INTERACTIVE RADIO INSTRUCTION: AN UPDATE FROM THE FIELD

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INTRODUCTION

Interactive radio instruction (IRI), a methodology developed to turn a typically one-way technology into a tool for active learning in and outside the classroom, continues to be an attractive educational strategy in developing countries after almost 30 years. The original model for IRI math, created in Nicaragua by a team from Stanford University in the early 1970s, sought to combine the low cost and high reach of the radio medium and a clear understanding of how people learn. Since that time, 20 countries around the world have developed IRI programs for a variety of subjects, audiences, and learning environments, many of which have been sustained for up to 10 years and counting. The methodology has been expanded and adapted to include different levels of math, science, health, English, Spanish and Portuguese, environmental education, early childhood development, and adult basic education for learners of all ages. In each case, the series has been designed specifically by local specialists to be engaging and to meet learning objectives in that country. After three decades, interest in IRI does not seem to be waning. (See the Annex at the end of this chapter for a list of IRI projects and their current status.)

This chapter updates earlier information about interactive radio instruction over the past five years, and introduces two cases where IRI has had an impact in Africa in two ways not captured in the past.[1] In Guinea, IRI has gone to scale on an unprecedented level in West Africa to reach students and teachers on a national level. The Guinean IRI series is integrated with teacher development initiatives and is used in almost all primary schools across the nation, with 880,000 students. In Zambia, a new IRI series is being developed that reaches out to students who otherwise would be without schools, and have become increasingly vulnerable due to poverty and the HIV/AIDs. This example shows how IRI can be used effectively to overcome obstacles of access in Africa and to increase the chances that students can receive an education. These examples show how IRI retains its core elements, yet continues to evolve to meet new educational and social challenges.

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WHAT IS IRI?

IRI is distinct from most other forms of distance education because its primary goal has been improvement of educational quality. Unlike many distance learning efforts that are designed primarily to address access issues, IRI began as a tool to use in the classroom to counteract inadequate teacher training, poor achievement among learners, and few resources. While IRI has demonstrated that it can be used to expand access and increase equity in both formal and nonformal educational settings, it retains a development strategy and methodology that require that active learning, attention to pedagogy, and formative evaluation included in the design.

The IRI methodology is also different in that it requires that learners stop and react to questions and exercises through verbal response to radio characters, group work, and physical and intellectual activities *while the program is on the air*. For both teacher and student, the lesson becomes an immediate hands-on and experiential guide. Short pauses are provided throughout the lessons, after questions and during exercises, to ensure that students have the time to think and respond adequately. Interaction also is encouraged within the learning environment between teacher and learners as they work together to conduct short experiments, perform activities, and solve problems using local resources and imaginative situations and stories.

The pedagogy of IRI is more deliberate than active learning alone. IRI series guide learners through the learning process with activities related to measurable learning objectives. Educational content is organized and distributed across lessons so that learning is built on previous knowledge, and new learners can understand more easily the subject being taught. Activities and problems are modeled first by radio characters so the teacher and learners have an idea of the process they are undertaking and the skills and support that may be required. All of these elements are knit together through story lines, music, characterization, and other attributes available through the audio medium.

IRI programs cater specifically to the audience and the situation where they will be used. Thus, one of the most important aspects of the design is its reliance on audience research, participation, and field-level formative evaluation to ensure that lessons are engaging and relevant and that learners can achieve the educational objectives. The format, activities, and pauses of a program change with each cycle of feedback and observation.

WHAT IS KNOWN ABOUT IRI'S EFFECTIVENESS?

The attraction of the IRI approach can be attributed at least partially to well-evaluated projects that have demonstrated greater learning gains for students using IRI programs than students in control groups not using IRI programs. In the first pilot year in Haiti, third grade students using IRI math improved almost 13% from pre- to posttests, while control students gained only 7%.[2] In a partial academic year in Guinea, second grade students using an integrated French and math series improved approximately 8% more than their counterparts who did not use IRI. Other studies, shown below (Figure 9.1), demonstrate IRI's effectiveness not only for math, but for a variety of subjects and age groups. While these data are impressive at face value, they are more impressive when their impact is analyzed (taken as the effectiveness quotient in cost-effectiveness studies).

In most cases, students show progressively greater achievement increases over time. In South Africa, for example, students who received fewer than 33 English in Action lessons improved by 6.7%, students who received between 34 and 66 lessons improved by 13%, and students who received more than 66 programs improved by 24%.[3] Similar results were found in Bolivia. In 1991, evaluators found that the average score of second graders using Radio Math jumped from 47.0% to 66.23%. (The mean score of the control group was 35%). Of these, the experimental students who had already completed one year of the radio lessons did much better (51.9% correct), and those students who completed two years of radio programs scored even higher (61.6%).[4]

WHAT ABOUT HARD-TO-REACH OR OUT-OF-SCHOOL POPULATIONS?

The Case of the Dominican Republic

In the Dominican Republic, for example, an IRI project called RADECO was created for children who had no access to school and has been broadcasting for 12 years. Early evaluations compared children who had just five hours of integrated instruction a week using IRI and 30 minutes of follow-up activities with students who were in a regular formal school for more than twice that amount of time. Studies showed that first graders using the RADECO programs responded correctly 51% of the time on posttests, versus 24% of the time for the control group. Second graders using IRI gave 10% more correct answers. Overall, even though these students had enormous obstacles, students in both grades who used IRI for an hour a day had comparable results in reading, writing, and language, compared with the control group, and performed significantly better in math.[5] Based on the early successes of the RADECO project, IRI programs are being developed in other areas where different obstacles are in place, such as failing schools in Haiti, non-formal early childhood development centers in Bolivia and Nepal, and adult learning centers in Honduras.

FIGURE 9.1 • COMPARISONS OF MEAN POSTTEST SCORES
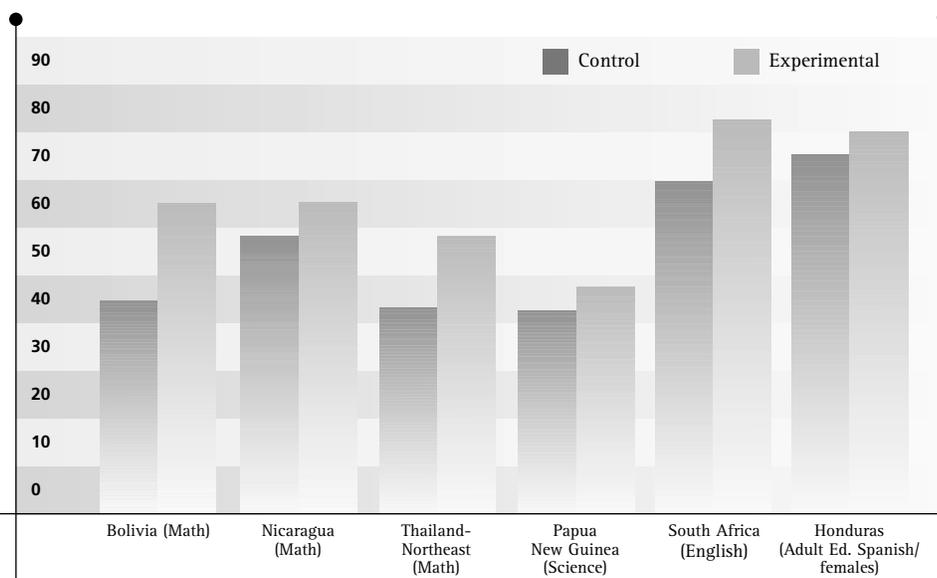
SOURCES: Tilson, T., Jamison, D., Fryer, M., Edgerton, D., Godoy-Kain, P., Imhoof, M., Christensen, P., & Roy, T. (1991). Sustainability in Four Interactive Radio Projects: Bolivia, Honduras, Lesotho and Papua New Guinea. In Technology and Teaching. World Bank. Unpublished; Leigh, S. (1995). *Changing Times in South Africa: Remodeling Interactive Learning.* LearnTech Case Study Series #8. Washington: USAID; Corrales, C. (1995). *Adult Basic Education in Honduras: Managing Multiple Channels.* LearnTech Case Study Series #9. Washington: USAID.

The Case of Zambia

In Zambia, interactive radio instruction now shows that IRI also can help to increase access to education for children who are without schools and teachers and who are increasing vulnerable due to the effects of HIV/AIDs and poverty. IRI is delivering basic education to out-of-school children, especially orphans and other vulnerable children, in community learning centers. IRI is a collaborative effort among communities, churches, nongovernmental organizations (NGOs), the Ministry of Education's Educational Broadcast Services (EBS), the Peace Corps, and the Education Development Center. EBS develops and broadcasts the programs and develops supplementary materials such as mentor's guides, and the Ministry of Education trains mentors in its District Resource Centers and provides supervision/monitoring at participating learning centers. Communities, churches, schools (both government and community), and NGOs provide the learning center venues, mentor(s) to facilitate the radio broadcasts, radio receivers, a blackboard, and some locally made materials. Communities also mobilize out-of-school children to attend the learning centers each day. The Education Development Center (EDC) has trained EBS writers and producers and assisted EBS to develop a training of trainers program for Ministry of Education resource center staff who, in turn, train mentors to run the community-based learning centers.

In 2000 and 2001, EBS produced and aired daily 30-minute lessons for grade 1, following the Zambian curriculum for mathematics and English. Grades 2 and 3 are in the process of lesson development. In addition, each IRI program includes skills in English as a second language, basic mathematical skills, and a five-minute segment covering life skill themes (hygiene, nutrition, social values, etc.) in an attempt to strengthen the ability of the community to support its children. The programs are designed to be guided by a facilitator rather than a trained teacher, so the content can be delivered easily and more students can participate. Because the programs promote interactive learning during the broadcast, as do all IRI programs, facilitators are supported in their leadership roles with new content and subject matter. Early evaluations suggest the programs are having positive effects on learning, and more data are forthcoming.

CAN IRI HELP CLOSE EQUITY GAPS?

Evaluations of IRI programs also indicate that they can make a substantial impact on educational equity. In Figure 9.2, evaluations conducted in Bolivia, Thailand, and South Africa show rural students with much higher total gains than their urban counterparts, who have greater access to materials and better-trained teachers. This distribution of evaluation results follows a pattern demonstrated in other countries and indicates that IRI programs are not only increasing in quality, as reflected in achievement gains, but also are having an impact on urban/rural equity gaps.

In a retrospective analysis of the potential of IRI to help close gender equity gaps, a similar trend was discovered.[6] Although girls were achieving about the same as boys in the posttests, because their baseline scores were lower, the total achievement for girls in the experimental groups was greater. This finding was demonstrated in science in upper primary schools in Papua New Guinea, in English in lower primaries in South Africa, and in adult basic education in Honduras, suggesting that the age of the learner and the subject taught did not necessarily matter (Figure 9.3).

FIGURE 9.2 • URBAN/RURAL DIFFERENTIALS
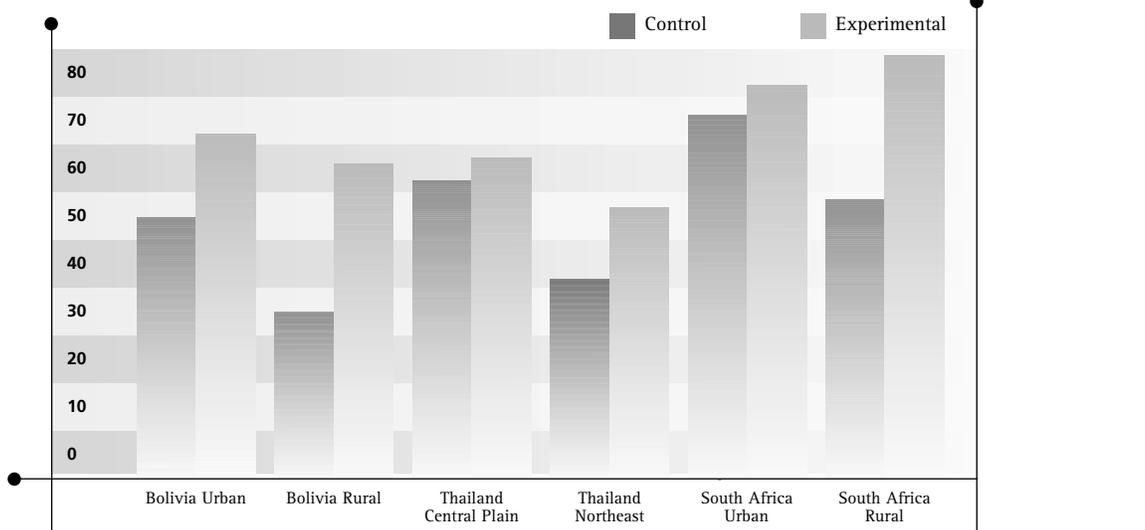
SOURCES: Tilsonet al., op cit; Leigh, 1995.

Another study of learning gains conducted in Honduras shows that the combination of IRI and other interventions may have synergistic effects. That study found that when IRI programs are introduced with new textbooks, the impact on learning gains almost doubles the impact of just providing textbooks (with an effect size of .61), indicating that a well-constructed, multichannel approach—where different educational strategies are aligned deliberately and traditional and nontraditional approaches reinforce each other—may have the greatest impact on learning.[7]

## CAN IRI PROGRAMS MOVE FROM PILOT TO NATIONAL PROGRAM?

The Case of Guinea

The Republic of Guinea, a former French colony on the West African coast, provides an example of how a multichannel learning approach and IRI can and do improve instruction on a nationwide scale. In Guinea, school enrollment has been at best around 40% (and closer to 30% for girls), and dropout, particularly female dropout, is frequent, and repetition rampant. Even for those who attain grade 6 (about 35% of those who start primary school), more than half fail the state exam that allows them to graduate to the seventh grade. The Guinean curriculum is not strikingly different from or more difficult than the curriculum used by neighboring nations with higher enrollment and retention rates. (Indeed, due to the traditionally centralized nature of instruction in the former French colonies, curricula are strikingly similar across francophone Africa.) This suggests that it is not what is being taught in Guinea, but, rather the organization of the learning process—or the flow of what

happens in the classroom—that has to be addressed to provide children with better access to the concepts and topics that make up the Guinean curriculum.

All of the educational models Guinea experienced before the country's independence—the tradition of "apprenticeship," where the apprentice is a blank slate on which the master imprints his knowledge; the Koranic tradition, where pupils spend years memorizing and repeating Koranic verses; and the French tradition, where form and presentation are as paramount as content mastery—have combined to create a postindependence educational culture where teachers "deliver" information to their students through teacher-centered, didactic, repetitive practices that afford children little opportunity to ask questions, draw on their own experiences, or experiment with incorrect answers or hypotheses. In addition, Guinean classrooms are often devoid of any instructional aids. In general, they are undecorated, tin-roofed spaces where teachers, who must instruct between 50 and 80 students, have nothing other than a blackboard and chalk, and the children have only a blank book and a pen.

Such problems are nationwide, so the EDC needed to devise a program that would reach the roughly 22,000 primary teachers in need of support and inservice training. In response, the EDC's Fundamental Quality and Equity Levels (FQEL) project has produced a series of materials, each of which relies primarily on a different "channel" to communicate important concepts and topics to students and teachers. There are 66 IRI programs per grade for every grade from 1 to 6. The children access this learning channel three times a week during their French and math classes. In addition,

FIGURE 9.3 • TOTAL ACHIEVEMENT IN MEAN POSTTESTS BY GENDER
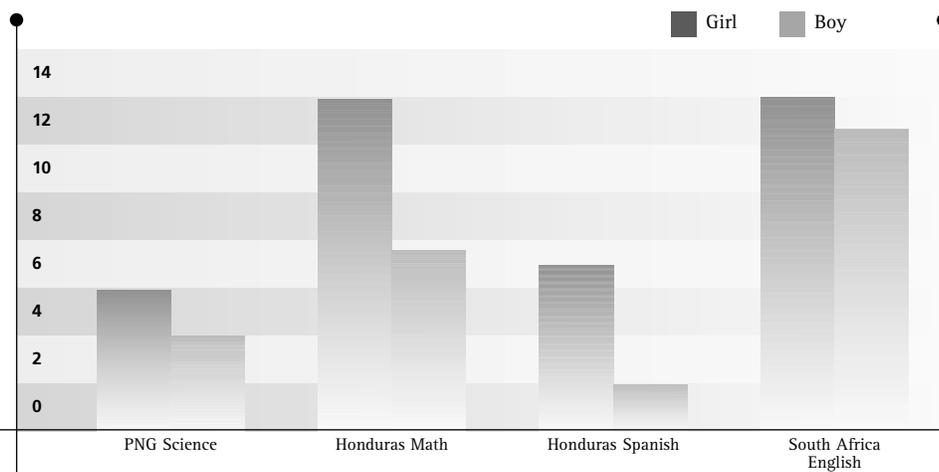
Scores are represented as percentage correct and represent differences in achievement between control and experimental groups.

SOURCES: Hartenberger, L., & Bosch, A. (1996). *Making IRI Even Better for Girls*. ABEL2 Poject. Washington: USAID; Tilson, T., Jamison, D., Fryer, M., Godoy-Kain, P., & Imhoof, M. (1991). The Cost-Effectiveness of Interactive Radio Instruction for Improving Primary School Instruction in Honduras, Bolivia and Lesotho. Paper presented at CIES Annual Conference, Pittsburgh, PA; Project LearnTech, (1991); Leigh, op cit.

there are materials that rely primarily on "print" to channel information toward the student: student workbooks for children in grades 2-6, and short-story readers for children in grades 1-2. Finally, there is a primarily visual channel: color posters, of which every primary school classroom has a set.

IRI was the glue of this nationwide system of teacher support. The radio programs quickly developed such a large following that teachers and students did not want to miss a single program. The reach of radio allowed EDC to introduce strategies, ideas, and resources into every classroom in Guinea in a much more efficient manner than organizing the equivalent amount of face-to-face training. Print materials also were distributed nationwide and were linked to the radio programs in such a way as to be supportive of and complementary to the IRI material.

At the very least, the addition of IRI programs and print materials to the teachers' spoken explanations of French vocabulary and basic math provide the children with a second auditory learning "channel" (the IRI programs), a more stimulating visual "channel" than their own notebooks (the color posters), and a number of kinesthetic "channels" supplied by the activities recommended in the IRI programs, on the backs of the posters, and in the teacher's editions of the workbooks and readers. All of the different materials are specific to the Guinean context and use objects/examples from the students' surroundings, thereby drawing on the learning "channel" to which students are exposed the most: the one that links them to their homes, families, and communities.

Teacher development is also an important component of the FQEL project. Both face-to-face training and materials focus on widening the channel of teacher-student communication to permit two-way communication (teacher-student and student-teacher). Once teachers are able to accept student input along the teacher-student communication channel, they are better able, for example, to perceive the abilities of their female students and better able to call on those abilities in organizing student-student communication. In addition, the combination of multichannel materials introduced under FQEL is designed explicitly to facilitate a more integrated, student-centered flow of instruction in the classroom.

In this sense, the materials are designed as much for the teacher as for the student. They provide support to the Guinean teachers as they try new practices and new configurations in the classroom. For example, the IRI programs prompt teachers to pair students for certain activities, thus facilitating cooperative learning; they prompt teachers to call on girls as well as boys; and they pose questions directly to students that require higher-order thinking skills such as

problem solving and analysis. By doing these things, they support teachers in expanding their repertoire of instructional practices. The print materials and posters are designed to do this as well, because they provide structured activities the teachers can try, modify, or build on as they gain confidence and become more comfortable with the new practices. Although the materials in themselves help to create new learning opportunities, when the flow of information along the teacher-student channel is improved in these ways, they function with maximal efficacy to improve Guinean children's learning environment.

WHAT ABOUT THE ECONOMICS OF IRI PROJECTS?

Alongside the data on learning gains is a growing body of literature analyzing the economics of IRI. A brief description of how IRI projects are designed and implemented will help to explain the implications of these studies. IRI projects are front-loaded—that is, they have higher initial fixed costs associated with creating management and training systems and producing audio and print programs than the far lower recurrent costs associated with permanent staff, dissemination, training, and maintenance. While IRI projects have capacity-building components, they are also product-oriented and are evaluated continuously during the early design and production stages to ensure that their products are relevant and effective. Because most of the radio programs have gone through this extensive formative evaluation and have built-in strategies of training, active learning, and quality control, high-level use can be maintained relatively easily over time, and the dilution of quality associated with some other strategies, such as pyramid training schemes, can be avoided. Teacher training and other recurrent costs stay relatively consistent over time after the development stage, and then vary, depending on how much training is integrated into the program, the subject being taught, and the special circumstances of the country. Other recurrent costs include airtime, distribution of simple supplementary print materials (such as one-page worksheets inserted into local newspapers or distributed at the beginning of the year), batteries and radios, and maintaining a management system or unit focused on IRI.

IRI is also different from many other educational strategies because of the wide reach of the radio broadcasts. As a result, increasing the number of learners increases the cost very little. In contrast, most other interventions with high variable costs require a proportional number of new school facilities, textbooks, or teachers as additional learners are added. In an IRI project, these extra factors do not influence the cost of the program dramatically, and, because the primary products—radio programs—are broadcast, the cost per learner decreases proportionally with any increase in users.

Governments using IRI projects have experimented with various cost-sharing and income-generation schemes to pay for recurrent costs. These strategies have been specific to the special circumstances in each country, but three interesting examples include Lesotho, where a tax pays for a portion of the costs; Honduras, which is currently experimenting with private-public-NGO strategies of cost sharing on the municipal level; and the Bolivian early childhood development series, which is experimenting with decentralized methods of sustaining IRI programs through local municipalities. In addition, most IRI projects are sustained at least partially through partnerships between ministries of education and ministries of communication and broadcasting.

What Do Cost Data Show?

Most cost analyses of IRI programs have incorporated these factors into their design and project per student costs over time using the underlying principle that the cost of development is offset when more learners use the programs.[8] In a study of Honduras math programs conducted in 1990, for example, it was discovered that the annual per student cost of using IRI mathematics was US$2.94 in the first year when development costs were included (based on 200,000 students and including a discount rate of 7.5%), but the incremental cost to continue the program fell to US$1.01 per student per year thereafter, which would be distributed across learners and government, and would be reduced dramatically if airtime, the highest-cost item, were provided free of charge or if the number of learners were increased.

While early economics studies may have overemphasized the scale some projects might reach in a short period of time, later studies showed that, with the economies of scale achievable with radio, the cost per student can be quite low. According to a 1999 World Bank/USAID study, for IRI to increase quality in primary schools, costs are likely to be in the range of US$3 to US$8 per pupil reached, depending on the size of the program.[9] The Adkins study calculated that once the lessons have been developed and the system is in place, the annual recurrent costs were approximately US$2.32 (large-scale program) and US$2.97 (small-scale program). Adkins also cites studies showing that IRI has been a cost-effective method of teaching language and math in primary schools in a number of countries, and that it is more cost-effective than some textbook or teacher training strategies.

Is IRI Cost-Effective Compared to Other Interventions?

A number of cost-effectiveness studies also have found IRI to be a highly competitive educational strategy, compared to other interventions. As early as 1988, Lockheed and

Hanushek[10] published a study comparing cost-effectiveness data on three IRI projects, two textbook projects, and four teacher training projects. Cost-effectiveness was measured as a ratio of incremental effectiveness (units of effect size) to incremental cost (dollars per student per year) and referred to as efficiency. The study showed that providing textbooks results in an attractive efficiency ratio of about .2 effect units per one dollar per year (with the exception of one case in the Philippines, where the gain was 1.5 per dollar). All other interventions were considered less cost-effective than textbooks, with the exception of IRI, which proved to be more cost-effective, with efficiency ratios in the .3 to 1.3 range.

Finally, in recent cost analyses conducted in South Africa, evidence suggests that IRI is still proving to be cheaper and more effective than other programs. A 1995 study showed that when the cost of South Africa's English in Action was compared to other English-language programs, the cost per student of English in Action ranged from one-third to one-half of other options.[11] Like other projects, South Africa's English in Action is now broadcast across country, indicating that the recurrent costs associated with sustaining the programs are considered justifiable.

CONCLUSION

IRI applications differ depending on the degree of activity required of the learners, subject matter, age and background of the learners, learning environment, and background of the teacher or facilitator. One might even say that the differences are greater than the similarities. But, despite these differences and the adjustments that IRI has undergone over time to become more culturally intriguing or educationally up-to-date, studies consistently demonstrate high learning gains, decreased equity gaps, and cost-effectiveness across projects. Today, IRI is showing that it can be taken to scale in complex environments or used to reach generally hard-to-reach populations to address the types of educational crises the world is facing in the new millennium.

It is difficult to pin the successes of the IRI methodology on any one characteristic. More likely, a number of key factors converge to provide the conditions needed for active and supported learning. The consistency of these factors seems to be able to fill a needed gap and provide an impartial educational catalyst for teachers and learners across traditional boundaries, such as gender, distance, and access to quality schools. We have seen additional examples of how IRI can be taken to scale and used to reach new audiences in Africa, arguably during the most difficult time in its history. These examples and the continued exploration of ways to make IRI a useful tool to improve educational quality, access, and equity hold our attention after three decades.

COUNTRY	YEAR	SUBJECT	AUDIENCE	KEY POINTS
Nicaragua	1974	Math	Grades 1-4	> Original model developed > Adapted in other countries
Kenya	1980	English	Levels 1-3	> Original model developed > Adapted in other countries
Thailand	1980	Math	Grades 1-2	> Main audience changed (formal schools to nonformal hill tribe schools) > Distribution methods adapted (radio broadcast to cassette)
Dominican Republic	1981	Integrated programs for nonformal; math for formal	128,000+	> Original model developed (integrated programming) > Small nonformal population reached annually (app. 8,000 per year), but has been sustained for 20 years
Papua New Guinea	1986	Science	Grades 4-6	> Original model developed (science) > Strategy compatible with educational needs > Payment for airtime (recurrent costs) > Program decentralized and coverage reduced after 11 years
Honduras	1987	Math	Grades 1-3	> Original model developed (mental math) > Attempted cost sharing > Program discontinued and transformed into adult basic education (see below)
Bolivia	1987	Math	Grades 1-5	> Strategy compatible with educational needs > More than a millions students served > Needs troubleshooting to change with policy shifts
Lesotho	1987	English	Grades 1-3	> Strategy compatible with educational needs > Innovative levies pay for recurrent costs
Guatemala	1990	Spanish, math	(3 grades in 220 schools)	> Attempted to recreate entire series rather than take advantage of work already done (more expensive) > Strategy not found to be cost-effective
Costa Rica	1991	Environmental education	Grades 4-5	> New model developed (environmental education) > Transition from pilot to national program did not occur; potentially connected to changes in policy and administration at key moments
Bolivia	1992	Health	Grades 3-4	> Original model developed (health) > Child-to-child method implemented > Strategy compatible with educational needs
El Salvador	1992	Math	Grades 1-2	> Strategy compatible with educational needs > Agreements between government and private press and radio stations to sustain airtime

COUNTRY	YEAR	SUBJECT	AUDIENCE	KEY POINTS
Honduras	1992	Adult basic education	Grades 1-6	> Original model developed (adult basic education) > Strategy compatible with educational needs > Agreements among government, regional radio stations, and organizations
South Africa	1992	English as a second language	Levels 1-3	> Model successfully recrafted from Kenya Language Arts to make it compatible with South Africa's needs
Indonesia	1992	Teacher training/ split shift	Teachers	> Strategy compatible with educational needs > Project received only minimal external sup-port—quality unknown
Pakistan	1992	English	Grades 3, 4, 5	> Pilot
Indonesia	1993	Civics, math	Middle school	> Strategy compatible with educational needs > Project received only minimal external support—quality unknown
Portuguese-speaking African countries	1992	Math, Portuguese	Grades 1, 2, 3 ,4	> Still in pilot stage > Intended to reach Cape Verde, São Tomé, Principe, Guinea Bissau, and Mozambique
Bolivia	1994	Early childhood care and development	Early childhood development centers, preschools	> Original model developed > Uses both radio and cassette > Decentralized dissemination matches education reform > Broadcast in 3 local languages
Bangladesh	1995	English	Unknown	> Methodology planned to be integrated into current work in Bangladesh
Nepal	1996	Early childhood development	Early childhood development centers	> Model adapted from Bolivia > Institutionalized within Radio Nepal > Broadcast nationally as of 1998 > UNICEF study (in 2000) showed 50% of formal and informal caregivers listen across Nepal
Haiti	1996	Reading, civics, math	Grades 2, 3, 4	> Pilot > New model being developed for reading > Math adapted from Nicaragua
Ecuador	1996	Conflict resolution/ critical thinking skills	Early childhood development centers, preschools	> New model developed (conflict prevention/ critical thinking skills) > Pilot incomplete
Venezuela	1991	Math	Grades 1, 2, 3	> Between 1991and 1999, program reached more than 3 million children nationwide
Guinea	1997	Integrated: English, math, life skills	Grades 1-6	> New emphasis on teacher development > First West African program to go to scale nationally with 880,000 students

COUNTRY	YEAR	SUBJECT	AUDIENCE	KEY POINTS
Costa Rica	1997	English	Grades 1-6	> Piloted with 14,000 students and continues to be broadcast
Zambia	1999	English; math, integrated	Grades 1-7	> Primary audience is AIDS orphans in communities > Pilot
Nepal	1999	Teacher training for English and math	Grade 3, 5	> Dual audience program for teacher training and instruction in math and English language > Pilot
Ethiopia	1999	English	Grade 1	> Pilot effort to reach all 10,000 schools in country
Honduras	1999	Integrated English, math, civics, environment	Grade 7-9	> Pilot > First program to target secondary school
Nigeria	2001	Math, literacy	Grades 2-4	> Pilot > Includes Koranic schools
Ethiopia: Somali refugees	2001	Integrated programs		> Pilot

ENDNOTES

1 This chapter is updated from Bosch, A. (1997). Interactive Radio Instruction: Twenty-Three years of Improving Educational Quality. *Education and Technology Notes*, 1 (1). World Bank Human Development Department. The sections on Guinea and Zambia were contributed by Rebecca Rhodes and Sera Kariuki, respectively.

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5 Goldstein, E., de Jesus D. (1995). Altagracia Dominican Republic: From the Margins to the Mainstream. In *Multichannel Learning: Connecting All to Education.* Washington: USAID.

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7 Tilson et al., op cit.

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10 Lockheed, M. & Hanushek, E. (1998). Improving Educational Efficiency in Developing Countries: What Do We Know? *Compare*, 18 (1).

11 Cobbes, op cit.