

## The Effectiveness of Grade One English Interactive Radio Instruction Programs in Ethiopia

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**Abstract:** The aim of this study was to find out whether Interactive Radio Instruction (IRI) English Programs in Grade One were effective in Ethiopia. The primary objective of the study was to measure student learning gains in English Listening Comprehension. A secondary objective was to determine if IRI programs had differential impact on girls and boys, and on urban/rural schools. A basic experimental design was used to compare the learning gains of children in classes using the IRI English programs and children in traditional English classes. Participants in this study constituted control and experimental groups and they were randomly selected and assigned to their respective groups. The sample size was 1466 children for both groups. The dependent variable, student scholastic achievement score was measured at two occasions: pre-test and post-test. For the pre-test both control and experimental students were given a listening comprehension test, which was recorded on a cassette. After an interval of seven months, which constituted a treatment period, the same test was given to the same students in their respective groups. The treatment consisted of 5 fifteen-minute interactive radio lessons every week in experimental schools. Traditional instruction was given in the control schools and there was no exposure of the students to IRI in these schools. Results indicate that students exposed to IRI gained significantly more than students in non-IRI or traditional instruction. In addition, in the IRI classes, female students gained more than male students. From this it was recommended that the use of interactive radio programs has to be expanded to benefit all students in Ethiopian primary schools.

### Introduction

The Educational Media Agency (EMA) in collaboration with the Basic Education Overhaul Project (BESO) /USAID initiated Interactive Radio Instruction English Programs for Grade One in 1999 in Ethiopia. EMA's mission as stated in the Education Sector

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Development Program of Ethiopia (ESDP-I) is to produce broadcast media programs for diverse audiences to “enrich the quality of education for those attending school and provide access to continuing education for those who are no longer enrolled”. With particular reference to EMA’s role in primary English education, the ESDP-I document noted that the main objective was to “improve the quality of English language instruction by producing high quality educational Interactive Radio Instruction programs to primary schools”. ESDP-I was completed in 2002/03 and now the implementation of ESDP- II (Education Sector Development Program-II) is underway. Likewise, the Basic Education Overhaul Project is in its second phase (now called Basic Education System Objective) after having completed its first phase in Ethiopia. With these transitions also came a renewed commitment to supporting English education with Interactive Radio Instruction.

English language instruction is emphasized in Ethiopia, because it is the official international language in the country, and is the medium of instruction in post-secondary education. Success in English is critical to achievement in higher education and is a major asset for the world of work. Because of the importance of English in Ethiopia, children begin studying English in Grade One. Daily Interactive Radio Instruction (IRI) has been used to produce widespread benefits in primary school language instruction, measurably improving student learning and simultaneously providing teachers with new skills and confidence in teaching this subject. Although, EMA has a long experience in broadcasting a weekly supplemental English radio programs for primary grades, the interactive approach is different. First, there are 4-5 programs instead of just one program per week. Second, the scripts are written in a way that actively engages the children. Every few seconds the children respond, usually by speaking, but sometimes by writing. Third, there are additional communicative language learning activities after the end of the program. The IRI lessons are based on the curriculum and for the pilot project, teachers were provided the lessons on audio-cassettes.

The program plan document for IRI envisaged the following possible benefits from the project:

- Improved learning of English by Grade 1 boys and girls throughout the country,
- Greater skill and confidence in teaching English among primary school teachers,
- Strong foundation for maintaining the standard of English language across all regions,
- Full exploitation of the educational potential of radio medium, and
- Increased integration between EMA and the Regional Education Bureaus in the areas of evaluation and support for teachers in schools.

The introduction of IRI English radio programs was proposed in two stages. The first stage involved the production, distribution and piloting of programs on cassettes in 1999/2000 while the second stage was to move to radio use in 2000-2001. For the pilot program in 1999/2000, the radio programs and teacher guides were produced and distributed to carefully selected 24 schools in eight regions. Of this number, 16 schools were “experimental schools” where the impact of IRI was studied. The remaining 8 schools using IRI lessons were visited on regular basis in order for EMA to obtain formative feedback for the purpose of improving the lessons. There was also a control group of 16 schools that did not receive the IRI lessons and relied on the traditional English language instruction in Grade one.

The formative evaluation addressed issues related to the implementation of IRI using both qualitative and quantitative methods while the summative evaluation used a listening comprehension test. This report focuses on the effectiveness of Interactive Radio Programs as investigated in the summative evaluation.

### **Objectives of the Study**

The general objective of this study was to analyse the effectiveness of Grade One Interactive English Radio Programs in Ethiopia. It was an attempt to examine the contribution of Interactive Radio Instruction Programs to improving the quality of English language instruction at the initiation of primary schooling in Ethiopia. The specific objectives of this study were:

- To analyse the contribution of interactive radio English instruction programs to the academic achievement of grade one students in Ethiopia,
- To compare the academic scores and gains of students exposed to IRI English Programs in Grade One with those of students of the same grade having no exposure to these programs, and
- To compare the academic scores and gains of students with and without IRI programs in terms of school location (urban/rural), and sex of students (male/female).

### **Significance of the Study**

English is the principal international language in Ethiopia. It is the language of instruction beginning in secondary school, or even earlier in some regions. It is one of the subjects that determine whether or not a student qualifies for higher education. Providing quality learning in English is therefore vital to enable students to remain in formal schooling as well as in the world of work. IRI is one of the approaches to meeting these ends. Studying the outcomes and effectiveness of this experimental approach provides vital information to decision makers.

Equity is a major lack of Ethiopian education. It comprises several dimensions including gender, location and school facilities. Experiences from several countries suggest that IRI had strong impact in closing equity gaps in education. This study includes an

analysis to show the potential of IRI to narrow differences in education while simultaneously improving quality.

Although Ethiopia has many years of experience in supporting primary education with radio, only limited research has been conducted as to the effectiveness of the programs. Thus, the scope of educational radio research and the areas investigated have been very limited. In this regard, the current study is a significant contribution to research on radio programs in Ethiopia.

### **Limitations of the Study**

Language skills can be assessed at listening, speaking, reading and writing levels, but this study was limited only to the assessment of listening comprehension. A variety of reasons including logistic, experiential and pedagogical have contributed to this limitation. The assessment of other skills is essential because they are included in the curriculum.

There was a considerable attrition of participants from the study. Some of the reasons have to do with technical problems in post-test production on tape recorders while others are the result of normal dropouts where over 25% of grade one children in Ethiopia drop out of school.

The administration of the tests using a tape recorder limited the testers from solving some problems in terms of instructions and making corrections during the tests. In fact the use of the mother tongue for instructions in some places might have produced some misconceptions.

This study was limited only to exploring the effectiveness of IRI in Grade One English instruction. As such, its main target was to investigate whether or not the use of IRI programs make a difference in students learning as compared to those schools that use traditional instruction. Finding out the factors that influence the learning gains of

students from IRI has not been the main direction of investigation at this stage. This approach in educational media research is not new. Clark (1983), and Thompson, Simonson, and Hargrave (1996), classify such a study into media comparison studies among the main types of studies that have dominated the field. The concern of media comparison studies is to find out the comparative effects on learning of two media (e.g. computers or television), or of one medium and traditional instruction. Commonly such studies are followed by other studies investigating the conditions that influence the effectiveness of media and technology in education. It is hoped that subsequent studies in Ethiopia will follow this trend to take up the remaining questions in the future.

### **Definition of Relevant Terms**

*Interactive radio instruction:* There is fairly a common understanding among different researchers on the meaning of Interactive Radio Instruction. It is described as interactive lessons in which an external teaching element, delivered by a distant teacher through the medium of radio or audiocassette, is carefully integrated with classroom activities carried out by the classroom teachers and learners (see Bosch, 1997; Dock and Helwig, 1999, Tilson, 1991).

*Quality in Education:* In much contemporary discourse in education, there is no agreed upon definition of quality in education. However, Chen (1996) identifies that there are three perspectives in defining quality. The first of these is the use of financial input as quality criteria. Financial inputs are measured by teacher-student ratio, per-student expenditure and the size of non-teaching support staff or library facilities. The second perspective in defining quality is the retentivity of schools. The main indicator is the extent to which schools retain pupils after the first year of schooling or until they reached a certain grade. The third perspective defines quality of education as the product or outcomes of education, and not as the resources or processes from which products emerge. The common

indicator used is student academic achievement, although educational products are much wider than academic attainment. In this study, quality of education refers to student learning as measured by an achievement test. With particular reference to Grade One English Interactive Radio programs in Ethiopia, a listening comprehension test was adopted following the pedagogical principle that verbal comprehension is more important in the development of a language in a child than the ability to verbalise thought through sound (Lennberg, 1970; Thurston and Thurston, 1963).

*Access:* This term is also used to mean equality of educational opportunity. According to Fagerlind and Saha (1989), access understood in this way refers to both the opportunity to participate in education and the availability of facilities. In this study, access refers to both the opportunity to participate in education and the availability of facilities.

*Equity:* The World Bank (1995) emphasizes that equity has two principal perspectives. The first one is everyone's right to basic knowledge and skills necessary to function in society. The second refers to the obligation to ensure that qualified potential students are not denied education because they are poor or female, are from ethnic minorities or geographically remote regions, or have special educational needs. Fagerlind and Saha (1989) related equity with access, and imply that equity involves the elimination of gaps in treatment and performance. In this study, equity is taken to mean the elimination of gaps in student learning due to geographical location and gender.

## **Literature Review**

### *Studies on Interactive Radio Instruction*

Research on Interactive Radio Instruction can broadly be divided into effectiveness and utilization studies. The concept of effectiveness normally refers to the ability to produce results (Temu: 1995). With

particular reference to interactive media, Reeves (1990) developed a framework that consists of six levels at which effectiveness can be understood.

These are cost-effectiveness evaluation, impact evaluation, immediate effectiveness evaluation, formative evaluation, assessment of the worth of objectives, and project documentation. Cost effectiveness studies focus on the delivery costs per unit of interactive media. Impact evaluation investigates performance changes in learners. The main purpose of immediate effectiveness evaluation is to explore the instructional effectiveness and efficiency of interactive media within the immediate temporal and spatial contexts of its implementation. Formative evaluation is concerned with how the delivery of interactive media programs can be improved. The worth of objectives are assessed to find out who benefits from such programs, while project documentation involves keeping records of when and where various projects occur, what activities cost and who participates in them. The most common effectiveness studies in Interactive Radio focus on student learning gains, professional development of teachers, cost effectiveness and the improvement of educational access.

The central theme of utilization is the universe of practice, and how links are built between action and reflection (House, 1993; Huberman and Cox, 1990). The chief task in this type of research is the mix of local knowledge to influence practitioners understanding, decisions and actions either individually or institutionally. Moreover, utilization studies involve working arrangements, contextual constraints and institutional history. In Interactive Radio Interaction, the concerns of utilization studies are the practical conditions that influence the effectiveness of the programs. Thus, the current review focuses on studies of both the effectiveness of Interactive Radio Instruction (IRI) and the factors that condition the usefulness or effectiveness of these programs following the part which analyzes the characteristics of Interactive Radio Instruction.



### **Characteristics of Interactive Radio Instruction**

Since its emergence as a large-scale medium in the 1920s, three distinct uses of radio were common in primary education. These are school broadcasting, radio schools and interactive radio instruction (Mayo,1999). School broadcasting focused on enrichment of classroom lessons, while radio schools aimed at expanding access. Interactive radio instruction is a methodology of instruction which turns a typical one-way radio technology into a tool for active learning inside and outside the classroom (Bosch,1997). According to Anzalone (1991) these programs are interactive, because the primary school children in class that use the program call out responses to questions prompted by the pre-recorded radio instructors, who then give the answers according to carefully timed scripts. The process simulates live instruction, even though the broadcast radio signal is a one-way medium. The instructional principles include active and frequent pupil responses while the program is on air, immediate reinforcement, and distributed practice of one learning content. The lessons also have a segmented structure to ensure variety and, thus, to help maintain the active interest of the children. Many of the IRI services provide support materials. IRI programs are directed to situations and audiences where they could be used. There is an emphasis on audience research, participation, and field level formative evaluation to ensure that lessons are engaging, relevant, and that learners can achieve educational objectives (Dock and Helwig, 1999).

According to Bosch (1977), what makes IRI different from other methodologies is its requirement from 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 air. In IRI the 'audio teacher' carries the main weight in teaching and directs the learner activities (exercises, answers to questions, songs, and practical tasks) that take place during carefully timed pauses in the audio-script. The classroom teacher is a facilitator. From this perspective, IRI is distinct from most other forms of distance

education because its primary goal is the improvement of educational quality rather than to extend access to needy students. Unlike many technologies designed to improve access, IRI is developed to counteract low level of teacher training, poor achievement among learners and limited resources.

The first IRI model was developed by the Nicaraguan Radio Mathematics Project at the Stanford University with funding from USAID. The project was aimed at improving students learning in basic Mathematics from Grade 1-4. Since then IRI technology has been adopted in many countries and for a variety of subjects including Science, English, Spanish, Portuguese, Environmental Education, Early Childhood Development, Adult Basic Education and Health Education.

### **Effectiveness of Interactive Radio Instruction**

The goals and results of Interactive Radio Instruction are known from well-documented evaluations in many countries. The goals include improving learning gains for students, improving educational access and equity, and enhancing cost-effectiveness in education. What does the literature tell about the effectiveness of IRI in relation to these tasks?

*Improving student academic gains:* With particular reference to *academic gains of students*, many studies have repeatedly demonstrated that students who learned with IRI consistently outperformed those who learned without it (see Bosch, 1997; Leigh and Cash, 1999, Lockheed and Hanusheck, 1988; Tilson, 1991). For instance, Bosch (1997) summarized a comparison of mean test scores between experimental and control schools in Bolivia, Nicaragua, Thailand, Papua New Guinea, South Africa and Honduras. The results in each case indicate that learning gains for students using Interactive Radio Instruction is more than the gains for students in the control groups. It has also been demonstrated in most cases that students show progressively greater increases in

achievement with increased exposure to the programs. For instance, Leigh (1995) reports that in South Africa students who received less 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%. In Bolivia, Tilson et al. (1991) reported that the average score of second graders using 'Radio Maths' increased from 47% to 66%. Of these, the experimental students who had completed one year of the radio lessons did much better (52% correct) and those students who completed two years of radio programs scored even higher.

*Improving Access:* The use of Interactive Radio for *improving the conditions of hard-to reach or out-of-school population* has also been significant. For instance, Bosch (1997) refers to the RADECO project in the Dominican Republic that was created for children who had no schools. In this project, children who had just five hours of integrated instruction a week using IRI plus thirty minutes of follow-up activities were compared to students who were in Regular formal schools for more than twice the amount of time. Results indicated that first graders using the RADECO programs responded correctly 51% on post-tests, versus 24% for the control group. Second graders using IRI gave 10% more correct answers. Over all, even though RADECO students had enormous difficulties, it was found that the use of IRI for an hour a day had comparable results in reading, writing and language for both grades.

*Improving Equity in Education:* One of the most promising outcomes of IRI has been its potential to close equity gaps between *rural and urban, and male and female students*. Concerning equity between urban and rural students, studies show that rural students gain more than their urban counter parts, who have greater access to materials and better trained teachers. That is, although children in IRI classes in both rural and urban schools out perform their counterparts in traditional classrooms, the IRI rural students gain more than the urban IRI students, thus, closing the usual performance gap between urban and rural students. Bosch (1997) summarizes data from Bolivia,

South Africa, Thailand and other countries to argue that IRI addresses not only issues related to quality, but also urban/rural equity gaps. Hartenberger and Bosch (1996) have also looked into whether or not IRI has closed gender gaps between male and female students in Papua New Guinea (Primary Science), Honduras (Maths and Spanish), and South Africa (English). They reported that girls were achieving about the same as boys in post-tests, but since the baseline scores of girls were lower, the total achievement for girls was greater.

*Improving Educational Costs:* IRI has also been *cost-effective*. According to a summary by Bosch (1997) most cost analyses of IRI programs project decreasing cost per student over time based on the fact that the relatively high cost of developing programs is increasingly offset as more and more learners use the programs. She refers, for instance, to Honduran Mathematics programs where 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, but the incremental cost to continue the program fell to US\$ 1.01 per student per year thereafter. IRI has also been cost-effective when compared to other interventions. For instance, a cost analysis study conducted in South Africa suggests that when the cost of 'English in Action' IRI programs 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 other options.

*Teachers' Professional Development:* Different case studies indicate that Interactive Radio Instruction offers promising professional development possibilities for teachers. Leigh and Cash (1999) refer to a study in Papua New Guinea where Radio Science teachers appreciated the opportunity to learn science along with their students. Similarly, in South Africa teachers reported a range of new benefits and strategies they were being provided by *English in Action* programs for effective language teaching. These include new teaching styles, improved moral and confidence, vocabulary, listening skills, and problem solving skills as well as improved communication

capacity. Leigh and Cash (1999) note that South Africa's English in Action Project developed a system of afternoon workshops called "Teacher Support Group Meetings" in order to maximize benefits for teachers. These provided periodic opportunities for IRI teachers from local schools to meet on a peer-to-peer basis, and discuss professional issues related to the effective use of IRI. An independent study showed that teachers appreciate these meetings, because they have found so much information to share by overcoming the effect of isolation.

*Adult and very young learners:* Some countries have used Interactive Radio Instruction for Basic Adult Education and Early Childhood Development Programs. Leigh and Cash (1999) refer to the Honduran Basic Education for All Radio classes and to the Bolivian Childhood Development Programs where high-level academic gains were observed. In Honduras, adults enrolled in Mathematics and Spanish Basic Education programs were tested and their scores were higher than control students. Using different indicators, an evaluation of the Bolivian Early Childhood Program found that IRI programs had a positive effect on overall child development – and not merely on education or cognition.

### **Conditions for the Effectiveness of Interactive Radio Instruction**

Although, Bosch (1997) carefully documents that about 22 countries in Africa, Asia and Latin America have used IRI since the 1970s, there is an overwhelming evidence that the use of these projects has been influenced by a variety of conditions (see Dock, 1999; Jamison and McAnany, 1978; Lockheed and Middleton, 1991; Nekatibeb, 1998, Suppes et al., 1978).

According to Lockheed and Middleton (1991), for instance, the main influencing conditions of IRI and all other educational technology programs in developing countries were the technological, administrative, and political environments. The administrative environment according to them includes the capacity to implement,

supervise and maintain the technological intervention by the implementing agency. The way the project is integrated into the existing bureaucratic structure and the financial commitments are other administrative variables for the sustainability of such projects. By technological environment they refer to the existing infrastructure and climatic conditions. In political determinants, their reference is to the stability and continuity in the Ministry of Education. They report that many promising projects have been closed down because of changes in top leadership, despite good evaluations in educational effectiveness.

Dock (1999) classifies factors that influence the effectiveness and sustainability of interactive radio programs into two broad categories. These are external and internal factors. By external factors he meant the appointment of consistent, high quality, caring leadership, financial security, political support, integration of the program into the education system, and the training of teachers and program facilitators. In the internal factors he included management, technical coordination, timely inputs, training and supervision, evaluation and long term planning and budgeting.

The external factors determining the effectiveness and sustainability of IRI programs reviewed by Dock (1999) are similar to what Lockheed and Middleton (1991) have summarized above. However, his review of internal factors refers to different experiences. Explaining the significance of internal management, he notes that good management or technical leadership is an important part of sustainable IRI program, and a factor that is often overlooked. A competent manager is a key person to organize and promote the image of the project, and to ensure that the head of the host institution supports the program. With reference to technical coordination, the central activities mentioned include the recruitment, selection, and training of qualified personnel, and the nurturing of the participation of teachers, principals and supervisors in the project. In relation to timely inputs it is said that all involved are subject to exact timing. Such inputs include radio transmission, script writing and

reviewing, formative evaluation, office supplies, production equipment, teacher guides and so on. In relation to evaluation, the emphasis is on the significance of assessing the effectiveness of IRI programs. In long-range planning and budgeting he notes that irrespective of commitments ensconced within a donor or loan agreement for completion of certain activities in a given period, a long-range prognostic is an essential first step in achieving sustainability.

## **Research Methodology**

### *Design*

In order to explore the effectiveness of the current project in terms of student learning, a basic experimental design was adopted. Participants in this study constituted grade one control and experimental groups that were randomly assigned to their respective groups. The dependent variable, student achievement score, was measured at two occasions: pre-test and post-test. At pre-test both control and experimental students were given a listening comprehension test, recorded on a tape-recorder. After an interval of seven months, which also constituted the treatment period, the same tests were again given to the same students in their respective groups. Traditional instruction was given in the control schools and there was no exposure of the students to IRI in these schools. In experimental schools students learned lessons having the same contents with control schools using IRI, and the time allotted to English was five 15-minute radio lessons every week. In order to ensure that the independent variable was the one that created difference, both groups of schools were supplied with textbooks, pencils for writing tests, and teacher guides. The project made few visits to schools in both groups.

Teachers from the Experimental schools were provided with two-day radio utilization training, auto-cassette players, radio-players, radio-cassettes, and radio guides in order to carry out the programs in the

classroom. Apart from this, experimental schools hadn't any special provision or inputs as compared to the control schools.

It was believed that an interval of seven months was adequate in order to eliminate the effects of the pre-tests from being carried over to the post-tests, and that there would be adequate time for possible differential in learning to take place. The study included only Grade One students and there were no non-equivalent groups. Results of students who took pre-tests but did not appear for the post-tests were removed from analysis. Although learning gain was the only dependent variable used in this study, school questionnaires were developed and used to find information on indicators used as descriptors.

### **Instruments of Data Collection**

The main instrument used to collect data to determine student-learning gains was a listening comprehension test. The test was adapted to the Ethiopian context by local and international experts from South African "English in Action" radio learning programs. The choice of listening comprehension was influenced by three factors. Primarily, the availability of an appropriately validated test instrument obtained from South Africa's "English in Action" radio learning programs provided the solid basis for beginning the study in the Ethiopian context. The content of the Ethiopian radio lessons was similar to the South African series. Secondly, this test was believed appropriate to the age and educational experience of students, as these children were too young for reading or writing tests. Third, the choice of listening comprehension was based on the previously mentioned pedagogical principle that verbal comprehension is more important in the development of a language in a child than the ability to verbalise thought through sound.

Tests were administered on a group basis in two sessions with an interval of ten minutes for break. In order to control other variables that may influence the experiment other than the independent variable, the test was pre-recorded and administered via a tape



recorder. Testing took place in two stages: Pre-test and post-test. The pre-test was administered at the beginning of November 2000 while the post-test was conducted in June 2001. In both phases tests were presented by media co-ordinators who had previously taken training as to how to conduct these tests in schools.

The other instrument for data collection was a questionnaire, which was completed by zonal media supervisors and the school directors. This questionnaire required information on the demographic characteristics of participants, school location, teacher characteristics, and characteristics of schools and classes in which the project was conducted. Part of this information was used to address equity issues.

### **Selection of Samples**

The Educational Media Agency (EMA) requested 8 Regional Educational Bureaus (REBs) to identify one zone in which there are urban and rural schools and where a Zonal Media Officer or another professional education worker would be available to assist. These regions were Tigray, Addis Ababa, Amhara, Oromia, SNNPR, Harari, Dire Dawa and Gambella. The regions were included in the study, because the scope of the project covers eight of them. Each REB was also asked to provide 6 rural and 6 urban schools from the selected zone. The 12 schools were also required to be within 50 km of the Zonal Office to be accessible to Zonal Media Officer by public transportation. From a pool of 96 schools (8 regionsx12 schools) EMA identified 16 urban and 16 rural schools at random. Using a random sampling technique on this list, EMA assigned schools to four groups: urban control (N=8), urban experimental (N=8), rural control (N=8) and rural experimental schools (N=8). This means each region had 2 experimental and 2 control schools to make a total 32 schools for the whole project.

The total number of students who originally took the pre-test in these schools was 2,120. Of this, the number of pupils who took the post-test was 1,466. The reasons for the reduced numbers of participation

were irregularities in test-administration and dropout of pupils during the period between the pre-test and the post-test. Irregularities in test-administration during the post-test occurred in 2 regions. Thus, the total population for which complete results were obtained amounted to 679 in control schools and 787 in experimental schools. The total number of sample schools for which pre-tests and post-tests were obtained amounted to 26.

All selected schools were government primary ones. Region was used as a stratifying variable because there are differences in the delivery of primary education among them. School location (urban/rural) was considered for inclusion in order to reflect the main settlement patterns of the population. Moreover, there was an assumption that urban and rural schools differ in facilities, teachers' experience, and exposure to English language utilization (all favouring urban schools). School group (control/experimental) was another stratification criteria in order to find out or isolate the impact of the new approach as compared to the standard instructional situation. In this phase, 8 regions were selected based on the desire to work with a widely representative group within the practical limits or capacity of the project in its first year. Within experimental and control schools, grade one students were randomly selected on section basis.

### **Data Management and Analysis**

The administration of the test at different times required the preparation of different data files for both the pre-test and post-test. In both cases after items were coded data was entered into the SPSS program. The questionnaire, which provided information on the characteristics of participants as well as their school environment, was entered to the same program after the separate files created for pre-tests and posts-tests were merged. Careful cleaning of data followed the entry in order to eliminate some mismatches. In some regions students who did not sit for the pre-test were seated for post-tests while in others those who were present on the pre-tests have dropped out.

Data analysis for the tests as well as for the questionnaires was performed using SPSS with means, t-tests and ANOVA as the main tools for summarizing data and testing the null-hypothesis. Tables and bar graphs were used for demonstrating results and providing a comparative analysis of student mean scores and academic gains between the different groups of schools included in the study.

## Findings and Analysis of Data

### Effectiveness of IRI in Improving Educational Quality

#### *Student Academic Gains in Control Schools without IRI Programs*

Educational quality in the current study was operationalized to mean student academic gains as measured by the listening comprehension test. As part of the experimental design, students in the control schools were exposed to both the pre-test and post-test. Results indicate that there are indeed improvements of achievement by students due to the educational treatments other than radio. The results are summarized in Table 1 below.

**Table 1: Student Academic Gains in Control Schools**

Measurement (N=679)	Mean Scores	Standard Deviation	Significance
Post-test	66.08	13.85	
Pre-test	56.32	19.45	
Academic Gain (Post test- Pre test)	9.75	18.62	.000

The above table shows that the mean of student academic scores for the post-test is 66.08 percent while the mean of student academic scores in pre-test was 56.32 percent. The mean academic gain of students was 9.75 percent. A 2-tailed t-test for equality of means indicates that the difference between post-test and pre-tests scores was highly significant at 0.05 level of significance (df=678, t=12.993).

This implies that the traditional intervention produces significant improvements in students learning.

#### *Student Academic Gains in Experimental Schools with IRI Programs*

Students in the experimental schools who were exposed to IRI programs were given the same pre-test and post-test at the same time as control schools. Results indicate the academic improvement is more than twice the improvement achieved in control schools. Table 2 below shows the results.

**Table 2: Student Academic Gains with IRI Programs in Experimental Schools**

Measurement (N=787)	Mean Scores	Standard Deviation	Significance
Post-test	76.58	13.59	
Pre-test	54.17	17.89	
Academic Gain (Post test-Pre-test)	22.40	19.33	.000

Table 2 above indicates that the mean academic achievement of students in the post-test was 76.58 percent while in the pre-test the mean student achievement score was 54.17 percent in experimental schools. The mean gain in student achievement scores was 22.40 percent. A 2-tailed t-test for statistically significant difference between the means indicates that the difference between the pre-test and post-test scores was highly significant at 0.05 level of significance (df=786, t=32.509). The implication of this finding is that interactive radio instruction indeed had a major impact on student learning of English.

#### *Comparison of Learning Gains in Experimental and Control Schools*

As previously described in the design section of this paper, students both in Control and Experimental groups were exposed to the same pre-test and post-test in the study. In the control schools the students were taught English using traditional methods and curricula. In the

experimental group, the students were taught 15 minutes a day by IRI programs, and the remaining class time by the teacher who used the IRI teachers guide and the regular guide from the official syllabus. The total time per day for English in both the control and experimental classes was 40-45 minutes. Results show that students who learned with IRI scored about 13 percentage points more than those who learned without Interactive Radio programs.

**Table 3: Students Learning Gains in Control and Experimental Schools**

Status (group) of the school	Measurement		Academic Gain (Post test-Pre test)	Sig.
	Post- test	Pre-test		
Control (N=679)	66.08	56.32	9.75	.000
Experimental (N=787)	76.58	54.17	22.40	.000
Mean Difference	10.50	2.15	12.65	.000

As Table 3 above shows, the introduction of IRI in experimental schools has brought a significant difference in learning gains over the control schools. That is, experimental schools gained a mean of 22 % against 9% in control schools after seven months of teaching English. A correlated t-test shows that this difference is statistically significant. As it will be indicated later in this report, an advantage of about 13% also produces about 0.65 effect size. This finding is consistent with other findings where higher learning gains for students using IRI were repeatedly reported in comparison to control schools. For instance, Bosch (1997) presented data from six countries in which IRI schools consistently scored more than the control schools. In that report, the effect sizes of IRI programs ranged between 0.24 and 0.94.

The 13 point advantage of the experimental group is particularly impressive in that the pre-test score of this group was 2 points lower than the control group. A 2-tailed significance test for the equality of means indicates that there was a highly significant statistical difference between control and experimental schools during the post-

test at 0.05 level of significance ( $df=1464$ ,  $t=14.621$ ) and less statistically significant difference during the pre-test at 0.05 level of significance (Sig.2-tailed=0.028,  $df=1464$ ). This finding indicates that students in control schools had a slight advantage of English knowledge as measured by listening skills (an average of 56 % against 54%) at the time of the pre-test.

### Effectiveness of IRI in urban and rural schools

Student performance varies between urban and rural schools in Ethiopia. According to the 1999 First Ethiopian National Baseline Assessment report in Grade Eight, for instance, rural primary school students performed significantly less than the urban students at the national level. Therefore it is expected that innovative programs like the IRI have to help to raise the quality of English instruction in rural schools. In this study, a comparison of student academic gains in experimental and control groups by urban-rural location was carried out in order to find out the extent to which IRI contributes to the improvement of quality in English instruction in Ethiopia. Table 4 below gives the results.

**Table 4: Student Learning Gains in Experimental and Control Schools by Location**

Measurement	School type	Mean Academic scores		Mean difference	Sig.
		Urban	Rural		
Post-test	Control	67.46	64.03	3.43	.001
	Experimental	80.74	72.19	8.54	.000
Pre-test	Control	57.08	55.21	1.86	.221
	Experimental	57.37	50.80	6.56	.000
Mean Gain (Post test-Pre test)	Control	10.38	8.81	1.57	.304
	Experimental	23.37	21.39	1.98	.322

In Urban Control schools N= 405. In Urban Experimental Schools N=404. In Rural Control Schools N=274. In Rural Experimental Schools N=383. \*Effect size = 0.65

From the above table, the mean difference of the post-test scores between urban control and rural control schools is 3.43 (sig.= 0.001,

$t=3.19$ ,  $df=677$ ). This finding is consistent with the First Ethiopian Baseline Assessment on Grade Eight Student Achievement (NOE, 1999). In that study, it was reported that the national aggregate achievement in English for rural students was 34.4 % while urban students scored 39.5%. What is also interesting from the above table is the fact that grade one students in urban and rural control schools had insignificant differences in their results at the pre-test. Yet, by the end of the year, rural students had already fallen behind in comparison to urban students.

Secondly, when results at post-tests between urban experimental and rural experimental schools are compared, urban experimental schools achieved more by a significant mean difference of 8.54 ( $df=785$ ,  $t=9.276$ ). At pre-tests, students in experimental schools had a 6.56 mean point difference over the control schools, implying that these differences even increased with the use of IRI. However, it has to be clear that in urban experimental schools academic achievement improved from approximately 57 percentage points to 81 percentage points, and from 51 percentage points to 72 percentage points in rural schools. This makes the academic gains of urban students 23 percentage points and that of rural students 21 percentage points. A comparison of overall means shows that the above difference in academic gains is not statistically significant.

Third, when the mean gains between urban control and urban experimental schools are compared, it is clear that the urban experimental school gains were more than twice (23.37 points) the gains of urban control schools (10.38 points) and the mean difference of 13.27 is a statistically significant (sig.2-tailed=0.000,  $t=15.810$ ,  $df=807$ ). This means that Interactive Radio Instruction has been more effective than traditional instruction in urban centres.

Fourth, when mean gains between rural control and rural experimental schools are compared, it is clear that rural experimental schools achieved more than rural control schools by a wide margin.

This indicates once again that IRI has been more effective than traditional instruction in rural schools.

Fifth, an overall comparison of mean gains between urban and rural experimental schools shows two encouraging results. First, IRI programs are significantly effective in the improvement of student learning both in urban and rural education. Second, the use of IRI closes the gaps in student performance between urban and rural schools as the difference in academic gains between the two types of experimental schools were statistically not significant.

Overall, traditional and radio instruction scored significantly higher on the post-test as compared to the pre-test. Nevertheless, these gains were greater in the experimental schools than in control schools. In fact Table 4 above shows that the effect size of IRI is 0.65. In comparison to results reported from other countries by Bosch (1997) this result shows a fair success. The IRI programs benefited urban experimental schools slightly more than rural experimental schools, although the difference is statistically insignificant. This implies that IRI can produce improvements without creating imbalances between urban and rural schools.

#### **Effectiveness of IRI by Gender of Students**

One of the most interesting findings is that female students gained significantly more than male students in IRI classes. However, this difference does not show up in the traditional or control schools. When the mean differences between males and females in control schools at the post-test are compared, the difference is statistically not significant. However, in experimental schools females have scored more than boys by 4.29 percent, which is statistically significant. Table 5 below summarizes the results.



**Table 5: Student Academic Gains in Experimental and Control Schools by Gender**

Measurement	School type	Mean Academic scores		Mean difference	Sig.
		Male	Female		
Post-test	Control	66.14	65.97	0.17	.873
	Experimental	74.52	78.81	4.29	.000
Pre-test	Control	55.42	57.36	1.94	.195
	Experimental	53.53	54.87	1.34	.294
Mean gains	Control	10.72	8.60	2.11	0.161
	Experimental	20.99	23.94	2.95	0.032

Males in Control schools N= 373. Females in control schools N=305. Males in experimental schools N=409. Females in Experimental schools N=378.

The above table suggests that in pre-tests, both male and female students had similar academic standards. Table 5 also indicates that in control schools the academic gain of male students was 10.72 points. When similar comparisons are made in experimental schools the academic gain of male students was 20.98 percent, which is a significant increase.

The academic gain of female students between the pre-test and post-test in control schools was 8.6 mean points as compared to 23.94 points in the experimental schools. The gains are much greater in experimental schools than in control schools. Within the experimental group, female students achieved more than male students as they started slightly behind males but finished significantly better at the post- test. These results suggest that IRI is more effective than traditional instruction for students of both sexes, but on aggregate favoured females over males.

## Summary and Conclusions

### *Summary*

The overall aim of this study was to analyse the effectiveness of Interactive Radio Instruction in Grade One English Instruction in

Ethiopia. The specific objective was to measure students' learning gains as shown by an achievement test comprising English listening skills. A secondary objective was to analyse the academic scores and gains of students with and without IRI programs in relation to school location and the sex of students.

The main approach of the study was a basic experimental design. As such its aim was to indicate how much the Interactive Radio English Programs in Grade One contributed to changes in student learning as compared to non-radio instruction. Participants in this study constituted control and experimental groups and they were randomly assigned to their respective groups. The dependent variable, student scholastic achievement score, was measured on two occasions: pre-test and post-test. At the pre-test, both control and experimental students were given a listening comprehension test, which has been developed and recorded on a tape-recorder. After an interval of seven months (which also constituted a treatment period), the same test was given to the same students in their respective groups. The principal independent variable was traditional instruction versus interactive radio instruction. Traditional instruction was given in the control schools and there was no exposure of the students to IRI in these schools. In experimental schools students learned with IRI and the time allotted to English has been fully covered by IRI. This included 5 fifteen-minute radio lessons every week. The samples were assigned on random basis to both groups and the sample size was 1,466.

Findings from the study indicate that Interactive Radio English Instruction Programs were effective in improving educational quality. Students who used these programs gained 22% as compared to 9% in control schools that did not use these programs.

In traditional or non-IRI classroom instruction, learning outcomes continue to favour urban students. In Interactive Radio Instruction, the students in urban and rural classes began with a slight differential in favour of the urban classes but there were no statistically significant

differences in the gains of urban and rural IRI students with each gaining nearly in equal amounts. Thus, radio was equally effective in increasing academic gains both in urban and rural schools.

Within urban areas a comparison of students' academic achievement in control and experimental schools indicate that students who use English IRI Programs significantly performed more than students in schools that do not use English IRI programs. Moreover, when academic gains in urban control and urban experimental schools were compared, it was found that students in urban experimental schools gained more than two times the gain of students in control schools. This means in urban areas IRI English Programs were highly effective.

Within rural areas, a comparison of control and experimental schools indicates that academic gains were much higher for students in experimental schools, even though the experimental schools started with a notable lower performance in comparison to control schools as shown by pre-tests. This implies that the use of interactive radio in rural areas can help to eliminate differentials between urban and rural schools.

Student academic achievement did not significantly differ among male and female students in control schools. In experimental schools, female students performed better than male students. Interactive Radio English Programs were more effective than Traditional Instruction for students of both sexes, but on aggregate favoured females over males.

In summary, the results of the current study show that the IRI English lessons had a significant impact on academic achievement. These positive results occurred in urban and rural schools and among male and female students. There was a slight advantage in terms of female students.

## Conclusions

This study has demonstrated that *English for Ethiopia*- IRI has been more effective in improving student learning than Traditional Instruction. This suggests that the innovation must continue and be adopted on a wider scale. This includes all regions and both urban and rural schools.

The fact that IRI has provided more opportunities to female students to perform well is a very positive tendency in Ethiopia. The potential of IRI English programs to improve student academic gains in urban and rural schools calls for more attention to strengthen these programs in the context of Ethiopian primary education.

The impact of IRI on teachers' classroom practice is an issue that calls for further investigation. Likewise, more attention is required to look into the contribution of Interactive Radio Programs in increasing the integration between EMA and regional education bureaus in the areas of evaluation and support for teachers in schools. New areas that need consideration may also include the influence of student background, school organization, school facilities, community factors etc. on student learning from IRI programs.

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