence on the effectiveness of radio in language teaching is largely anecdotal. Radio has obvious advantages in low-income countries with geographically scattered populations. For countries in which a national language policy requires the teaching of a second language on a massive scale, radio can be the most appropriate medium and represents the greatest extent to which technological innovation can be implemented.

The Radio Language Arts Project currently nearing completion in Kenya represents one model for the use of radio in language instruction. This five-year research and development effort is systematically assessing the cost and benefits of an intensive use of radio to teach English to lower primary children in rural Kenyan schools. This paper discusses radio's effectiveness in providing quality language instruction to meet the social and educational goals of developing countries and provides some implications for radio's interaction with other technologies.

When I first looked at the program for this conference, I felt like a voyager who had just come ashore in an alien land. Even the language was strange: dot matrix, template, authoring systems. But then, in amongst the strange terms and labels were some words that seemed familiar: literacy, reading, writing, testing. Even parser was almost friendly.

I realized I was not in a strange land, and that I had not slept through a decade of technological development. Instead I had been focusing on a different kind of development--not one that encouraged thinking about limitless technical possibilities, but one that tried to compensate for the economic constraints of the poorest countries. For the past 5 years, I have been looking at radio as an appropriate technology and medium for teaching a foreign language in the classrooms of developing countries.

There are several ways in which teaching by radio relates to the shared concerns of this conference:

- the subject is language
- the methodology is interactive
- the origins are programmed learning and computer assisted instruction.

What I would like to do in the next few minutes is to describe the use of interactive instructional radio in teaching beginning English as a foreign language to very young children.

This research and development radio project, funded by the United States Agency for International Development, is being carried out in Kenya, and although final data analyses haven't been completed, preliminary data clearly show that teaching English by radio is not only possible, it is better than what happens in the conventional classrooms.

After a description of the project, I would like to pay particular attention to the characteristics of intensive, interactive radio that have implications for other media—not that other media and good teachers don't use these techniques already, but the project in Kenya further validates a methodology that is productive in language teaching. In addition, it maximizes the use of an inexpensive delivery system already in place in most developing countries.

Why Radio?

There are a number of reasons that probably seem self-evident but that are important to review in order to shift our attention from the medium to the users. Too often our technology has had to go in search of an educational problem in order to justify the time and effort going into the development of the technology. Educational problems abound and in Africa, for example, are being compounded by population growth, rising expectations, and limited resources. Looking at the potential student population and the educational issues led us to radio rather than the other way around.

From the users point of view then, there are important reasons for selecting radio to assist education.

Radio provides the greatest access to the largest numbers. No other medium is as universal as radio and requires as little from its users. It is estimated that there are more than 2 billion radios in the world. Although radio ownership is unevenly distributed, studies show significant radio ownership and listenership among all social classes even in the world's poorest countries.

Since radio does not require literacy, it is the most democratic medium, able to talk to the isolated rural farmer or the overcrowded urban family in a language or languages they know.¹

Radio is familiar and non-threatening. People generally have positive feelings toward radio, which has conventionally brought news, information, and entertainment. Instruction by radio may be less familiar, but attitudes toward the medium and the process of acquiring information through this medium support the use of radio for education.

Radio is cost-effective. The initial cost of developing good instructional radio lessons can be high. As with any curriculum reform and teaching materials development, however, these costs are pro-rated over the numbers of learners eventually reached and over the years the materials are used.

As an alternate strategy for up-grading the quality of, and access to, education, radio compares very favorably with pre-service and in-service teacher training or with curriculum reform and textbook development. An analysis of per student costs in one of the previous AID-funded instructional radio projects determined an annual cost of between \$.50 and \$.75 per pupil. Once lessons are developed, the cost per pupil decreases because the same lessons can be broadcast over and over to thousands of children.²

Radio can entertain at the same time it teaches. Entertainment is not unique to radio, but it is an expected part of radio's normal sound. The role of songs, a familiar aspect of radio, is firmly established in language teaching. Radio can model the songs and encourage participation in a highly professional way. During a typical radio lesson in Kenya, for example, children are asked to sing a song:

We have done it!
We do it every day.
We have done it!
We did it yesterday.
What are we doing?
We are growing, so are you.
We are growing, growing, growing,
And we're learning English too!

While singing, pupils are reinforcing important linguistic forms: do, did, are doing, and have done. The radio lesson then switches to a reading

exercise in which pupils read from the blackboard and from their worksheets. Radio is enjoyable, but the entertainment can be planned to introduce new concepts, practice new skills, and review old linguistic forms.

Radio instruction can make use of the best language teaching methods. Radio programming requires the use of instructional design principles, with very clear objectives, carefully sequenced practice, varied examples and situations, and frequent review. Although radio has a number of constraints that limit its effectiveness, many innovative methods and techniques can be employed in writing radio lessons. In fact, some of the constraints are what encouraged the writers in Kenya to concentrate their efforts to develop the interactive aspects of the English lessons.

Radio can establish a uniform standard of excellence. Radio can bring expert instruction into the classroom in support of the inexperienced or ineffective teacher. In a language class, this may mean both the quality of the language spoken and the quality of instruction.

Radio lessons can be designed and produced to take advantage of the best speakers of the language, providing models of the language that are acceptable standards of the community. Equally important, radio paces the lessons, providing variety, enthusiasm, intensity, and structures the sequence of learning activities in ways the inexperienced teacher may not be able to.

Radio is still a novelty in the classroom. While widely available in homes, radios in classrooms are still not typical in most underdeveloped countries. Radio receivers and batteries to operate them are costly. These costs cannot be lightly dismissed, but compared to alternate delivery systems, radio provides an effective and exciting door to opportunity for children in poor rural areas.

For foreign language learning, the novelty of radio provides another important incentive to learning. It seems to make speaking English a more natural activity in the context of rural classrooms. It is largely a game or a fiction for the classroom teachers to speak English; they know the mother-tongue of the children after all. But it is natural for the remote radio characters to speak English and to expect the children and the classroom teacher to respond to them in English. It is our observation that children do not find speaking English with the radio strange at all. The practice of

English with the radio becomes much less "foreign" than the typical classroom exercise of the same type carried out by the teacher.

Radio is effective. There is mounting evidence that intensive, interactive radio is effective. For over 10 years the Office of Education, Bureau for Science and Technology, USAID, has supported research and development in the use of radio to teach basic primary subjects.³ In short, an intensive use of radio that makes frequent use of student-radio interaction is dramatically more effective than conventional classroom instruction in the subjects and in the countries where the method has been tested.

Many of the positive effects of radio on the user are not unique to radio as a medium of instruction. Good language classroom teachers can be more effective than the radio. They can be entertaining, well organized, excellent speakers, well trained, and they are certainly familiar. But good classroom teachers are expensive to train and expensive to maintain and are often rare.

Interactive videodisc instruction can be novel, entertaining, well organized, and of uniform standards. But videodiscs and computers are not yet accessible to the millions of primary pupils in developing countries.

In summary, the most convincing reason for using radio seems to be that it can bring the least expensive quality instruction to the largest number of students.

At this point, let me illustrate this reason with the example of the Radio Language Arts Project in Kenya.

Radio Language Arts Project

The Radio Language Arts Project is a 5-year research and development project designed to test whether radio can be used as the major medium of instruction for teaching English as a foreign language at the lower primary level. English is taught in Kenya as a subject in the first three grades while the mother-tongue of children is used as the language of communication and instruction. At fourth grade, English becomes the medium of instruction.

Put simply, our goal was, at the end of three years, for children in the radio classrooms to know and use English better than children in the

conventional classrooms. Although the conventional classrooms vary, typically they have a teacher and an audio-lingual textbook series written for Kenyan children.

In order to test whether we succeeded in our major goal, we employed a fairly classic educational research design to compare pupils at each grade level over a three-year period. Pupils in the control classrooms--who heard no radio lessons--and pupils in the experimental classrooms, that is the radio classrooms, were in the same schools. We used this method of selecting classrooms in order to match pupils as closely as possible in cultural, linguistic, economic, and educational experiences.

The way it worked was that grade 1 pupils in the control classes were tested at the end of the year. No radio instruction occurred during that year. These children then moved to grade 2 the next year. While they were receiving conventional instruction in grade 2, we taught grade 1 by radio. At the end of that year, we tested the grade 1 radio pupils and compared them to the grade 1 conventional pupils from the previous year. We continued this lapped-year design throughout the three years of radio instruction which ended in November 1984.

All in all we have identified about 80 variables in the research of the project, and within a few months we will be able to discuss a number of research questions. Our main interest, however, was to see whether in two sets of comparable children, the radio children, as a group, could perform better in English.⁴

We also were interested in the transferability of the interactive instructional radio methodology to other countries with similar educational concerns. We wanted to demonstrate at the end of the project that these lessons, developed specifically for Kenyan children, could be adapted effectively and with modest new costs to other educational settings and subjects. We were interested, therefore, in the development process as well as the pupil achievement.

The Development Process

Some understanding of the process is important to illustrate how this form of interactive instructional radio is different from educational radio as most educators know it. Familiarity with the process also may help to show how the radio methodology was adapted to Kenya's needs and can be adapted to other situations, other countries. Some of the features of the process include the following.

Radio is only one strategy. We assumed that radio could not carry all instruction necessary in learning a language, although as it turns out it can do a better job than we thought. We held the point of view that technology would be used in response to the most critical educational problems, not in isolation but in interaction with other strategies.

The curriculum is already in place. We based the radio lessons on the Kenyan national English language curriculum for grades 1 - 3. That assured acceptance by local educators and avoided extensive discussions about what to teach. It also meant that whatever flaws there were in the curriculum had to be lived with if our evaluation was to be fair to both groups of pupils. This turned out to be a troublesome point. The Kenyan curriculum is very heavy linguistically. Grammatical patterns are complex, vocabulary is often arbitrary, and situations for use of the language are more literary than expository and informative. This problem should not have influenced one student group more than the other, except that the linguistic content affects the kind of radio activities that can be designed for instruction and practice. The linguistic structures also affected the Kenyan educators' expectations of what the radio would teach. At the same time, we felt the curriculum limited the naturalness of language used that might have led to greater gains in proficiency.

Radio lessons are carefully organized. Based on a review of the curriculum, the next step was to develop a plan for the script writers and radio producers. Instructional objectives, in the form of specific linguistic competencies, were specified for each week. By grade 3 these were stated in the form of topics and functions. In order to assure that we were covering the same linguistic content we also specified the structures and suggested vocabulary for the week. Situations for using the language, however, usually

dictated what the writers would write about. This document, the plan for the year, prepared by language teaching specialists, was the year's guide for the writers. It was at this stage of planning that we were able to take a more innovative approach to language teaching.

Radio lessons are divided into short segments. Radio lessons cannot simply be a textbook read over the air. In order to provide effective radio teaching and to meet the daily broadcast schedule for schools, the writers followed a very strict format based on the concept of segmented, varied presentation and practice, and on the concept of distributed learning. (This is discussed in more detail below since this is the special quality of interactive instructional radio that has direct relationship to other teaching technologies discussed at this conference.) The radio lesson format—but not the entire lesson—was field tested before school broadcasts began with Kenyan primary school children.

The 30-minute lessons are divided into major blocks of time and content, and each block is divided into smaller segments. A segment may take as little as 10 to 15 seconds but is more likely to be a minute or two in length. Segments related to a particular skill, reading for instance, may make up a block of 5 or 6 minutes. A fixed portion of air time is planned and allotted to each block and segment.

Writing assignments were divided among the writing team by means of these blocks and segments. The project broadcast one 30-minute radio lesson per day for 195 lessons per school year. The project staff wrote and produced these lessons plus pupil worksheets and daily teachers notes.

Radio lessons require careful formative evaluation. Since radio is a one-way medium, instruction passes by the learners only once. If the instruction fails, writers need to know whether the problems are with the instructional methodology, the time on task, or the medium itself.

The AID-funded interactive radio projects have developed a unique formative evaluation process that has shortened development time and resulted in good radio lessons.

Interactive Radio

There are a number of reasons children in Kenya may be learning English in the radio classrooms in addition to the radio medium itself.

Intensive. One such reason is the intensity of instruction. Although the radio broadcasts and the follow-up periods fill the normal English time table, the amount of English used in a 30-minute broadcast is vastly greater than that in a conventional classroom. Every minute is filled with English, either spoken by the radio characters or by the children's responses. The typical traditional class period is filled with the teacher's talk about English--even to six-year-olds--often in mother-tongue rather than English. Explanations and directions are generally in mother-tongue also. There may be several minutes of wasted time on logistics, meaningless repetition, and endless fiddling. Teachers and headmasters frequently comment on the effectiveness of radio in keeping children focused on using English.

Interactive. We believe the main reason children learn more in the radio classrooms is the interactive nature of the lessons. Any classroom can be more interactive than it generally is. I suppose since the first cave man stumbled into a strange cave, language teachers have been trying to get language students to interact by using the language.

Radio is of course a tool, not an instructional methodology. The Radio Language Arts Project in Kenya draws heavily for its instructional system on the Radio Mathematics Project which successfully taught math by radio to lower primary children in Nicaragua. The designers of the Radio Math Project were, not by accident, innovators in teaching mathematics through programmed and computer assisted instruction. From their experience of structured learning materials and interaction between the learner and these materials, they cut up the radio broadcast materials into small segments suitable for primary students and distributed the concepts and skills over an appropriate period of time. Student response to the radio was frequent and varied. Feedback to the learner, generally in the form of correct answers or reinforcement, was also frequent.

Building on the Nicaragua experience but, equally important, recognizing the importance of language as communication, the Radio Language Arts Project team worked to overcome the constraints of radio as a one-way medium. Every

effort was made to develop natural speech and behavioral responses by pupils to the radio characters.

The radio lessons require pupil responses every few seconds, typically over a hundred interactions in a 30-minute lesson. These responses vary greatly. Perhaps some examples will illustrate the kinds of language interaction possible in a formal classroom situation, with radio as the medium.

- Physical response by the class to a spoken command on the radio.

Radio: Touch your nose.
Class: (Children touch their noses)

- Physical response to a sound cue.

Radio: (Slide whistle, up)
Class: (Stands up)

- Physical response to a spoken command from the teacher or another pupil, cued by the radio.

Radio: Juma, tell the children to sit down.
Juma (a pupil in the classroom): Sit down.
Class: (Sits down)

- All the above in small groups and individually, e.g. all girls, all boys, small groups, or individual pupils. Individual pupils may be given tags with names which the radio may call on during the days broadcast. For example, one boy may wear the name Juma for one day. When the radio addresses Juma, he carries out the instructions.
- Spoken choral response to a spoken command by the radio, the teacher, another pupil.

Radio: Rosa, say, "My name is Rosa."
Rosa (a radio character): My name is Rosa.
Radio: Children, say, "Her name is Rosa."
Class: Her name is Rose.
Radio: Her name is Rosa. Again.
Class: Her name is Rosa.

- Spoken individual response to a spoken command by the radio, the teacher, another pupil, or the class.

Radio: Juma, tell the teacher your father's name.
Juma (a pupil in the classroom): My father's name is _____.

- Spoken choral, group, and individual repetition of phrases or sentences on the radio.

Radio: Children, say, "She's reading the book."
Class: She's reading the book.

- Spoken choral, group, and individual answers to questions by the radio, the teacher, another pupil.

Radio: Rosa, are you standing?
Rosa (a pupil in the classroom): Yes, I am.

- Copying words or phrases from the blackboard or worksheet.

The blackboard is prepared by the teacher before the broadcast as suggested in daily teachers notes.

Radio: Copy sentence 1 in your exercise books.

- Written repetition of phrases or words spoken on the radio.

Radio: Take out your exercise books.
Write the word beans.

- Reading aloud--choral, group, individual--with the radio.

Radio: Take out worksheet 26. Read sentence 4 aloud with me.

- Reading repetition--choral, group, individual--after the radio.

Radio character reads a sentence, e.g. number 5 from the worksheet or the blackboard.
Radio: One child, read sentence 5.
(The teacher picks out one child.)

- Spoken--choral, group, and individual--answers to questions based on the reading.

Radio: (to entire class) Read sentences 13, 14, 15, 16, silently.
Pause for silent reading.
Radio: One child, why did the shopkeeper close the door?
(The teacher picks out one child.)
Child: (responds)
Radio: (confirms a correct answer)

- Written answers to questions based on the reading.

Similar to 15, with children writing answers in their exercise books.

- Sing or chant along with the radio.

Radio character introduces a song by singing it. Children are then asked to join in. Popular songs are used throughout the series. The words of new songs are included in the teachers notes for further practice during the post-broadcast lessons.

- Sing or chant with physical actions with the radio.

Same as above, but with physical actions that provide instructional reinforcement, e.g. learning right and left. In some cases, the activity provides a welcome outlet for the children's excess energy.

- Individual role-playing by acting and speaking.

The radio, with the teacher's help, directs a child or children to assume a role in a simple dialogue that also requires some action in front of the class. Further practice is encouraged during post-broadcast activities.

- Following spoken directions by acting, speaking, reading, and writing.

Radio: Take out your exercise books and write the answer to question 7. Raise your hand when you have finished.

Simpler commands and directions in English are used from the beginning of the series.

This is not an exhaustive list. Such a list would get rather boring since the instructional techniques are already familiar to good language teachers. In fact, good teachers can direct additional interaction between students that can be initiated by the radio but which is impossible for the radio to monitor and reinforce.

Many of the same question-and-answer activities listed above can be carried further by groups or individuals, and combinations of activities can lead to more natural speech acts than some of the simple examples above. This in turn can lead to guided but spontaneous speech that permits the learners to create language on their own. The radio cannot "correct" this more creative language behavior nor reinforce it effectively. This is one significant role for the classroom teacher even in a radio classroom.

The Radio Classroom

I have suggested in this paper that the intensive and interactive nature of the radio English lessons is the unique feature which leads to gains by the radio pupils. Both of these features are significant for other mediated instruction, and although the specific kind of interaction may differ from medium to medium, they clearly lead to language learning.

There is an additional feature of the project in Kenya which I have strong feelings about but no supporting research. It is my opinion that in language learning the classroom-group structure is valuable in immeasurable ways--at least with very young children. I sense from observing children that interacting with the radio is a less-threatening way to learn and generates an enthusiasm totally different from an individual interacting with a teacher (especially if that teacher is hesitant, aloof, or threatening).⁵ There seems to be something about the social support of other learners that makes a radio classroom lively. Real speech (rather than formal manipulation) seems to be going on. I suspect that for many learners radio in the classroom would be more effective than individuals working with a tape recorder or a computer. Further research in this area will no doubt come with increased use of computer assisted instruction for language learning.

One case supporting this view has been children who came into the radio classes midway in the project, either because they transferred into the school or, more commonly, they had to repeat a grade and therefore ended up in a radio class. These pupils initially were slow in responding to the radio and probably were behind the other pupils in their ability to learn from the radio lessons. Teachers, however, felt that the pupils quickly caught up with the other children. It is my feeling that a period of time in the classroom where they could enter anonymously into the activities with the more experienced radio group provided the kind of support that the learners needed in order to catch up. We do not have supporting data to confirm this view, however, and, conversely, some observers feel that the repeaters have pulled the entire class down in its performance. Even if this is the case, it has permitted the repeaters to enter into the language activities in a way that has enhanced their own language learning.⁶

Summary

Radio as an instructional technology has been used in many situations with varying degrees of success. Interactive instructional radio is unlike educational radio as we knew it, however. It is more intensive and it is certainly more interactive. Rather than offering modest support, which the teacher could either make use of or not with little difference in overall results, it provides the major instructional program. The teacher helps, of course, but the radio, making the most of quality planning and production, brings effective instruction into classrooms that often have never experienced it.

The evidence on the effectiveness of radio in language teaching from other projects is largely anecdotal. Few radio projects have had controlled and sustained evaluation. Few have adequately documented their purpose or their methodology. Fewer still have indicated where they failed. The AID-funded interactive radio projects, on the other hand, have demonstrated radio's effectiveness in teaching mathematics and language.

Radio has obvious advantages in low-income countries with geographically scattered populations. For countries in which a national language policy requires the teaching of a second language on a massive scale, radio can be the most appropriate medium and represents the greatest extent to which technological innovation can be implemented.

NOTES

- 1 For an insightful discussion of radio's role in democratizing education see Alex T. Quarmyne, "Radio and the Educational Needs of Africa." (Keynote address presented at the "New Directions for Education by Radio" conference held in Nairobi, Kenya, September 25-28, 1984). The paper is available from the Radio Language Arts Project, Academy for Educational Development, 1255 23rd Street, N.W., Washington, D.C. 20037.
- 2 Stuart Wells and Steven Klees, "Education Decisions and Cost Analysis for the Radio Mathematics Project in Nicaragua." In The Radio Mathematics Project: Nicaragua 1976-1977, Patrick Suppes, Barbara Searle and Jamesine Friend, ed. (Stanford: Institute for Mathematical Studies in the Social Sciences, 1978).
- 3 Office of Education. "Interactive Radio in the Classroom: Ten Years of Proven Success" (Office of Education, Bureau for Science and Technology, U.S. Agency for International Development, 1984). This paper is available from the Clearinghouse for Development Communication, Academy for Educational Development, 1255 23rd Street, N.W., Washington, D.C. 20037.
- 4 For a description of the project's research design and first-year results see Philip R. Christensen, "The Radio Language Arts Project: Teaching by Radio in Rural Kenyan Primary Schools." (Paper was presented to the Northwestern University Program on Communication and Development Studies' "Communication, Mass Media and Development" Research Conference, October 13-15, 1983). The paper is available through the Radio Language Arts Project, Academy for Educational Development, 1255 23rd Street, N.W., Washington, D.C. 20037.

- 5 For a discussion on the way in which an "affective filter" may hamper language acquisition, see Stephen D. Krashen and Tracy D. Terrell, The Natural Approach: Language Acquisition in the Classroom. (Hayward, CA: The Alemany Press, 1983).
- 6 We will have data on repeaters in both the control and experimental groups that should enable us to answer some questions about repeaters.