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Interactive Radio Instruction: Twenty-Three Years of Improving Educational Quality

by
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ABSTRACT

Interactive Radio Instruction (IRI) is the use of interactive lessons delivered through either radio broadcast or audiocassette. An "audio" teacher directs the lessons while classroom teachers serve as facilitators. IRI has been used in developing countries worldwide to improve the quality of education across a range of school subjects and to serve as a form of teacher development. Multiple studies of IRI consistently have shown high learning gains, decreased equity gaps, and cost-effectiveness. Twenty-three years after their initial launch, several major IRI projects continue to operate successfully. While over the years IRI has been updated in various ways, its basic structure and methodology remain largely unaltered. IRI continues to be used in projects around the world.

INTERACTIVE RADIO INSTRUCTION: TWENTY-THREE YEARS OF IMPROVING EDUCATIONAL QUALITY

BY
ANDREA BOSCH*

INTRODUCTION

Learners retain approximately 10 percent of what they read, 26 percent of what they hear, 50 percent of what they see and hear, but 90 percent of what they say and do (Silcox 1993). It is no wonder, then, that interactive radio instruction (IRI) — a methodology developed to turn a typically one-way technology into a tool for active learning inside and outside of the classroom — continues after 23 years to be an attractive educational strategy in developing countries. The original model for teaching mathematics through IRI, 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, 18 countries around the world have developed IRI programs for a variety of subjects, audiences, and learning environments. Many of these programs have been sustained for up to 10 years and counting. The methodology has been expanded and adapted to include different levels of mathematics, science, health, English, Spanish, Portuguese, environmental education, early childhood development, and adult basic education for learners of all ages. In each case, the series has been designed by local specialists specifically to capture the interest of the learner and to meet learning objectives in that country. Twenty-three years later, the interest in IRI has not waned (see Appendix 1 for a list of IRI projects and their current status).

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WHY THIS TECHNICAL NOTE?

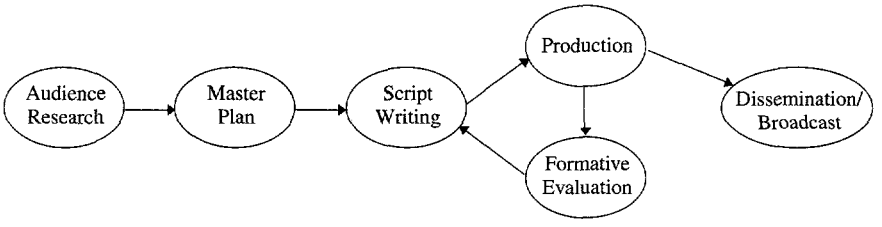
The purpose of this technical note is to provide an overview of IRI, and elaborate some commonalties and research findings in an effort to explore what makes IRI and radio useful technologies that continue to address many educational concerns in developing countries today.

For countries with high hopes but small educational budgets and difficulties in training teachers, providing educational materials, maintaining quality, and increasing access to meet the educational needs of a broad populace of learners, selected strategies and technologies must be effective, reliable, and meet country needs. As this note will reveal, IRI can meet such criteria.

WHAT MAKES IRI DIFFERENT FROM OTHER DISTANT LEARNING METHODS?

IRI is the use of interactive lessons in which an audio component delivered by an "audio teacher" through a radio or audio cassette and classroom activities carried out by the learners are carefully integrated. Within this structure, the audio teacher carries the main weight of the teaching, and directs learner activities (exercises, answers to questions, songs, and practical tasks) that take place during carefully timed pauses in the audio script, utilizing the classroom teacher as a facilitator. IRI is distinct from most other forms of distance education because its primary goal has been the improvement of educational quality. Unlike many distant learning efforts designed to address issues of access, IRI began as a classroom tool to counteract low levels of teacher training, poor achievement among learners, and limited re-

Figure 1: The Development of IRI Programs



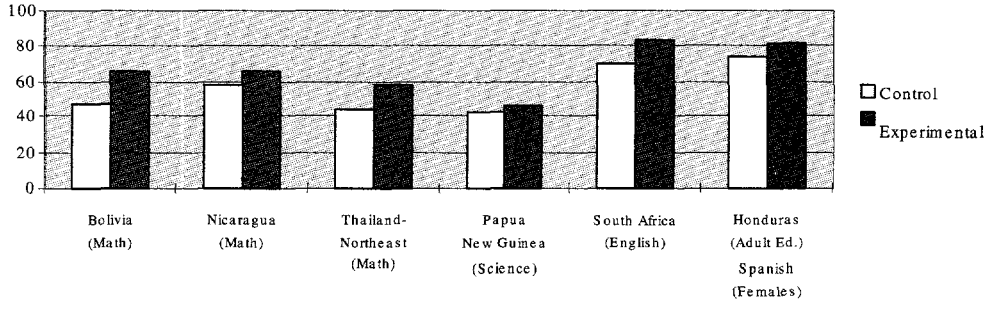
sources. While IRI has demonstrated that it can be used to expand access and increase equity in both formal and nonformal educational settings, it retains an emphasis on quality improvement through a development strategy and methodology that require active learning, attention to pedagogy, and formative evaluation to be included in the design.

The IRI methodology also is different in that it requires learners to 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 the teacher and students, 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 adequate time to think and respond. Interaction also is encouraged within the learning environment among the teacher and learners as they work together to conduct short experiments, undertake activities, and solve problems using local resources, imaginative situations, and stories.

The pedagogy of IRI is more deliberate than active learning alone. IRI series guide participants in the learning process through a progression of activities related to measurable learning objectives. Educational content is organized and distributed across lessons so that learning is built upon previous knowledge and new learners more easily construct an understanding of the subject being taught. Activities and problems are first modeled by radio characters so that 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 storylines, music, characterization, and other attributes available through the audio medium.

IRI programs are tailored specifically to the audience and the situation in which they will be used. One of the most important aspects of the design, therefore, is the 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. In the preparation of an IRI series, the format, activities, and pauses in a program change with each cycle of feedback and observation (Figure 1).

Figure 2: Comparison of Mean Post-Test Scores (Percent Correct)



Sources: Tilson, Jamison, Fryer, Edgerton, Godoy-Kain, Imhoof, Christensen and Roy 1991; Leigh 1995; Corrales 1995.

WHAT IS KNOWN ABOUT IRI'S EFFECTIVENESS?

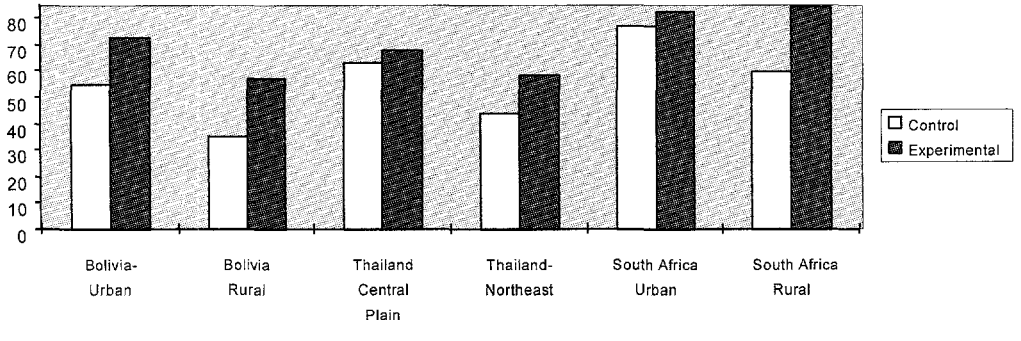
Carefully evaluated IRI projects have repeatedly demonstrated learning gains for students using IRI programs when compared with students in control groups (Figure 2). While these data are impressive at face value, they are more impressive when effect sizes are analyzed (taken as the effectiveness quotient in cost-effectiveness studies).

In most cases, students show progressively greater increases in achievement over time. In South Africa, for example, students who received less than 33 English in Action lessons improved by 6.7 percent, students who received between 34 and 66 lessons improved by 13 percent, and students who received more than 66 programs improved by 24 percent (Leigh 1995). Similar results were found in Bolivia. In 1991 evaluators found that the average score of second grade students who used Radio Math jumped from 47 percent to more than 66 percent, compared with a mean of 35 percent for the control group. The experimental students who had already completed one year of the radio lessons did much better (51.9 percent), and students who completed two years of radio programs scored even higher (61.6 percent) (Tilson et al., 1991).

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

The foregoing results have been found in IRI programs for a variety of subjects and learning environments. Leading evaluators assume that it is the basic tenets of active learning and the IRI methodology that make the difference. IRI also seems to ameliorate other obstacles to education. Substantial learning gains have been demonstrated in IRI projects that were used in nonformal settings, or were used in unusual ways to overcome a particular educational barrier, such as poorly trained teachers, a lack of schools, or incompatible school scheduling. In the Dominican Republic, for example, an IRI project called RADECO was created for children who had no schools. The program has been broadcasting for 12 years. In early evaluations, it was discovered that the skills of children who had just five hours of integrated instruction a week using IRI and 30 minutes of followup activities were comparable to those of students who were in regular formal schools for more than twice the amount of time. Studies showed that first graders using the RADECO programs responded correctly 51 percent of the time on post-tests, versus 24 percent of the time for the control group. Second graders using IRI gave 10 percent more correct answers. Overall, even though these students had enormous obstacles, students who used IRI for an hour a day had comparable results in reading, writing, and language for both grades when compared with the control group. They also performed significantly better in mathematics (reported in Goldstein and de Jesus 1995). Based on the early successes of the RADECO project, IRI programs are being developed in other countries facing different types of educational obstacles, such as in Haiti, nonformal early childhood development centers in Bolivia and Nepal, and adult learning centers in Honduras.

Figure 3: Urban/Rural Differentials (Percent Correct)



Sources: Tilson, Jamison, Fryer, Edgerton, Godoy-Kain, Imhoof, Christensen and Roy 1991; OLSET 1995.

CAN IRI HELP CLOSE EQUITY GAPS?

Urban/Rural Equity Gaps

Evaluations of IRI programs indicate that they can make a substantial impact on educational equity. Figure 3 displays results of evaluations conducted in Bolivia, Thailand, and South Africa, which show rural students achieved much higher total gains than their urban counterparts that have greater access to materials and better trained teachers. These results follow a pattern that has been demonstrated in other countries and indicates that the IRI programs are not only increasing quality, as reflected in gains in achievement, but also are making an impact on urban/rural equity gaps.

Gender Gaps

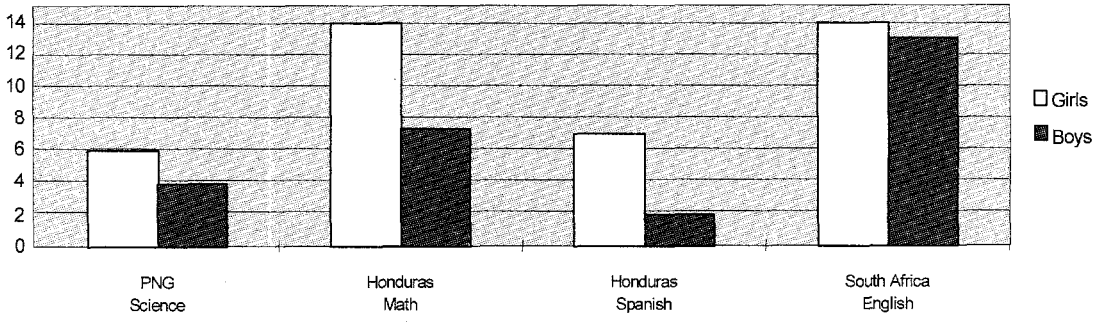
In a recent retrospective analysis of the potential of IRI to help close gender equity gaps, a similar trend was discovered (Hartenberger and Bosch 1996). Although girls were achieving about the same as boys in the post-tests, because their baseline scores were lower, the total achievement for girls in the experimental groups was greater (Figure 4). This finding was demonstrated in science in upper primary schools in Papua New Guinea, English in lower primary in South Africa, and adult basic education in Honduras, suggesting that the age of the learner and the subject taught were not controlling variables.

Another study of learning gains conducted in Honduras shows that the combination of IRI and other interventions may have synergistic effects. The study found that when IRI programs are introduced with new textbooks, the impact on learning gains almost doubles the effect of providing textbooks alone (effect size = 0.61). The indications are that a well-constructed multichannel approach—where different educational strategies are deliberately aligned so that traditional and nontraditional approaches reinforce each other—may have the greatest impact on learning (Godoy-Kain 1990).

WHAT IS KNOWN ABOUT THE ECONOMICS OF IRI PROJECTS?

There is a growing body of literature analyzing the economics of IRI. A brief description of how IRI projects are generally designed and implemented reveals 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, when compared with conventional systems. At the same time, they have far lower recurrent costs associated with permanent staff, dissemination, training, and maintenance. Although IRI projects have capacity-building components, they also are product-oriented and are evaluated continuously during the early design and production stages to ensure relevance and effectiveness. Because most of the radio programs have gone through this extensive formative evaluation and have built-in strategies for training, active learning, and quality control, high-level use can be maintained relatively easily over time, and

Figure 4: Total Achievement in Mean Post-Tests by Gender (Percent Gain)



Sources: Hartenberger and Bosch 1996; Tilson, Jamison, Fryer, Edgerton, Godoy-Kain, Imhoof, Christensen and Roy 1991; ProjectLearnTech 1994; Leigh 1995.

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 only 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 supplementary materials such as one-page worksheets inserted into local newspapers or distributed at the beginning of the year, batteries and radios, and the maintenance of an IRI management system or unit.

In addition, the wide reach of radio broadcasts means that *increasing the number of learners increases costs very little.* In contrast, most other interventions with high variable costs will 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 dramatically influence the cost of the program. Because the primary product—radio programs—is broadcast, the cost per learner decreases proportionally with an increase in the number of 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 circumstances in each country, but three interesting examples are: (i) Lesotho, where a tax pays for a portion of the costs; (ii) Honduras, which is currently experimenting with cost-sharing strategies at the municipal-private-public-NGO level; and (iii) the Bolivia early childhood development series, which experiments with decentralized methods of sustaining IRI programs through local municipalities. It also is important to note that most IRI projects are at least partially sustained through partnerships between ministries of education and ministries of communication and broadcasting.

WHAT DO COST DATA SHOW?

Most cost analyses of IRI programs project decreasing student costs over time using the underlying principle that the cost of development will be offset as more and more learners use the programs (Jamison 1990, Tilson, Jamison, Fryer, Godoy-Kain and Imhoof 1991, and Cobbes 1995). In a study of Honduran mathematics programs conducted in 1990, for example, it was discovered that the annual cost per student 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 percent). However, the incremental cost to continue the program fell to US$1.01 per student for each year thereafter, a cost that would be distributed across learners and the government. Moreover, this cost would be reduced dramatically if airtime, the highest cost item, was provided or if the number of learners increased.

A similar 1991 study of mathematics in Bolivia found that the cost per student would be US$1.51 in the first year (including program development costs and a projected reach of 200,000 students) or US$1.04 if the number of students increased to 600,000. The incremental cost of sustaining the program for 200,000 students per year, however, was only US$0.81 per student after the development stage (Jamison 1990, Tilson, Jamison, Fryer, Godoy-Kain, and Imhoof 1991). When compared with the traditional mathematics classes, the cost-effectiveness ratio of IRI programs would be 64 percent higher, assuming 200,000 students per year were reached (Jamison 1990).

Early criticisms of this analysis suggested that the projected number of learners was too high, and that Bolivia would not be able to provide and sustain the use of IRI programs for very long. In 1996, after nine years of broadcasting, over a million learners had used the Bolivia Math and Health programs as part of the ministry's national curricula, a long-term total that even ambitious project evaluators did not anticipate. Records show that 184,490 students and teachers officially used the mathematics programs in 1996, and if the shadow audience were included (the incidental listeners or formal or nonformal learners who discovered the series over the airwaves and used it on their own), total learner figures would be even higher. As the cost of airtime also had been distributed among a variety of radio stations around the country, it is likely that the overall cost per student in 1996 was even lower than previously projected.

A 1991 study conducted in Lesotho attempted to understand how the same type of program would compare in a country with completely different circumstances. Using the same methodology, an annual per student cost of US$0.94 was derived, of which only US$0.24 would be covered by the government. While the per student cost is much lower than Bolivia's, it actually constitutes a greater percentage of Lesotho's total education budget than in Bolivia and, therefore, indicates a significant education policy decision. Compared with other options, the IRI programs in Lesotho are considered to be cost-effective and are still being used today.

IS IRI COST-EFFECTIVE WHEN COMPARED WITH OTHER INTERVENTIONS?

A number of cost-effectiveness studies have found IRI to be a highly competitive educational strategy when compared with other interventions. As early as 1988, Lockheed and Hanushek published a study that compared cost-effectiveness data on three IRI, two textbook, 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 the *efficiency ratio*. The study shows that providing textbooks results in an attractive efficiency ratio of about 0.2 effect units per one dollar per year (with the exception of one case in the Philippines where the gain was 1.5 effect units 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 0.3 to 1.3 range.

Finally, in a recent cost analysis conducted in South Africa, evidence suggests that IRI continues to be cheaper and more effective than alternative programs. The 1995 study shows that, when the cost of South Africa's English in Action is compared with other English language programs, the cost per student of English in Action ranged from one-third to one-half of that for the other options (Cobbes 1995). Like other projects, South Africa's English in Action is now broadcast countrywide, indicating that the recurrent costs associated with sustaining the programs are considered justifiable.

HOW HAS IRI EVOLVED OVER TIME?

Certain trends are worth noting in the evolution of IRI since the 1970s. For example, the original concept of making programs "teacher-proof" has been largely discarded. Instead, most new programs serve as a guide or tool for the teacher and, in some cases, are used for teacher training. The early childhood development series used in Bolivia, Nepal, and South Africa, for example, has learning objectives for two audiences: the young learners and their teachers and caregivers. This arrangement has been particularly important when the radio characters point out elements of early childhood development as the teachers and caregivers interact with the young children during the IRI program. The series serves as both a nonformal radio program for children and a hands-on training tool for caregivers and kindergarten teachers. The same strategy has recently been adopted for English programs in the Dominican Republic and Costa Rica so that teacher training is an intrinsic part of the total system.

Strategies also have been devised to make IRI more entertaining and culturally appropriate. For example, a soap opera/novella style was adopted for A fifth grade environmental education program in Costa Rica. Story and drama have become popular ways to demonstrate more constructivist styles of learning.

More attention also is being given to making the programs engaging, relevant, and appropriate for both boys and girls. A recent review of research data and script analysis of four IRI programs showed that, although girls were making great strides in achievement, the programs did not take full advantage of the potential to present positive role models and interactions between female and male characters. A script analysis process was subsequently created for IRI scriptwriters in order to enhance IRI programs in this regard (Hartenberger and Bosch 1996).

Finally, the design of IRI has evolved in response to educational research and ideologic changes in learning theory. For example, South Africa took a particular interest in developing

constructivist programs and attempted to make English and mathematics more open to individual discovery and analysis. Even countries with a long history in IRI—such as Bolivia—have shown increasing interest in updating their methods to be compatible with current views of learning.

WHAT CONCLUSIONS CAN BE DRAWN?

IRI applications differ in the degree of activity required of the learners, the subject matter, the age and background of the learners, the 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, studies consistently demonstrate high learning gains, decreased equity gaps, and cost-effectiveness across projects. The basic structure and methodology of IRI has worked well enough that it is still used in projects around the world 23 years after they were launched.

It is difficult to pin the successes of the IRI methodology on any one characteristic (Box 1). More likely, a combination of the key factors converges to provide the needed conditions for active and supported learning. The consistency of these factors forms a methodology that appears to fill a needed gap and provides an effective instructional catalyst for teachers and learners across traditional boundaries, such as gender, distance, and access to the highest quality schools.

WHERE NEXT?

Given this potential, the challenge will be to look into the nuts and bolts of known IRI projects' design and implementation, to determine how differences and similarities have contributed to sustainability. Why, for example, have some countries overcome obstacles and maintained their programs for up to ten years, while others have not? With this information, educational planners will have the information needed to make decisions on the appropriateness of IRI as an educational strategy in their country, and to proceed to the design of projects that will continue to demonstrate IRI's potential for achieving educational effectiveness in the face of limited material and human resources.

Box 1: Characteristics of IRI

Early Prototypes	Current Trends
• Regular pauses for learner interaction with radio	• Regular pauses for learner interaction with radio
• Directed to one audience: the student	• Requires interactions among learners and teachers/ facilitators to facilitate an active learning environment; often directed to two audiences
• Distributed learning throughout series	• Distributes learning throughout series
• Use of known local resources, such as rocks and sticks	• Use of known local resources, such as rocks and sticks
• Use of characters and imagination to aid in learning	• Increased use of characters who act as gender role models in dramas and imaginary settings
• Broadcast over radio	• Broadcast over radio, used on cassette, or both
• "Teacher proof"	• Teacher training deliberately incorporated
• Used repetition, reinforcement, and problem solving	• Incorporates more constructivist approaches
• Incorporated pedagogical principles of how teaching/learning is constructed	• Incorporates pedagogical principles in how teaching/ learning is constructed
• Targeted to math and language in school	• Used for a variety of subjects and learning environments
• Always used supplementary worksheets for students and guides for teachers	• Sometimes uses supplementary materials, depending on ability to disseminate cheaply

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APPENDIX I

Country/Start Year	Subject/Grades	History and Current Status of IRI Program
Nicaragua (1974)	Math/1–3	The first pilot project demonstrated high learning gains and cost-effectiveness, but was abandoned because of the revolution. After one year, math scores on a standardized test increased from 39 to 65 percent. A total of 465 radio lessons were produced.
Kenya (1980)	English	The original English as a Second Language showed learning gains, but was not institutionalized for political reasons. After one year, IRI students scored 18 percent higher on a standardized test than did control students.
Thailand (1980)	Math/1–2	Thailand's radio mathematics series was the first adaptation of the original Nicaragua math series and was used to provide learning opportunities for rural students. The series is still broadcast in some areas and is being used on cassette in hilltribe cluster schools.
Dominican Republic (1981)	Integrated/ programming	The RADECO programs were developed to reach children in areas where there were no schools. Four levels of primary education were developed through a combination of radio lessons and supplementary print materials. Evaluations showed that students learned almost as well, or better than, children in full-day conventional schools. Ten years after its inception, the government still broadcasts the series. A first and second grade math series is broadcast in formal schools.
Papua New Guinea (1986)	Science/4–6	The Radio Science programs were the first to be created for upper primary and to use an inquiry approach. Because of its higher demands on teachers, it requires a more intense teacher training component. It has been broadcast for 10 years and, under new privatization struggles, the National Department of Education and National Broadcasting Commission are negotiating how to continue to pay for airtime.
Honduras (1987)	Math/1–3	A new series of math programs called *La Familia de los Numeros* was produced to make the original math model more relevant. The series was based on mental math and enhanced the teacher's role. While it was not successfully institutionalized, the IRI methodology was changed to meet newer needs in adult education.
Bolivia (1987)	Math/1–5	The Bolivia math programs were a more in-depth adaptation of the Nicaraguan series. IRI Math has been broadcast for 10 years and is part of the national curriculum. In 1997, the government looked for ways to make IRI programming consistent with their educational reform goals.
Lesotho (1987)	English/1–3	The English radio programs are still used nationally. The Ministry of Education has levied a tax to pay for the guidebook that accompanies the programs, and programs are broadcast in every age-appropriate classroom.
Costa Rica, Guatemala, El Salvador, Dominican Republic (1988-1992)	Math/1–3	Adaptations of the Honduran math series were made for neighboring countries, although the extent of institutionalization varied by country. The Costa Rica programs are no longer used. The El Salvador series, *El Maravilloso Mundo de los Numeros*, is used nationally as part of the basic education curriculum and additional basic education components are being added.

APPENDIX I (continued)

Country/Start Year	Subject/Grades	History and Current Status of IRI Program
Costa Rica (1991)	Environmental Education/4–5	Two pilot series were developed that used adventure stories and a drama format to engage children in environmental activities. The pilot was not institutionalized, but the new style of IRI continues to be replicated in other areas.
Bolivia (1992)	Health/3–4	Radio Health adapted the IRI methodology to teach health in school through child-to-child strategies. IRI Health has been broadcast nationally for four years.
Honduras (1992)	Adult basic education	Three levels of adult basic education have been produced and 3 additional levels are being created and broadcast through an innovative decentralized strategy. The use of IRI is heavy in the early levels and tapers off at advanced levels.
South Africa (1992)	ESL/1–2	Two levels of English in Action have been created in South Africa and a third is being developed. The original English model was recast to serve as a teacher training instrument and to be more open in its approach. The programs are broadcast nationally.
Indonesia (1992)	Teacher training	A unit was developed within the government and pro-grams continue to be developed and broadcast.
Portuguese-speaking African countries (1992)	Math/3–4	Originally developed in Cape Verde for eventual use in Angola, Cape Verde, Mozambique and Sao Tome e Prin-cipe, IRI math is now fully financed by the Dutch government through an agreement with UNESCO.
Bolivia (1994)	Early childhood development (ECD)	A new model of IRI was developed to teach ECD practices to adult caregivers and to engage children in developmentally appropriate activities and play. IRI for ECD is both broadcast and used on cassette in three languages and uses a decentralized implementation approach that has been adapted for the reform.
Bangladesh (1995)	English	The Bangladesh Rural Advancement Committee (BRAC) has decided to introduce IRI English into nonformal schools. Ninety lessons have been developed and an adaptation of the Honduras Mental Math programs are being discussed.
Nepal (1996)	ECD	UNICEF and Radio Nepal are adapting the model created in Bolivia for three regions of Nepal, with increased emphasis on nutrition, health and gender. The pilot was scheduled to go to scale mid-1997.
Pakistan	English	IRI English for grades 3–5 has been adapted for use in the Northwest Frontier Province. The program is expanding from 40,000 students in 800 schools to all schools in the province and to other provinces.
Haiti (1996)	Reading, civics, math	Programs are being written and produced in Creole for primary schools.
Ecuador (1996)	Conflict resolution, critical thinking skills	A pilot program is being developed for teachers and parents of ECD, kindergarten, and first grade children to help adults learn how to facilitate the development of critical thinking skills and conflict resolution in young children. A decentralized approach to development and implementation is being used to be consistent with the decentralized elementary system.
Dominican Republic/ Costa Rica (1997)	English	A two-country ESL pilot is currently being developed with funds from the World Bank. The series has developed a set of learning objectives for teachers on teacher practice, as well as learning objectives for students learning English as a Second Language.

APPENDIX II

Figure 1. Comparisons of Mean Post-Test Scores (Percent Correct)

	Bolivia-(Math)	Nicaragua-(Math)	Thailand-Northeast (Math)	Papua New Guinea-(Science)	South Africa-(English)	Honduras (Adult Ed.-Spanish/ Females)
Control	47	58	44	42	70	74
Experimental	66	66	58	46	83	81

Sources: Tilson, Jamison, Fryer, Edgerton, Godoy-Kain, Imhoof, Christensen and Roy 1991; Leigh 1995; Corrales 1995.

Figure 2. Urban/Rural Differentials (Percent Correct)

	Bolivia-Urban	Bolivia Rural	Thailand-Central Plain	Thailand-Northeast	South Africa-Urban	South Africa-(Females) Rural
Control	55	35	63	44	76.6	59.4
Experimental	73	57	68	58	82	84.3

Sources: Tilson, Jamison, Fryer, Edgerton, Godoy-Kain, Imhoof, Christensen and Roy 1991; OLSET 1995.

Figure 3. Total Achievement by Gender (Percent Correct)

	PNG-Science	Honduras-Math	Honduras-Spanish	South Africa-English
Girls	6	14	7	14
Boys	3.9	7.4	2	13

Sources: Hartenberger and Bosch 1996; Tilson, Jamison, Fryer, Edgerton, Godoy-Kain, Imhoof, Christensen and Roy 1991; Project LearnTech 1994; Leigh 1995.

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