EDUCATION DEVELOPMENT CENTER, INC.

TUNED IN TO STUDENT SUCCESS

ASSESSING THE IMPACT OF INTERACTIVE RADIO INSTRUCTION FOR THE HARDEST-TO-REACH

A REVIEW OF RESEARCH

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With an Introduction by Mike Laflin

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Table of Contents

Table of Figures

Executive Summary

Evaluation data gathered between 1975 and 2000 demonstrated that Interactive Radio Instruction (IRI) had improved learning outcomes in conventional classrooms by between 10% and 20% when compared with control classrooms not using IRI. These programs often had relatively well-funded evaluation components, often taught a single subject, and focused almost entirely on improving quality.

This study focuses on the use of IRI in more taxing circumstances and the outcomes it achieved as well as children learning in conventional school settings. It looks at the use of radio to teach children who are not in school, who are affected by conflict, who are orphans, who live in countries where most social systems have broken down or never existed – the poorest, least supported and most remote learners to whom access to education has traditionally been denied. It also looks at IRI operating in systems of huge scale, such as the 20+ million learners in India.

The projects documented in this study were largely carried out since 2000 (although reference is made to earlier projects also) and addressed early childhood education, mathematics and language instruction and teacher training. They were not research projects, and their circumstances challenged data collection and student testing. Nevertheless, the data demonstrate that these IRI programs have had a positive impact on learning outcomes and on the behavior of teachers.

Interactive Radio Instruction (IRI) delivers daily 30-minute radio broadcasts that promote active learning and are designed to improve educational quality and teaching practices in schools and to deliver a complete basic education to learners not in school. This paper uses student assessment data collected on recent EDC IRI projects to determine the impact of IRI on student achievement and to highlight general patterns that emerged from the review. In all, 15 projects provided 37 records (grade-year combinations e.g. grade 1 in 2007) containing student learning data which served as the basis of this report.

The data indicate that exposure to IRI is associated with higher levels of student achievement. Generally, students in IRI classrooms demonstrated learning advantages over their non-IRI peers. This pattern held true in all but 7 of the 37 cases analyzed. Among learners of primary school subject matter (both in and out of school), participants in IRI programs demonstrated particular strengths in grade 1 across math, literacy, and English language learning. Positive effect sizes for grades 2 and 3 are also consistent in these three areas, and in the case of grade 3, this performance pattern extends into social studies as well. In grade 4, student achievement in local language literacy, English, and social studies improved with the introduction of IRI, although results vary by country and are less consistent with respect to math. The most remarkable result in primary learning was seen in an English-language program in Pakistan, where the average student outranked all or almost all of his or her peers in non-IRI classes.

Results from four IRI programs aimed at pre-primary learners are analyzed. Each program assessed children using a variety of criteria meant to capture progress in holistic early childhood development. In each setting, young learners participating in IRI programming made progress in all assessed categories of development. In three cases, children in IRI programs surpassed the learning gains of children not exposed to IRI, while in a fourth, IRI learners in informal centers with previously untrained caregivers kept pace with children in formal school settings. These results suggest that IRI is a positive influence in the early stages of both physical and cognitive development.

Classroom observation results from projects in two settings support IRI as an effective delivery mechanism for in-service professional development, as teachers are able to actively employ improved instructional techniques in the classroom while undergoing radio-based training. Teachers not only demonstrated a better understanding of pedagogical concepts emphasized by broadcasts, but more frequently utilized active learning and student-centered techniques in lessons independent of radio guidance. Steady improvements in instructional practice have been recorded in both projects over relatively short timelines, boding well for continued teacher-targeted programming.

An analysis of students in marginalized populations was challenging because of the variable quantity and quality of the data collected. Nevertheless, a closer look at student achievement by gender suggests that when boys perform well, so do girls (and vice versa). Findings by location show that IRI has bridged gaps in urban-rural achievement in English and in mathematics, although local language literacy data were less conclusive. IRI was seen to be as successful for isolated learners as it was for urban and rural students in Pakistan. An analysis of IRI learning in fragile states, while limited, demonstrated large effects on student learning outcomes in mathematics, English and local language literacy. Finally, a review of the learning outcomes for Orphans and Vulnerable Children attending IRI centers and community schools showed performance relatively on par with non-IRI learners in similar school settings, even if their achievements were not as great as those IRI learners in formal schools. While the data demonstrates that IRI enables learning opportunities for all participants—both marginalized and otherwise—a reduction in achievement gaps between marginalized and dominant student populations was less clearly evident than has been reported in earlier studies. In addition to data limitations and other factors, a shift in the settings in which IRI is used may contribute to this finding.

Among the 37 records analyzed for this paper, average effect sizes ranged from -0.16 to +2.19 across a variety of subject areas, projects, and participant countries. This variation suggests that several factors affect the degree to which exposure to IRI can improve student achievement. The researchers believe these may include the availability of qualified local resources, the quality of project implementation and monitoring, and the extent to which students actually do listen to and participate in IRI programs. While it is beyond the scope of this report to address these and other qualitative variables, they are suggested as areas for further research. What is clear, however, is that IRI consistently produces learning gains among its participants of diverse ages and in diverse settings.

I: Introduction

What is Interactive Radio Instruction?

Interactive Radio Instruction (IRI) is an instructional tool designed to deliver active learning by radio. It has improved both educational quality and teaching practices in classrooms and increased access for out-of-school learners. Audio lessons are developed to guide the teacher or facilitator and students through activities, games, and exercises that teach carefully organized knowledge and skills. During short pauses built into the radio scripts, teachers and students participate in the radio program, often more than 100 times in a half-hour lesson, reacting verbally and physically to questions and exercises posed by radio characters. Actual formats vary according to the subject and grade level being taught. Learners also participate in group work, experiments, and other activities suggested by the program. In this way, IRI exposes learners to regular, curriculum-based content and models effective teaching and activities for teachers.[1]

Based on the national curriculum, IRI programs are designed to be part of a comprehensive, multichannel learning system. Multichannel learning is based on the belief that successful learning is more likely when more than one channel is used because people learn in various ways and through various means. The paths, or channels, that connect learners to knowledge and skills are numerous: teachers and facilitators, other learners, family and community members, educational materials, and media of all kinds. In addition to radio-delivered instruction, IRI enriches the learning environment by engaging resources already available (including, for example, teachers, local cultural artifacts such as songs, games and the environment, instructional materials in the classroom such as books and the blackboard, the expertise of local community members, and locally available materials such as bottle tops and sticks) to create a blend of good teaching and learning practice.

In some instances, rather than to transmit instruction via live broadcasts, lessons are pre-recorded (onto CDs or in mp3 format, for example) and are delivered with accompanying audio players to classrooms. With non-broadcast devices, program content and structure remain similar to those employed by IRI, although pre-recorded interventions are often labeled "Interactive Audio Instruction (IAI)" rather than IRI. There is a major, largely un-researched difference, however: there is almost no way to influence the way IAI is used in the classroom. Only the teacher can control whether the IAI programs are played in the correct order, whether they are used every day as intended or used in learning "binges" of three or more programs played back-to-back on a single day, whether the lesson is used in its entirety or ten minutes at a time with pauses in between, or if some segments or entire programs are skipped altogether.

[1] The World Bank. (2005). Improving Educational Quality through Interactive Radio Instruction - A Toolkit for Policy Makers and Planners. The World Bank, Africa Region Human Development. Washington DC

EDC and IRI

IRI was first developed in the 1970s in Nicaragua by Stanford University, funded by the United States Agency for International Development (USAID). At that point, the question was simply, "Is it possible to improve learning outcomes in mathematics using the radio every day as a tool for direct instruction in the classroom?" The answer was an unequivocal "Yes," leading to similar USAID-funded experiments in Kenya to teach English, in Papua New Guinea to teach science, and in the Dominican Republic to teach the entire primary curriculum to children who were not in school. Because learning outcomes showed gains of approximately 20 percentage points over control groups of children who did not have the benefit of IRI, USAID funded the Education Development Center, Inc. (EDC) in the mid-1980s to lead the use of Interactive Radio Instruction over the next ten years in more than 25 countries.

Since about 2000, as the effects of HIV/AIDS and conflict have overwhelmed many countries, IRI has received unprecedented attention as a strategy to reach some of the estimated 72 million children not in school, and to improve the quality of instruction in schools which have too few teachers or too many untrained teachers. Since 2000, EDC has assisted Ministries of Education in the Democratic Republic of the Congo, Guinea, Guyana, Haiti, India, Indonesia, Madagascar, Malawi, Mali, Nigeria, Pakistan, Somalia, Sudan, Tanzania and Zambia to develop their own IRI programs. IRI has helped provide basic education, mainly to grades 1- 4 in formal schools and centers serving out-of-school students, early childhood development programming to very young children in centers, and in-service training to community educators and certified teachers. Strategies for upper primary grades have also been tested, and interactive strategies using other technologies such as teaching primary science in a one-computer classroom, hybrids using radio, computers and television, or teacher training strategies built around cell phone technology have all been tried.

Most of the principles of interactive instruction identified by the original Nicaragua project have proved durable, appropriate and relevant. Where change has taken place, it has been additive. Constructivist thinking has rightly made IRI practitioners more aware of the need to take account of the experience children bring with them; common sense has reinforced the need to focus on the management of the entire class over thirty minutes rather than focus on the moment-by-moment instructional relationship between the radio, the teacher and the single student; and we have acknowledged the primacy of training the teacher as well educating the learner, building in explicit training objectives for the teacher along with learning objectives for the learners.

The IRI projects of the seventies and eighties had clear and quite comprehensive research agendas about learning outcomes and also had the funds to address them. IRI projects of the last decade have focused more on addressing critical and urgent deficits in meeting Education For All (EFA) goals, and have had fewer resources to gather data about learning outcomes. This paper sets out to add to what we know about an important question: "What effect has IRI had on student learning when it has been applied in difficult

environments and taken to national scale?" This study pulls together student assessment results collected and published by EDC's recent projects. This report does not include data from non-EDC projects, nor does it draw conclusions about their impact.[2] Annex 1, however, provides an inclusive summary of IRI activities undertaken around the world.

The IRI Methodology at EDC

The varied contexts in which IRI has been implemented by EDC present a challenge to researchers conducting a comparative review. The IRI methodology implemented by EDC maintains similar core principles[3] across all countries while improving on earlier experience, but each IRI project is designed to be responsive and adapted to local circumstances and desires. In addition to being situated in diverse learning environments - both between and within countries - the actual implementation of IRI has varied considerably.

In each project, the IRI programs start with different purposes and objectives, use local resources of varying quality and availability, and are subject to a range of forces within the local education system. Available local capacity may contribute most significantly to the variability of IRI projects worldwide, and since it cannot be captured or quantified here, may pose the greatest challenge in this review. By design, EDC's IRI projects rely, for the most part, on host country nationals. These staff members are usually trained at the same time as they are writing, producing and formatively evaluating IRI lessons. Much of an IRI program's character thus depends on the nature of the capacity supplied by the host country including time, technical expertise, and implementation support.

A second challenge involves the educational objectives of an IRI program, as well as the ambitions of local education officials, and can lead to significant variations in the time available to develop an IRI series. For example, some projects developed a complete series of programs for a grade level very rapidly (within 3-6 months), while others composed programs with greater thoroughness over the course of a calendar year, or more, for each grade. While there is no certainty that taking longer increases the quality of the product, it is inevitable that rushing planning, writing and production, and skimping on formative evaluation, will reduce the final program quality. Inevitably these sources of variability create difficulties for researchers in making broad generalizations about the impact of IRI on student learning.

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[2] Care must be taken when comparing educational activities that may have fundamental differences in their design. Experiences from other organizations are not included in this report because, without prior knowledge of the ways in which the methodology of developing radio programs differs at other organizations, the researchers cannot reasonably compare EDC's results from these (possibly) divergent efforts.

[3] These elements include the steps in the development process (e.g., curriculum mapping, the training of scriptwriters, production, and formative evaluation), training of teachers, and criteria development for formative evaluation. For a more complete treatment of this topic, the reader is referred to the following EDC website: http://ies.edc.org/ourwork/topic.php?id=15

Although the EDC IRI model organizes local resources differently in each country, every country includes the same essential elements. The instructional design emphasizes active learning as exemplified by many, frequent responses by the learners. The programs are approximately thirty minutes in duration and are usually used every day, for a total of between 100 and 150 lessons per grade. The teacher in the classroom is an integral part of the lesson, but the direction and plan of the lesson is led by the radio. Where IRI has been called upon as a front-line response to poor learning across subject areas, the IRI design for each grade level has tended to cover the entire syllabus and address all core skills in literacy and numeracy, usually with a secondary emphasis on science and social studies. IRI follows a similar model in single-subject designs, such as mathematics in Guyana, English language in Pakistan, science in India, and teacher training in Madagascar. In these single-subject designs, IRI has tended to focus on depth instead of breadth: for example, in India, some series were designed to focus on "hard spots", areas in the curriculum that teachers experienced particular difficulty in teaching.

Therefore, EDC's IRI programs worldwide can be looked upon as having a core set of principles that are common to all and also a set of unique characteristics that result from the local situation. The commonalities of IRI programs underscore the comparisons made in this paper across projects, while an attempt is made to interpret the findings, meaningfully, in light of the project context.

Factors Influencing Learning Outcomes of IRI Programs

While EDC's methodology is based on a common set of principles that guide the development and implementation of each IRI series in-country, the previous section also highlights the ways in which the methodology is unique in individual contexts. Similarly, each context gives rise to a set of external variables that can also influence the impact of IRI. If learning outcomes are used to render judgments on IRI as a methodology and to predict future impact, it is important to acknowledge that several factors, extraneous to the design of the IRI series itself, can affect the extent of the impact.

Some of these variables to consider when evaluating the impact of IRI include:

- *Could the programs be heard clearly every day?* The quality of short and medium wave signals can vary enormously during the day, and atmospheric conditions can also affect signal quality. FM signals are affected by terrain. If learners cannot hear the lessons, they cannot learn from them, and that will be reflected in the data.
- *How often did teachers and learners attend the classes?* As with any classroom-based intervention, students can only benefit if they attend school. In South Africa in the turbulent mid-1990s, political events led to varied attendance rates throughout the country. As a result, in some schools learners heard about a third of the IRI lessons, some about two-thirds of the lessons, and others heard all of them. Tests results showed 7%, 13% and 24% gains respectively, so the frequency of attendance

correlated very closely with learning outcomes.[4] Teacher attendance is also important to the success of student learning. In Zambia, there was a clear difference between learners whose teachers were consistently present and those whose teachers only attended about 75% of the time.[5]

- *How do programs tend to differ as a result of ongoing capacity-building?* During the processes of designing the IRI series, writing scripts, recording and formatively evaluating programs, EDC simultaneously focuses on building local capacity. With the majority of scripts written by local teachers, consultants, or in-country education specialists, this dependence on local resources and expertise expectedly causes IRI series to vary in pedagogical styles, levels of interactivity, and quality of writing. Although the IRI approach developed and refined by EDC over the years is followed, programs are 'localized' to maximize adoption in classrooms.[6]
- *Do the tests on which the learning outcome data are based reveal true mastery of skills or simply the acquisition of facts?* In some projects, tests evaluated rote skills rather than mastery or a deeper understanding of concepts. On other projects, the tests may have been well-constructed but were not always well-administered. The data used in this review is only as good as the tests.
- *How much training and support was provided to teachers?* Some IRI programs built classroom management and pedagogical support into the radio lessons themselves, while in other projects teacher training and follow-up support was provided by face-to-face means. Some did both. While all IRI projects provide some level of training to teachers prior to the start of an IRI series, the length and quality of training can vary. For example, some projects benefitted from close partnerships with local education offices, where IRI training was embedded in regular teacher training events. In others, master trainers were trained in each district, and it was left up to the local education officers to ensure that all classroom teachers were trained. Needless to say, learning outcome data can and will be sensitive to good teaching as well as good learning.
- *Does the learning environment encourage or discourage learning?* EDC staff has seen classes of over 100 children in countries where projects have tapped into a deeply felt desire to grab any opportunity to learn. Even if there are several radios in the classroom, or even more than one teacher, it is difficult to overcome those conditions if the activities are designed for active learning by no more than 40 children.

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[4] Leigh, Stuart, "Changing Times in south Africa: Remodeling Interactive Learning," LearnTech Case Study Series #8, USAID, Washington DC, 1995

[5] "Learning at Taonga Market: IRI Learning Centres and Community Schools: An Evaluation of Interactive Radio Instruction at Grade One in 2005," Education Development Center, Washington DC, 2005. p. 20

[6] Qualitatively, EDC's field experience has shown that by localizing IRI materials, teachers in particular were more likely to use them because the characters, sounds, stories, and some teaching styles were familiar. Students also benefit from this familiarity. For example, the ability of students to learn basic English depends, in part, on their ability to understand the pronunciation of words and sounds in ways that are familiar to them.

II: Study Design and Methodology

Purpose of the Study

The goal of this study is to analyze available data on student learning outcomes from recent EDC Interactive Radio Instruction (IRI) projects and to highlight the general patterns that emerge. As previously discussed most, if not all, of these recent projects have taken place in difficult conditions and have addressed national or very large audiences. While other issues, such as cost, are important, this study does not attempt to undertake any other type of evaluation,[7] nor to draw conclusions regarding the success or failure of IRI. The study simply presents the available data in a meaningful way to inform policy-makers and practitioners alike.

Most early data suggested that exposure to IRI programs had a positive effect on student test performance when compared to test scores of similar students who were not exposed to IRI.[8] Different from these early experiences, EDC's recent portfolio of projects incorporates areas in challenging conditions (e.g., countries in the midst of or emerging from conflict such as southern Sudan, Somalia, the Congo, and Haiti); are implemented for very large numbers of students (e.g., IRI programs in India target over 14 million students and boast over 350,000 teachers trained in IRI); target beneficiaries who are the poorest of the poor (e.g., orphans and remote rural populations in Zambia or children in abusive forms of labor in Tanzania); or are implemented in countries attempting to deal with rapid growth in enrollment (such as Guinea and Malawi). While there is a clear shift in the role that IRI played then and now, the study at hand is an attempt to determine whether the quantitative data is consistent with previous research, and to interpret the findings within the context of each project to provide the reader with a richer understanding of the impact of EDC's recent projects on student learning.

Data Limitations

The researchers acknowledge limitations to this study that are either inherent in the data itself or in the IRI development and implementation process, as discussed above. The limitations of the data recognized by the researchers are as follows:

1. studies vary in the number of measures available to assess student learning in a given year;
2. existing data sets do not always report similar variables;
3. not all IRI projects contain an evaluation component, and of those that do, not all have available data.

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[7] It is recognized that IRI has often been promoted as an affordable alternative, as well as a practical educational tool, for reaching masses in areas where resources are severely limited. See "*Improving Educational Quality through Interactive Radio Instruction - A Toolkit for Policy Makers and Planners,"* The World Bank, Africa Region Human Development, Washington DC, 2005.

[8] See "*Interactive Radio Instruction: Impact, Sustainability, and Future Directions*" (The World Bank, 1999), "*Improving Educational Quality through Interactive Radio Instruction*" (The World Bank, 2005), "*Twenty-Three Years of Improving Educational Quality*" (Bosch, 1997), "*Improving Education Efficiency in Developing Countries*" (Lockheed, 1998).

The first data limitation of this study lies in the number of data points available in each study in a given year. For instance, some studies report both pre-test measures (before the beginning of IRI in the academic year) and post-test measures (immediately following the completion of the IRI programs), while others collect and report only post-test measures. To address this, the researchers have reported these results separately, and have indicated the nature of the data available.

A second limitation is that different sets of variables are often available for analysis in each dataset. For example, some data sets report results by gender while others do not; some report findings separately for urban and rural students while others only report combined results. To address this, the researchers have included all the available data. No additional manipulation on the datasets was performed by the researchers. In future investigations, it is recommended that existing datasets (that are available electronically) be obtained and analyzed to further inquire into specific variables.

A third limitation is the restricted amount of data available for analysis. The researchers recognize that the quality of data collection, for various reasons, did not always produce reliable results. So this paper is not a comprehensive record of all IRI activities at EDC but rather of those projects for which there is data of known reliability. Where the data is questionable but nonetheless interesting, and therefore worth including, we have labeled it as such.

The Data

This paper uses learning outcomes data as reported by EDC's projects. No raw data has been manipulated in the process of analysis. Additionally, in an effort to build upon findings in prior studies, the researchers have included data from previous reports. In all, this analysis covers data ranging from Nicaragua in 1977 through Indonesia in 2008. The following table provides a comprehensive list of the projects which provided the data for this study:

Table 1. Data Sources for the Review of Research

Country	Project Duration	Subjects and Grades Assessed
El Salvador	2003-2005	Pre-Primary – Early Childhood Development
Haiti	2002-2008	Math and Reading, Grades 2-4
Honduras	2003-2005	Pre-Primary – Early Childhood Development
India	2002 - ongoing	English, Grades 1-4; Math, Science, and Social Studies, Grades 4 and 5
Indonesia	2005 - ongoing	Pre-Primary – Early Childhood Development
Nigeria	2002-2004	Math and Literacy, Grades 3-6
Nicaragua	1975-1978	Math, Grade 1
Madagascar	2006-2008	Teacher Observations – Grades 1 and 2
Mali	2004-2007	Teacher Observations – Grades 1 and 2
Papua New Guinea	1990	Science, Grade 4
Pakistan	2006, 2007	English Grades 1 and 2
Somalia	2005-2008	Reading, Grade 1
Sudan	2004-2009	English, Literacy, and Math, Grade 1
South Africa	1995	English, Grade 2
Zambia	2000 – 2004	English and Math, Grades 1 and 4
Zambia	2005-2009	Zambian Language, English, Math, Life Skills, Science, Social Studies, Grades 1 – 4

For ongoing projects, available data to date is used in this report.

Throughout this report, reference is made to 'records'. A record is a unique combination of a grade and year. For example, Pakistan provides three records to this study – grade 1 2006; grade 1 2007; grade 2 2007. In all, 15 projects supplied 37 records which provide the basis for this report.

Criteria for Inclusion of Studies

The following criteria were applied to determine the final list of 15 projects that were considered in this study. For each study, more than one year of data was often available. In addition to data reported in previous studies (for Papua New Guinea, Nicaragua and South Africa), the researchers identified datasets that:

- *had available a technical report that detailed results of IRI with some measure of student learning as an outcome variable; and*

- *included in the report results for a control group, including standard deviation, mean, and sample size (n). In instances where this data was not reported, efforts were made to obtain the data files containing the raw data. In all instances, except for Somalia, all data were obtained and verified.*

Study Methodology

In this study, the researchers attempt to summarize recent research on the overall effectiveness of IRI as an intervention on student learning outcomes. This is done by analyzing all available project data and summarizing findings across subjects, grade levels, countries, over time, and by target groups.

To address the varying nature of IRI across contexts, this study employs effect size comparisons as a common measure of student assessment results. Effect size is a term given to a set of indices that measure the magnitude of a treatment effect, without dependence on sample size. By using effect sizes, researchers since 1976 have been able to summarize results from studies to effectively compare findings in a specific area of research.[9]

In this report, one of the more common indices of effect sizes, Cohen's d, is used. To calculate an effect size (and thus measure the magnitude of the effect of exposure to IRI), a control group is required. A control group is a set of students who only differ from the experimental group in that they did not listen to IRI programs. While some measure of learning is available in most of EDC's projects where IRI has been implemented, only 15 of these offer data sets complete with control group for effect size calculation.

The use of effect size allows for the interpretation of student assessment results in terms of the shift in student ranking for an IRI student as if they had participated in the control group. For example, an effect size of 1.0 (a relatively large effect size) indicates that if the average IRI student had participated in the control group, he would have been ranked at the 84th percentile in his class rather than at the 50th percentile. This 34 percentile "boost" in rank is attributed to the student's exposure to IRI. For a more complete explanation of effect size, readers may refer to Text Box 1.

[9] The current practice of calculating effect size as a means to combine results from different studies was developed by Glass in 1976.

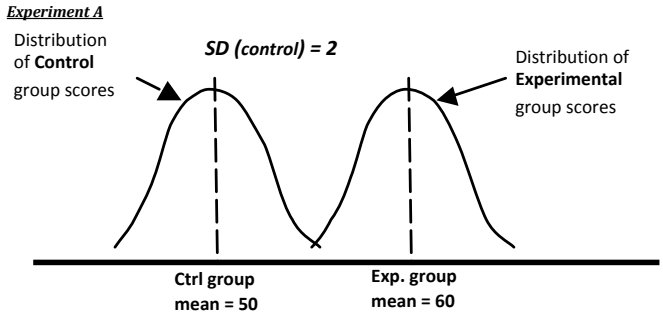
Text Box 1. What is Effect Size?

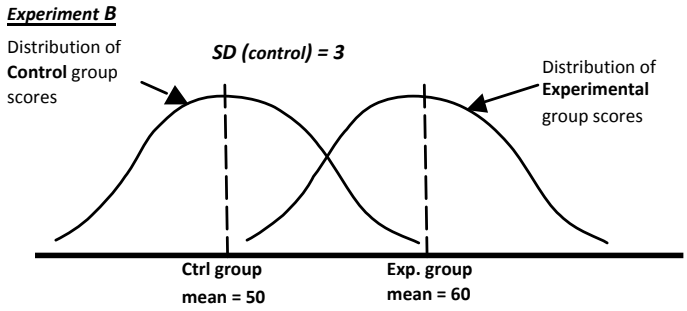
What is Effect Size?

Effect size is simply a way of quantifying the difference between two groups. In examining the impact of Interactive Radio Instruction, effect size allows us to determine the effectiveness of IRI as an intervention. This is done by analyzing differences in student performance between experimental and control groups on a common scale. Where differences in mean scores exist, the effect size allows us to interpret how *big* the difference actually is. A simple calculation for effect size, as defined by statistician Jacob Cohen, is as follows:

$$Effect\ size = \frac{Mean\ of\ treatment\ group - Mean\ of\ control\ group}{Standard\ Deviation\ of\ Control\ Group}$$

Effect size is a ratio in which the numerator is the mean difference in scores for the treatment and control groups, and the denominator is the standard deviation (SD) of the control group. The standard deviation is a measure of how widely spread-out scores in a group are relative to the mean. When scores are close to the mean, the standard deviation is small, and vice versa. In the ratio shown above, this means that a larger SD (widely distributed scores around the mean) will result in a smaller effect size. Alternatively, a smaller SD (less distributed scores) will result in a larger effect size.
For example, let's say two experiments are conducted – A and B. On the pretest, both treatment and control groups in each experiment have a mean of 20. At post-test, experiment A's treatment group has a mean score of 60 and the control group a mean score of 50. This means that the numerator in the effect size calculation is then 60-50, or 10. In experiment B, the same post-test mean scores were obtained. The key difference between the results in experiment A and B lies in the variability of student scores (or the Standard Deviation). In experiment A, a standard deviation of 2 was recorded, while scores in experiment B were more widely distributed and thus a standard deviation of 3 was recorded. The larger standard deviation in experiment B means that the effect size is smaller than that in experiment A. This example is illustrated below, with the calculation for effect sizes shown:





$$ES_A = \frac{10}{2} = 5 \quad ES_B = \frac{10}{3} = 3.3$$

A larger distribution of scores in experiment B (as compared to A) yield a smaller effect size (3.3) in experiment B, even though both experiments have the same mean difference in scores between experimental and control groups (10). To put effect sizes on a scale, this study uses Cohen's categories for small, moderate, and large effects which are as follows:

Small = ≤ 0.2
Medium = 0.3 to 0.5
Large = ≥ 0.6

In this report, effect sizes are derived by comparing the results for IRI students (experimental) to those students who have not been exposed to IRI (control). The results compared in this report are of two types: those based on gain scores, and those based on post-only scores. Gain scores are computed by subtracting a pre-test measure (student achievement at the beginning of the treatment period) from the post-test measure (student achievement at the end of the treatment period). Where pre-test measures are not available, effect sizes are computed based on post-only scores.

Across both gain score and post-only comparisons, the analyses by grade are based on an average of the effect sizes across countries. This assumes that subject content at grade level is relatively comparable on an international scale. Analyses by country illustrate effect sizes by grade level as well as by year of assessment, allowing for a fully detailed review of results.

In interpreting the data, general patterns and highlights of the data are discussed. Patterns are identified where more than three records are available to support the conclusions. As such, where fewer than three records are available, results are discussed but their interpretation, and generalizations to a larger population, are avoided. Similarly, the researchers recognize that the data available limit the ability to explain the reasons for patterns of success or failure in specific projects. This also is not the purpose of this paper.

Upon a review of the available data, the researchers selected several lenses through which to analyze and present the findings. The lenses, or perspectives, selected were based on a) the availability of data, b) some general assumptions about the types of questions stakeholders may ask regarding the impact of IRI, and c) the lenses through which IRI has historically been analyzed.

For example, the impact of IRI on various marginalized populations is reviewed and discussed. While there is quite limited data on some of the populations discussed (for example, Orphans and Vulnerable Children), the researchers thought it imperative to include this data, primarily because it has been EDC's recent experience that interest in this area (the impact of IRI with marginalized populations such Orphans and other Vulnerable Children) is growing both in donor and recipient communities. It also sets the stage for such data to be collected in future projects.[10]

[10] The reader should also note that other projects, in the past and present, may also be targeting and addressing learning needs with Orphans and Vulnerable Children. The data presented in this report is not meant to be an exhaustive compilation of all projects which work with these populations.

III: Key Findings

In the following sections, the data are 'sliced' and analyzed using several different lenses. Of the 15 projects that provided information for this report, those containing data by subject are included in the first section, which analyzes learning outcomes by subject. Three projects provided information on the impact of IRI on pre-primary and early childhood learning outcomes and are included in the second section. The third section looks at classroom observation results from two projects implementing radio-based in-service professional development for primary school teachers. The fourth section analyzes learning outcomes across all grades, subjects and countries, and reviews the data by four different marginalized populations. These sections are organized as follows:

- *Student learning outcomes by Subject Area*
    - Mathematics
    - Local Language Literacy
    - English
    - Social Studies
- *Student learning outcomes in Early Childhood Education*
- *Teacher Professional Development observation outcomes*
- *Student learning outcomes with Marginalized Populations*
    - Girls and Boys
    - Students in Rural and Urban Areas
    - Students in Fragile States
    - Orphans and Vulnerable Children

SECTION 1: Student Learning Outcomes by Subject Area

As an instructional delivery mechanism, Interactive Radio Instruction has been used to bring teaching and learning material into classrooms in a wide variety of subject areas. The following analysis reviews student learning outcomes as an assessment of IRI's effectiveness in supporting the mastery of core subject content in the primary grades. It asks the questions: What kind of impact has IRI made, in terms of student achievement, in each of these key subject areas, and has it proven to be a more effective tool in some disciplines over others? Additionally, have greater achievements in core competencies been seen in some grade levels than in others? How has IRI fared in a diversity of country contexts?

A: Mathematics

We analyze data for IRI projects implemented from 2003-2007 in three countries: Zambia, Sudan, and Haiti. These projects included mathematics segments in 30-minute programs that also taught numeracy and life skills. Previous studies conducted on IRI mathematics instruction have evidenced positive results with respect to pre- to post-test gains. In Nicaragua, for example, effect sizes in 1978 are reported as high as 1.32 in grade 1, and in Thailand, are reported at 0.58 for grade 2 in the Northeast and 0.24 in the Central Plain (Bangkok area) in 1983 (Anzalone, 1987). In Bolivia, an evaluation conducted in 1991 reported an effect size of .94 in grade 2 math instruction (Tilson, 1991). In Honduras, effect size for grade 1 was 0.80 and 0.61 for grade 2 (Tilson, 1991). The following presents effect sizes derived from absolute levels of achievement (post-test scores only), and are not directly comparable to these earlier results. Direct links to past data are also complicated by the fact that these earlier projects devoted whole programs to math instruction rather than integrating several topics into a single programming session (allocating perhaps ten minutes of a 30-minute program to math). Nevertheless, recent evidence shows consistent programmatic impact across the lower grades.

A summary review of mathematics results from 2003-2007, as in Figure 1, illustrates an effect size of 0.41 in grade 1. This tells us that had the average control student participated in an IRI math program she would have been ranked at the 66th percentile of her class rather than at the 50th; the 16 percentile "boost" in rank at year-end is attributed to the effectiveness of IRI instruction. Subsequent grade levels through grade 4 also demonstrate positive effects of IRI math programming.

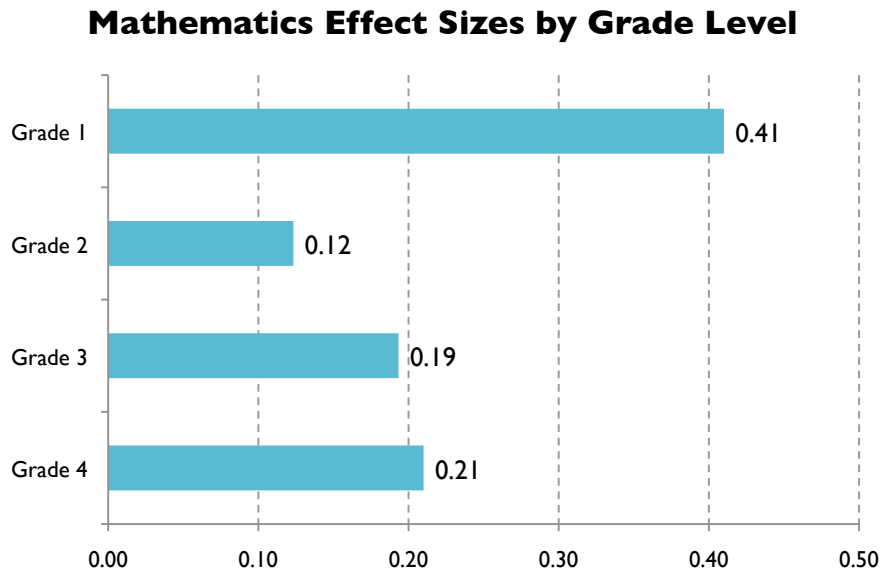


Figure 1. Mathematics Effect Sizes by Grade Level

Note: Data for Mathematics includes student scores on tests administered by EDC and its partners in three countries—Zambia, Sudan, and Haiti–across different years spanning from 2003-2007. Grade 1 is based on two records (combination of countries and years), grades 2 and 3 on three records each, and grade 4 on four records. In cases where more than one record is available, the average effect size is reported.

IRI was first applied to mathematics in Nicaragua, and few subsequent IRI series have departed very much from the strategies developed on that project for lower primary instruction. While IRI mathematics was implemented through grade 5 in Bolivia, and through grade 7 in Zambia, continuing developments in upper level IRI have resulted in a broad range of outcomes, making it difficult to speak with confidence beyond grade 4 findings. With effect sizes for the first four grades highlighting the strengths of IRI math programming, however, it is recognized that the time has come to address the challenges of designing an appropriate radio-based instructional strategy for grades 5 to 7 and beyond.

Looking at student assessment results in mathematics by country, we see that not all series have been equally successful. As shown in Figure 2 below, the data suggest that IRI produced higher mean test scores in Zambia and Sudan, while exposure to IRI appears to have had a more mixed impact on test scores in Haiti.

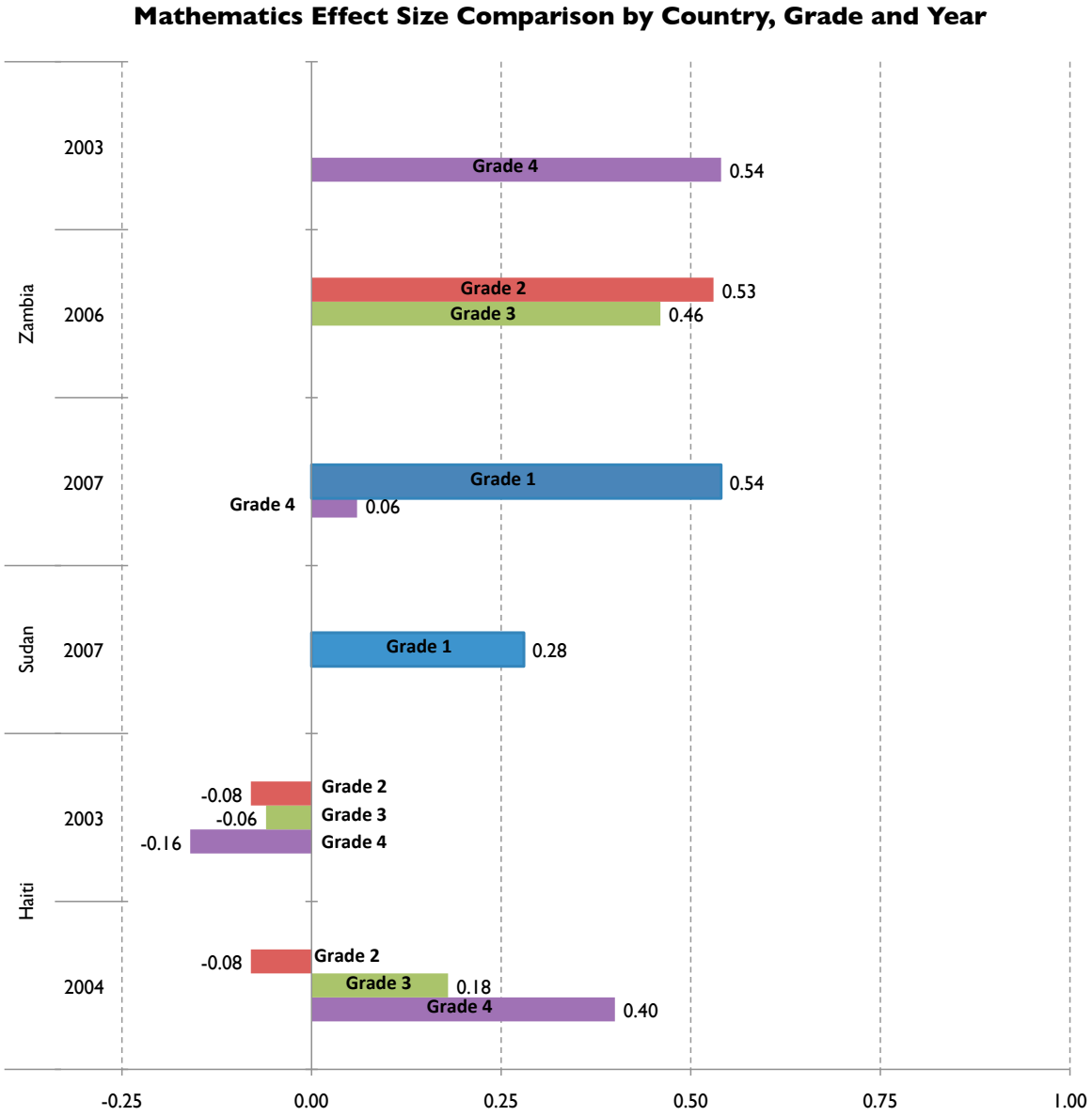


Figure 2. Mathematics Effect Sizes by Country, Grade, and Year

In Zambia, moderate effect sizes (0.3< d <0.5) are observed in three of five records and positive effect sizes are seen across all grades for which data is available. This is particularly encouraging given that large populations of IRI learners in Zambia were orphans who attended 40-minute daily lessons in community-based radio learning centers led by untrained volunteers. In grade 1, for example, the average student participating in IRI programming was seen to achieve a mean test score 21 percentage points above the mean of the average control student (who attended a conventional school) at the time of year-end math assessment. The effect size shown for grade 2 shows that the average IRI student performed at the 70th percentile of her control school counterparts in conventional schools rather than at the 50th. The effect size observed in grade 4 in 2003 (where, again, the average grade 4 IRI learner performed at the 71st percentile of his control peers in math), is of special note as assessments conducted that year were performed by external evaluators and compared out-of-school IRI learners with grade 4 learners in government primary

schools. Grade 4 assessments conducted in 2007 were performed by the project, and it is possible that resulting differences in test design, administration, and sample population may have contributed to the relatively lower effect size observed here.

While 2003 results from Haiti appear slightly negative in all grades assessed, the data suggests that improvements in IRI math have been made over time in grades 3 and 4. Though grade 2 effect sizes remain at -0.08 from 2003 to 2004 (meaning that the average IRI student performed at the 47th percentile of his peers in a non-IRI class), effect sizes in grade 3 jumped from -0.06 in 2003 to 0.18 in 2004, and in grade 4 from -0.16 to 0.40. This implies that, by 2004, the average grade 3 IRI student performed at the 57th percentile of her non-IRI colleagues, and the average grade 4 IRI student outranked 66% of her control school counterparts.

B: Local Language Literacy

Local language literacy instruction includes skill building in reading, writing, and speaking. This analysis incorporates data from four countries: Zambia, Sudan, Somalia, and Haiti, spanning 2003-2007. For most IRI projects, the language of instruction is determined by the policies set forth by the host country's national curriculum. In some instances, as in Sudan and Zambia, programs provide instructions to the teacher in English to perform radio-guided activities in the mother tongue. In Somalia, the language of instruction is Somali, and in Haiti, the programs teach reading in Creole. The results presented for Zambia within this section pertain only to IRI instruction in Zambian Language while English instruction is reviewed under the subject section "English Language."

Interactive Radio Instruction is seen to have stimulated favorable learning outcomes in primary literacy instruction with positive effect sizes observed (as shown in Figure 3) in grades 1-4. Of particular note is the effect size calculated for grade 1, wherein the average control learner, had she participated in IRI programming, would have been ranked at the 68th percentile at the time of post-test administration rather than at the 50th.

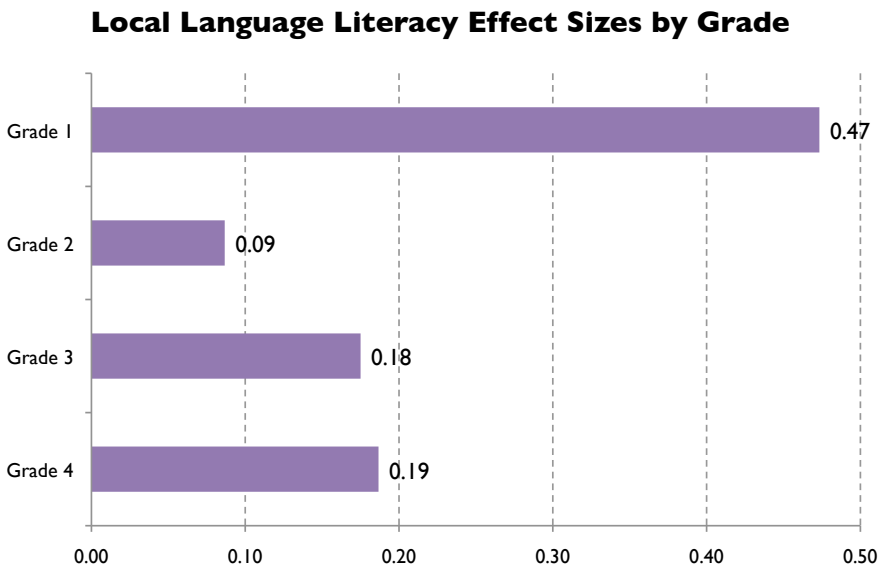


Figure 3. Local Language Literacy Effect Sizes by Grade

Note: Data for Local Language Literacy includes student scores on tests administered by EDC and its partners in four countries--Zambia, Sudan, Somalia, and Haiti--across different years spanning from 2003-2007. Grades 1 and 2, and 4 are based on 3 records each (combination of countries and years), and grade 3 is based on 2 records. In cases where more than one record is available, the average effect size is reported.

As shown in Figure 4 below, results by country highlight the successes of IRI literacy programming in a variety of settings. Improvements in student literacy outcomes are observed in Zambia in grade 1 with effect sizes moving from -0.05 in 2005 to a large effect size of 0.76 in 2007 (where large is $d > 0.6$). That is, while the average IRI student ranked at the 48th percentile of her control school peers in 2005, she ranked at the 78th percentile in 2007. Several factors may contribute to this difference in effect size. It should be noted, for example, that the delivery of grade 1 IRI literacy instruction changed in 2003 following Zambia's official transition from initial literacy in English to mother tongue instruction.

Effect sizes in Haiti were seen to be positive across all grades in 2003, although as with Haiti math results, slight improvements in these are observed in 2004. This is particularly true for grade 2, which evidences a statistically small effect size of 0.04 in 2003, and a moderate effect size of 0.26 in 2004. Thus, the average IRI student went from ranking in the 52nd percentile of his control school colleagues to performing in the 60th percentile in 2004.

Both Somalia and Sudan evidence moderate effect sizes in grade 1 literacy. In Somalia, this means that had the average control student participated in IRI literacy programming, he would have been ranked at the 60th percentile of his class rather than the 50th percentile. In Sudan, the average student saw a 16 percentile "boost" in her class rank at the time of year-end testing as a result of her participation in IRI.

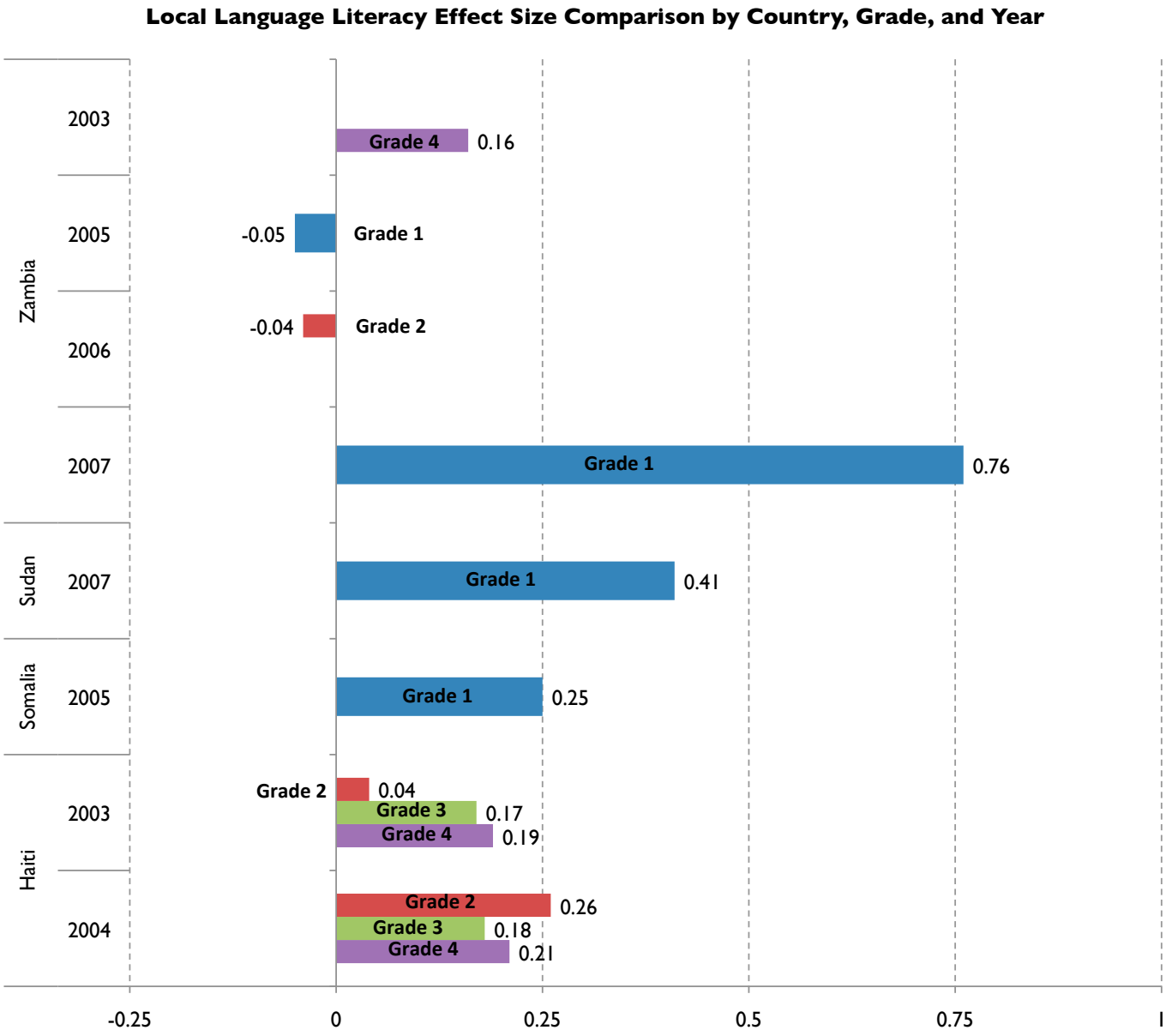


Figure 4. Local Language Literacy Effect Sizes by Grade and Country

C: English

IRI has almost always improved English language competency in the instances examined below. Indeed, experience has shown that simply listening to a model of good English every day has an emphatic impact on listening and speaking skills. In Zambia, for example, grade 1 children in rural areas came to class knowing almost no English, but by the 50th IRI lesson were reported to anticipate the translation of English radio instructions into local languages by the teacher, beginning activities without waiting for the teacher's translation. Previous analyses of IRI English instruction support these in-class experiences of improved student aptitude in English language learning. In Kenya, for example, grade 1 assessments administered in 1984 measured an effect size of 0.89 in listening skills and 0.32 in reading tests among IRI learners. Grade 2

IRI student results in Kenya were observed to have effect sizes of 1.17 in listening skills and 0.29 in reading, while grade 3 learners achieved effect sizes of 0.57 and 0.45 in listening and reading tests, respectively.[11] Since this era, English language instruction has been in increasing demand, both by parents and ministries of education alike, while at the same time countries have faced a growing deficit in the pool of teachers with sufficient English language proficiency.

The following analysis presents data from projects implemented in Zambia, Sudan, Pakistan, and India, and represents assessments conducted from 2003-2007. Figure 5 below details effect sizes derived from post-test learning achievements in grades 1-4. Results shown for grades 1 and 2 represent a single series of programs that have been implemented in both grades and are treated as a separate category consistent with this unique implementation design.

Across all grade levels, students participating in IRI are consistently seen to outperform their control school counterparts. In grade 1 and grade 2 especially, effect sizes are largely positive. In grade 1, had the average control student participated in IRI, she would have been ranked in the 96th percentile at the time of year-end testing rather than the 50th, and in grade 2, the average control student would have been ranked in the 89th percentile had he participated in IRI English programming. For series reaching both grades 1 and 2 students, effect sizes show the average IRI student performing at the 67th percentile rather than at the 50th percentile (where the average control student would place).

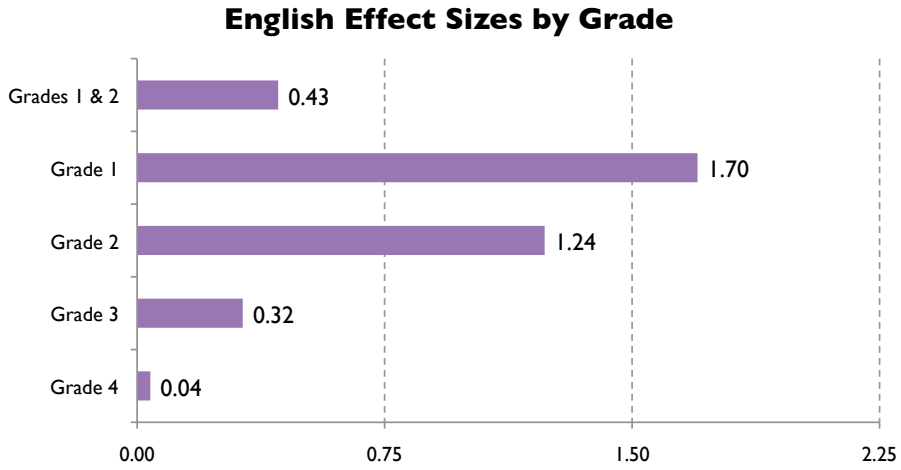


Figure 5. English Effect Sizes by Grade

Note: Data for English includes scores on student tests administered by EDC and its partners in four countries--Zambia, Sudan, Pakistan, and India--across different years spanning from 2003-2007. Grade 1 is based on three records (combination of countries and years), grade 2 on two records, grade 3 on one record, and grade 4 on two records. Grades 1 and 2 combined represent results from programs implemented in both grades and is based on four records. In cases where more than one record is available, the average effect size is reported.

[11] Anzalone, S. Using Instructional Hardware for Primary Education in Developing Countries: A Review of the Literature. Institute for International Research, Prepared for Harvard University - Project BRIDGES. Washington DC: USAID, 1987.

The rather impressive results in each grade 1 and grade 2 are primarily attributed to post-test scores obtained in Pakistan, as can be discerned from Figure 6 below detailing effect sizes by country. The magnitude of the impact IRI has had on English language instruction is evident, where 7 of the 11 records show moderate or large effect sizes. For instance, had a grade 1 control school student participated in IRI programming in Pakistan, she would have been ranked in the 98th percentile of her class in 2006, and in the 99th percentile in 2007, rather than at the 50th. A grade 2 control student would have fared just as well in 2007, ranking in the 99th percentile of his class rather than at the 50th percentile.

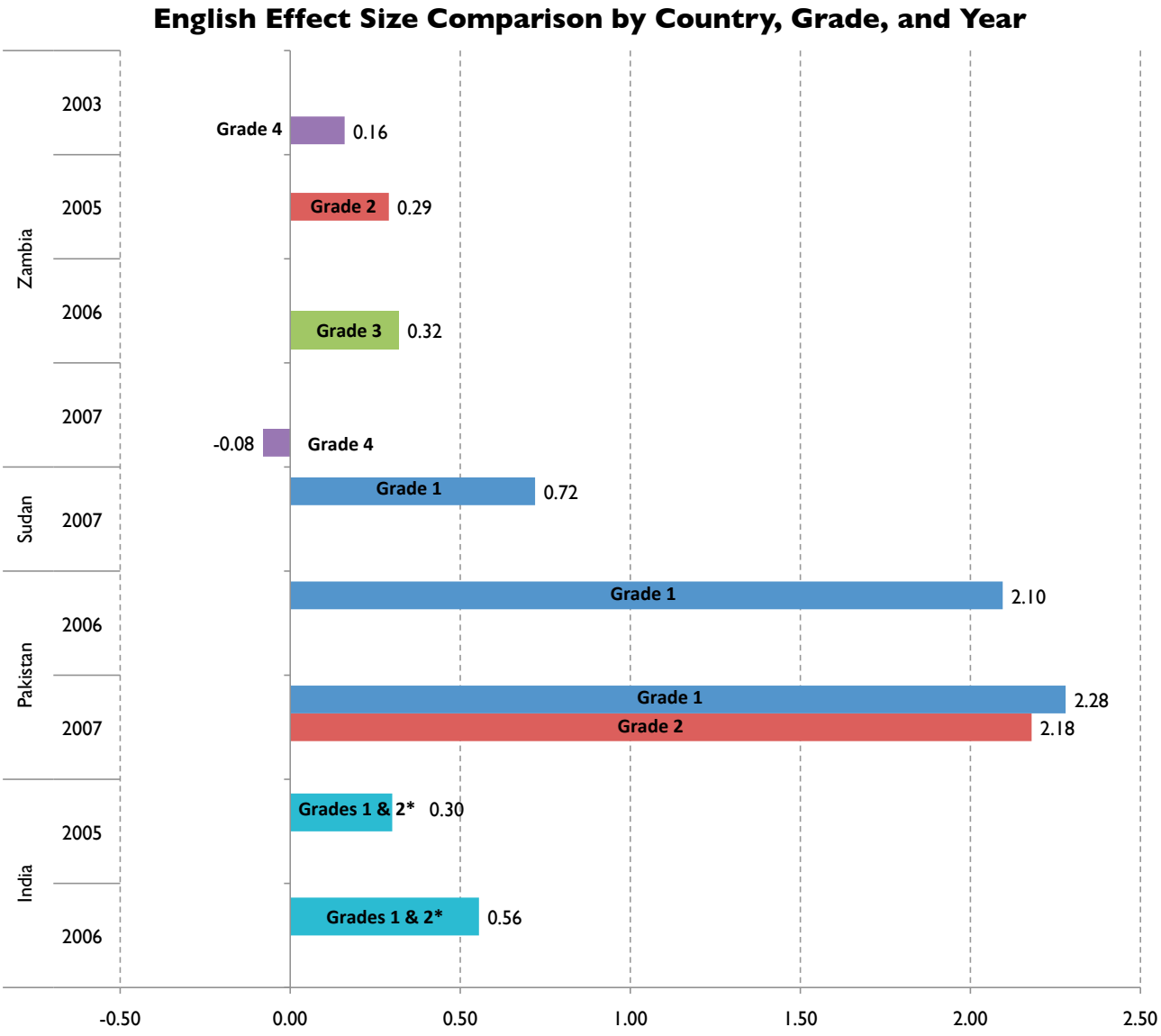


Figure 6. English Effect Sizes by Country, Grade and Year

Looking further into the large effect sizes seen in Pakistan, the data reveals some interesting results by way of language of instruction. Included within both samples were schools offering English as the official language of instruction as well as those schools instructing in Urdu, the mother tongue. Although students from the English medium schools were expected to fare better on the grade 1 English language assessment conducted

in the 2005/2006 school year, effect size analysis of pre- to post-test gains illustrate an effect size of 0.66 in favor of Urdu medium schools. This suggests that had a student enrolled in an IRI Urdu medium school rather than an English IRI school or a non-IRI school, he would have ranked at the 75th percentile in terms of pre- to post-test gain rather than at the 50th. This advantage may be explained by the propensity of teachers in the Urdu medium schools, who are presumably less fluent in English, to follow IRI programming instructions more closely and lesson schedules more faithfully than their English medium colleagues. Additionally, the Pakistan experience was outstanding in the frequency and quality of monitoring during the intervention period, which was in part possible due to a small number of project schools (totaling 66). This monitoring effort was designed to ensure not only that teachers were using the IRI programs (provided to them on CD), but also that it was being used correctly. To date, the researchers are unaware of other projects at EDC that have implemented such rigorous monitoring schemes during the implementation period.

Strengths in grade 1 English IRI instruction are reinforced by data from Sudan, which suggest that the average IRI student performed at the 76th percentile of her colleagues not participating in IRI rather than at the 50th. Effect sizes from India in grades 1 and 2 combined are moderate in 2005, and even stronger in 2006, again substantiating a strong pattern supporting the positive impacts of IRI in English language instruction.

D: Social Studies

The introduction of social studies using IRI is a recent development, and is typically allocated less time than mathematics and local language literacy programming. The study to follow draws upon a limited data set including India and Zambia in 2006 and 2007.

Student learning outcomes in social studies from both Zambia and India show slight advantages for IRI learners in grade 4 programming as well as in grade 4 and 5 combination programming. This is not particularly surprising in the case of India, as social studies programming was embedded within a multi-subject series and was offered relatively little exposure in comparison with other subject areas. Grade 3 results from Zambia are stronger and suggest that had the average control learner participated in the IRI social studies series, she would have been ranked at the 58th percentile rather than at the 50th.

More data is certainly required to confirm early patterns observed in these results. However, the evidence in this review suggests, albeit inconclusively, that IRI is effective in this area.

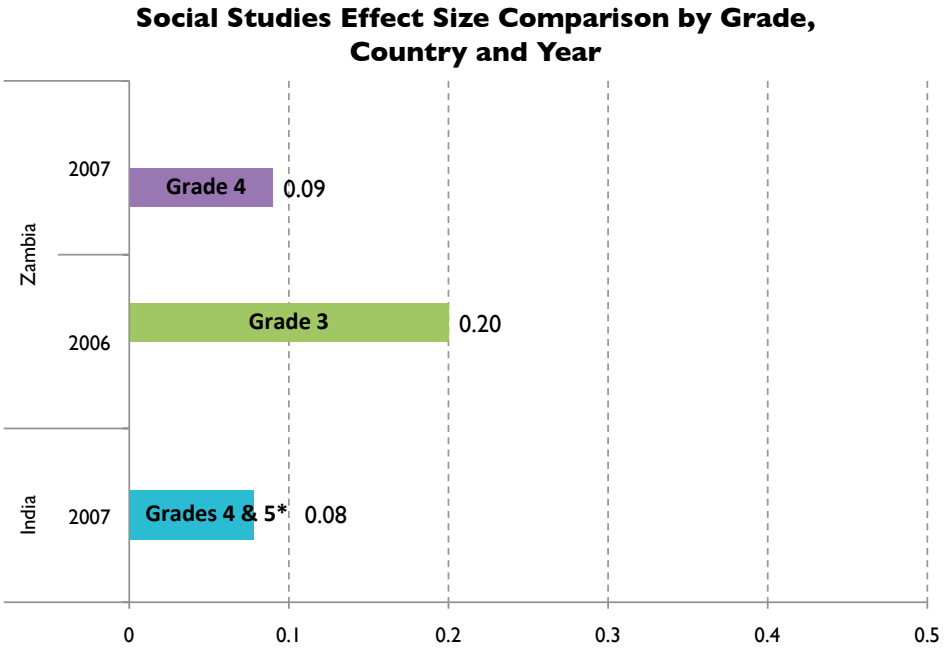


Figure 7. Social Studies Effect Sizes by Country, Grade and Year

E: Conclusion – Student Learning Outcomes by Subject Area

Applications of IRI have concentrated on basic skills in mathematics, local language literacy and English language instruction in grades 1 – 4, and this focus is reflected in the positive effect sizes seen across grades and subjects. General patterns suggest particular strengths in grade 1 impact across the three subjects of math, literacy, and English language learning. While not as strong, positive effect sizes for grades 2 and 3 are also consistent in these three areas, and in the case of grade 3, this performance pattern extends into social studies as well. Moving into grade 4, student achievement in local language literacy, English, and social studies is seen to have improved with the introduction of IRI, although results vary by country and are less consistent with respect to math. IRI in grades 5 and higher have been attempted, but the strategies applied have imitated--often inappropriately--those used for early primary grades and have, subsequently, not been analyzed here.

The subject results described in this section mirror similar learning outcomes from earlier years, although projects since 2000 have tended to include all core subjects, unlike earlier projects which tended to focus only on single subjects.

Although an initial review of results appears positive, limited data is available for a review of social studies assessment results. This is because of the prioritization of basic skills in literacy and numeracy in the early grades over other subjects, and partly because social studies is typically treated as a smaller component of life skills instruction (also not analyzed here due to limited data available).

Additionally, EDC managed the only IRI programs addressing science (in Papua New Guinea), health (in Bolivia) and environmental science (in Costa Rica). Each was a challenging and interesting experience in education by radio targeting grades 4 and 5, though none applied instructional strategies that could legitimately be labeled IRI as employed by the programs assessed here.

SECTION 2: Student Learning Outcomes in Early Childhood Education

In addition to delivering primary-level classroom content, IRI has also been applied at earlier stages of cognitive and social development as a tool to support early childhood development and education. In the cases examined below, IRI has proven to be an effective pre-primary intervention in terms of early childhood development. Results have shown to be positive in both urban and rural environments, as well as in alternative learning centers lacking trained teachers.

Pre-primary IRI was first developed in Bolivia to address early learning in communities faced with the constraints of poverty, the need to work, poor literacy skills, large families, and little knowledge of the kinds of experiences that could most improve young children's skills and school preparedness. The program thus targeted two audiences simultaneously: young children for whom programs provided a time to participate in entertaining and consistent sequences of cognitive, physical, social-emotional and communication activities; and caregivers for whom programs provided opportunities to learn about child development through practice.

This model of early-childhood IRI focused on enabling both caregivers and children to interact in stimulating environments for learning and developmental growth. A major thrust of the program was to demonstrate to caregivers good early child development not only with an emphasis on pre-reading and counting, but also on the development of well-balanced children who are able to make sense of, and feel confident in, their surrounding environment. Additionally, by supplying caregivers with audio programming, posters, and illustrated guidebooks, the program was purposively accessible to caregivers with limited literacy skills.[12]

This model of pre-primary IRI proved to be successful in Bolivia and was used in more recent projects, including Honduras, Indonesia, Tanzania, and Malawi. The following analysis presents the quantitative results that were obtained from EDC's projects in Bolivia, Honduras, El Salvador, and Indonesia. Results from tests that are administered to younger learners (generally between the ages of four and six years old) are usually summarized by levels of development rather than "percentage correct." Since effect sizes cannot be calculated on this type of metric, the data below should not be directly compared across countries in an absolute sense. What the data does show is that the trend of change in the development of young learners suggests that IRI can be influential in the lives of such very young children.

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[12] Crespo, A. B. (1995). *Jugando En El Pidi: Active Learning, Early Child Development and Interactive Radio Instruction - Supporting Caregivers, Parents, and Young Children.* LearnTech. Washington DC: USAID.

A: Bolivia

In Bolivia, the IRI series Jugando en el Pidi (as described above) administered baseline and post-pilot assessments in 19 experimental (IRI) and 6 control classrooms measuring learner levels of verbal communication, physical activity, positive affects and engagement, and skill levels in performing designated tasks. The children assessed were ages 4 to 5 years. Caregivers also participated in a questionnaire before and after the pilot which solicited their assessment of children's skill levels and attitudes while learning.

Bolivia's Pidi were daycare centers set up through World Bank funding in the houses of untrained, often poorly educated women. Physical facilities were improved, but initially the project did not train or support caregivers so they had little idea what to do with the children all day long. IRI programs on audiocassette provided activities for the children and trained caregivers in simple early childhood psychosocial practices.

As seen in Figure 8 below, caregivers in classrooms using IRI were consistently more positive in their reviews of children's attention levels, skills, and general enjoyment of learning activities than caregivers in control classrooms. Figure 9 below, detailing learner assessment results, confirms the evaluations put forth by caregivers in both IRI and control classrooms. Here, student assessment results show IRI learners are seen to outperform their control counterparts in each subcategory by an average margin of 27 percentage points. These achievements are considerable, particularly given that target beneficiaries represented large, often remote audiences, and that caregivers required training materials and program tools not reliant on high-level reading skills or face-to-face instruction.

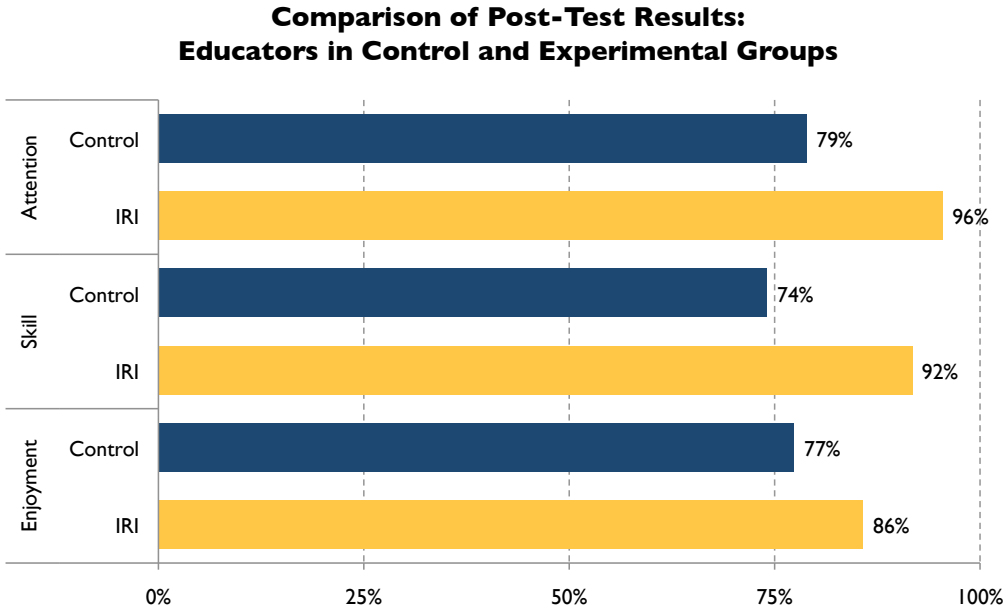


Figure 8. Bolivia - Educator Assessment of Learner Attitudes and Skill Levels

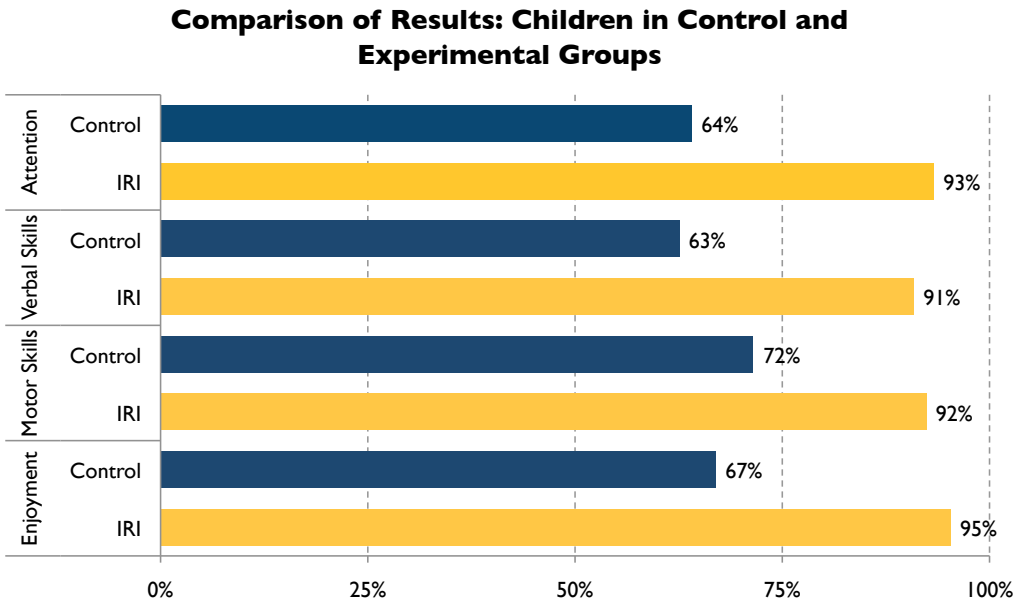


Figure 9. Bolivia - Learner Assessment Results

B: Honduras

An EDC-led project, *Juego y Aprendo*, established 53 early childhood IRI centers in Honduras with the objective of increasing access to pre-primary education. It was not expected that, following 12 months of intervention, the project's alternative IRI centers--staffed with volunteer educators--would match student achievement levels attained by the control group comprised of existing, formal pre-schools. Despite this, post-test scores for the 180 experimental group learners and 80 control group learners were not seen to be significantly different. Indeed, children participating in IRI programming made notable progress from pre- to post-test, with a sound majority of respondents in "Developed" and "Advanced" categories by school year end, as can be seen in Figures 10 and 11 below.

The early childhood centers in Honduras were based on the practices developed earlier in Bolivia. The IRI programs were instrumental in initiating change in ECD practices in the centers, providing daily infusions of activities for young children and training of caregivers in best practices.

For urban centers using IRI, as in Figure 10, this meant a 70 point decrease in the percentage of children categorized as "Needs Attention" from pre- to post-test, the reduction in the number of students categorized as "High Risk," and an increase in the percentage of students evaluated as "Developed" by 73 points. For rural IRI centers, as shown in Figure 11, this also meant the elimination of students categorized as "High Risk" from pre- to-post test, a reduction in the percentage of students evaluated as "Needs Attention" by 60 points, and an increase of children in the "Developed" category by 56 percentage points. Additionally, by the time of post-test administration, 5% of rural IRI learners were categorized as "Advanced." In both urban and rural settings, these shifts between categories were also seen in control schools, although again, differences in year-end achievement were not seen to be significant, as was expected.

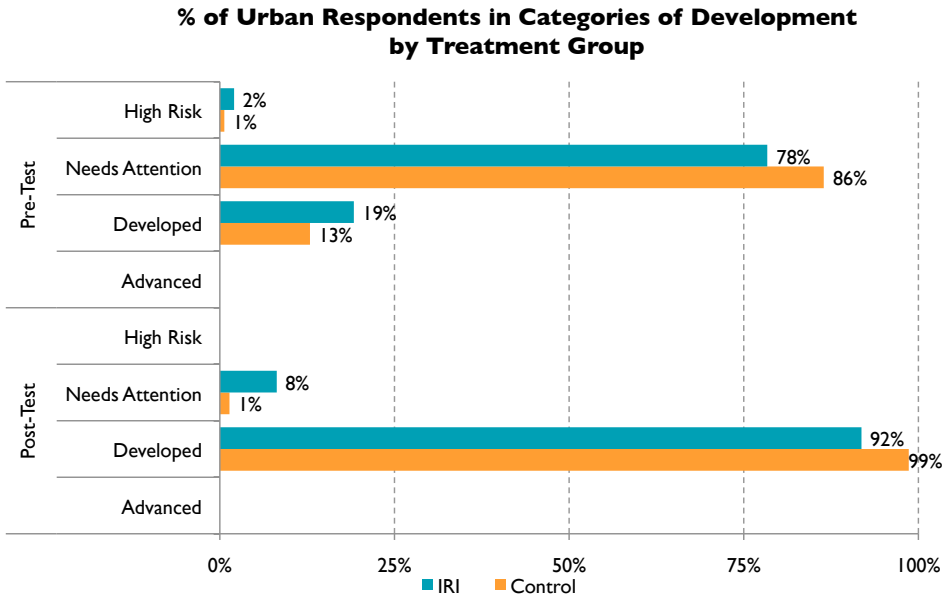


Figure 10. Honduras - Percentage of Urban Respondents in Categories of Development

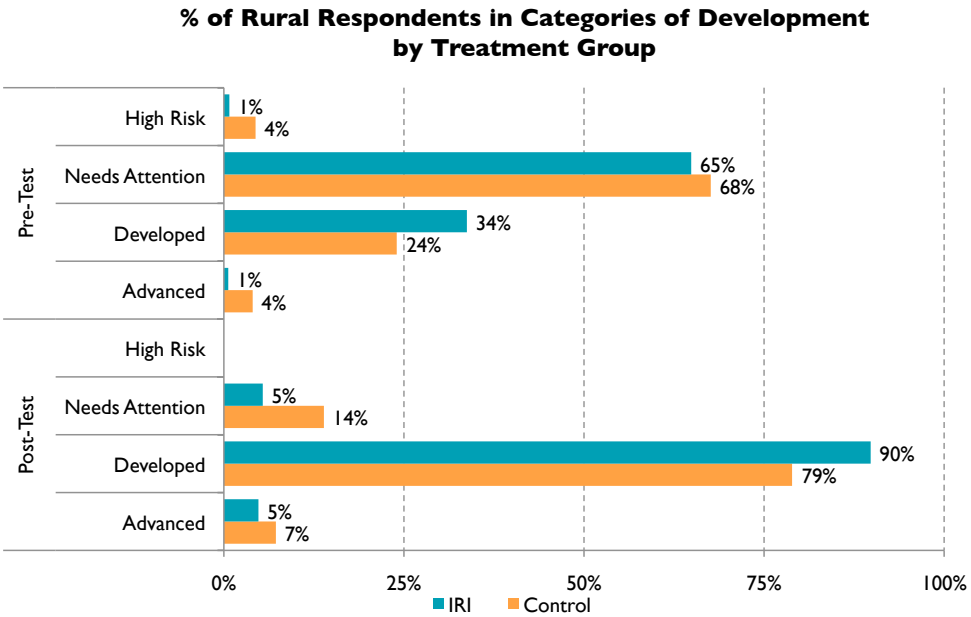


Figure 11. Honduras - Percentage of Rural Respondents in Categories of Development

C: El Salvador

In El Salvador, Interactive Radio Instruction was introduced as a pilot intervention by The Early Childhood Family Education Activity (EDIFAM) program in support of early childhood teachers and educators in their centers. The pilot drew on materials created for the *Juego y Aprendo* project conducted in Honduras, although the span of the El Salvadorian pilot was considerably smaller, targeting eight experimental centers and four control centers (488 IRI learners were assessed, as were 248 control center learners). Even though

the testing period was only a few months, which resulted in using only 35 or fewer of the 108 45-minute programs created for *Juego y Aprendo*, student assessment results nevertheless proved positive.

Similar to the instrument employed in Honduras, EDIFAM prepared an assessment tool measuring children's skills in four key developmental areas: Personal Development (with subcomponents of Identity and Autonomy), Spatial Understanding (with subcomponents of Spatial Location and Knowledge of the Body), Psychomotor Development (with subcomponents of Balance and Lateral Movement), and Language and Creative Expression (with subcomponents of Oral Expression and Interest in One's Surroundings). As demonstrated in Figure 12 (below), overall pre-test scores show the percentage of control group learners exemplifying "Excellent" performance exceeded that of IRI learners by 33 percentage points, while the percentage of IRI learners categorized as "Needs Improvement" surpassed that of their control group peers by 14 percentage points.

However, the progression of children from pre- to post-test evidences notable movements to the "Excellent" category. This was true of both center types. Although some children remained in "Needs Improvement" by the end of the testing period, the percentage of IRI learners in this category dropped by 23 points, while control schools saw a reduction by 5 percentage points. At the other end of the scale, the percentage of IRI learners evaluated as "Excellent" jumped from 34% to 82% while Control schools saw a rise in the percentage of students within this category from 67% to 80%.

Within individual areas of measurement, IRI learners were seen to make the greatest pre- to post-test gains in being able to discern "left" from "right," oral expression, and interest in one's surroundings. In all three cases, the percentage of learners evaluated as "Needs Improvement" decreased by more than 30 percentage points. This is a marked achievement, especially when compared with the pre- to post-test movement of control school learners within the "Needs Improvement" category for these three measures, which evidences a 3 percentage point increase for students in lateral movement, a 6 point decrease in oral expression, and a 3 point decrease in expressing interest in one's surroundings.

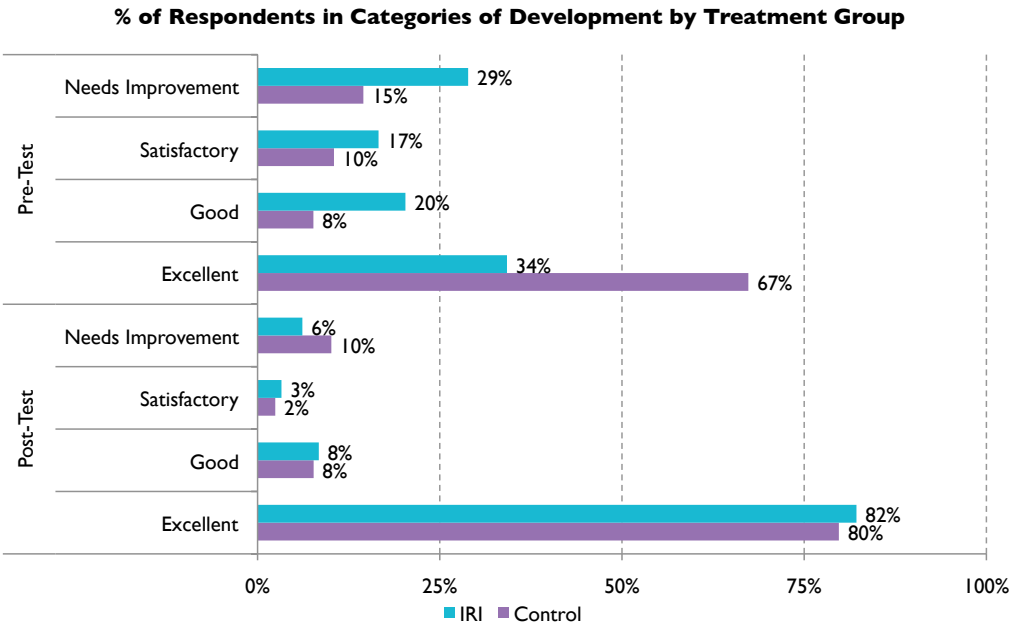


Figure 12. El Salvador - Percentage of Respondents in Categories of Development

D: Indonesia

In Indonesia, a pilot initiative under the Decentralized Basic Education 2 project seeks to enrich the quality of pre-primary learning through the introduction of Interactive Audio Instruction (IAI). While maintaining the same methodologies and approaches of Interactive Radio Instruction, IAI is delivered via pre-recorded CDs rather than live radio broadcast. Accompanied by teacher training and printed guides, IAI has been introduced in 59 kindergartens throughout the country to date. Pre- and post-test administration occurred in the 2007-2008 academic year, with the post-test conducted following instructional delivery of the first of two IAI series. Learners were assessed in the areas of Language, Cognitive Development, and Physical and Psychomotor Development.

While preliminary, the first year of assessment results compiled in Indonesia appear rather promising and support the patterns observed in Bolivia, Honduras, and El Salvador. Despite the fact a greater percentage of DBE 2 students were assessed as "below" in all subcategories than control students at the time of the pre-test, the percentage of DBE 2 kindergartners meeting "average" and "above average" criteria are seen to be equal to or greater than students from control kindergartens in every subcategory at post-test examination. Of note, this meant an increase in the percentage of DBE 2 students meeting or exceeding school readiness requirements in each Language and Cognitive Development categories by 21 points from pre- to post-test—where control kindergartners increased by 13—and in Physical and Psychomotor Development by 5 percentage points—where control kindergartners saw a gain of 2 percentage points.
Perhaps most notable are the achievements observed at post-test, detailed in Figure 12, below. Though the percentage of kindergartners assessed as "average" and "above average" in physical, psychomotor, and cognitive development is roughly equivalent between both IRI and control groups, language results show far

more observable differentiations. Here, the percentage of control school learners performing "below" minimum readiness requirements in language was greater than that of IRI learners. Additionally, the percentage of IRI kindergartners assessed as "above average" in language surpassed that of control school kindergartners by 7 percentage points. This is a particularly laudable accomplishment given that early developments in language and phonological awareness are critical, as well as indicative of successes in later stages of reading.[13] Those that fall below school readiness standards in language are at risk of falling further behind their peers in their ability to benefit from schooling.

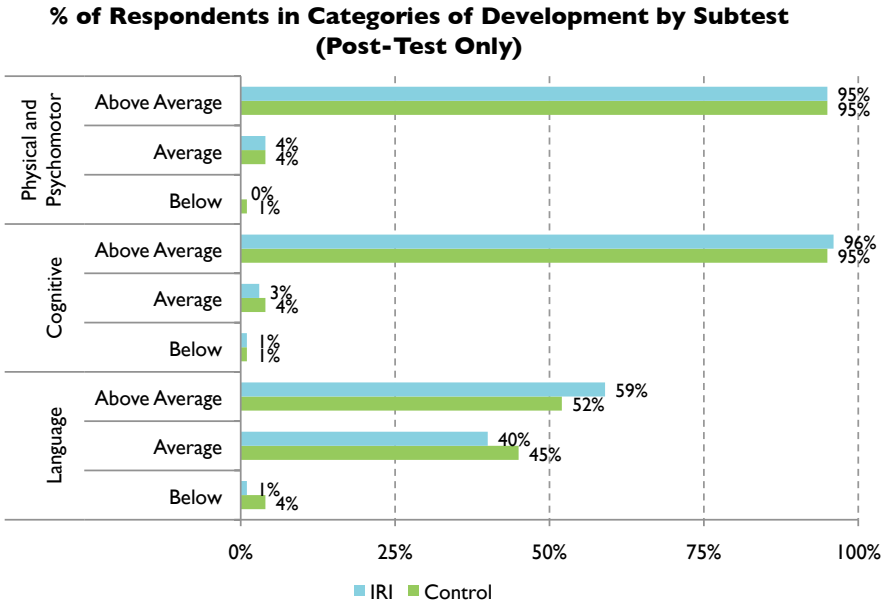


Figure 13. Indonesia - % of Respondents in Categories of Development by Subtest

E: Conclusion – Early Childhood Education

In each setting, young learners participating in IRI programming are seen to have made progress in all assessed categories of development. In the case of Bolivia, a pilot version of pre-primary IRI addressed caregiver skill sets in early childhood development and effected an improved quality of early learning, as was apparent in IRI-learner assessment results far exceeding those of control learners. In Honduras, IRI learners enrolled in project-established centers met levels of development equivalent to their peers enrolled in formally established pre-schools. In El Salvador, IRI student achievements were observed to meet or surpass those of control school students at the time of post-testing despite having relatively disadvantaged statistics at the time of pre-testing. In Indonesia, early results show that the reduction in percentages of IRI students "below" school-readiness standards, and the increase in percentages of students "above average," are slightly greater than that evidenced by control learners, particularly by way of language development. Results from all four cases thus seem to encourage IRI as a positive influence in the early stages of both physical and cognitive development.

[13] Snow, C., Burns, S., & Griffin, P. (1998). Preventing reading difficulties in young children. Washington, DC: National Academy Press.

SECTION 3: IRI and Teacher Professional Development

Though in most contexts Interactive Radio Instruction has followed a dual-audience approach involving direct instruction to students while modeling teaching strategies and classroom organization techniques for teachers, IRI has also been used specifically for teacher professional development. In Mali, teacher training was introduced via IRI as a delivery mechanism built to overcome long distances, reaching educators at the school and classroom level. Radio-based in-service training complemented school-based "communities of learning" and face-to-face trainings developed by the Ministry of Education. The IRI series in Mali offers two types of programming: one for listening groups of teachers gathered after school hours, and another for use during French and mathematics lessons. In Madagascar, in-class IRI training took on a similar form in which radio teachers would model the different games, songs, and student-centered learning activities to their classroom counterparts, aimed at improving teaching in mathematics, French and Malagasy. Pauses in the radio programs allowed participating teachers time to try new activities with their students while listening to the program. The primary objective of both programs was to improve the quality of classroom instruction with an emphasis on active learning and student-centered methodologies.

Multi-Channel Learning and Guinea

Guinea introduced the most integrated version of IRI to date. In Guinea, with overall student enrollment approximately 40% - and even lower for girls at 30% - the basic education system suffered frequent student drop-outs, and beyond grade 6, promotion rates remain drastically low. The Fundamental Quality and Equity Levels (FQEL) project introduced a series of materials, each relying on a different "learning channel" to communicate concepts to students and teachers – including materials in audio, print and visual formats.

IRI programs developed for grades 1-6 were broadcast three times a week, providing students an auditory learning "channel" to supplement that of the teacher's spoken explanation of French vocabulary and basic mathematics. New student learning materials provided an additional print "channel," which included student workbooks for children in grades 2-6 and short-story readers for children in grades 1-2. Color posters distributed to every classroom served as a stimulating visual "channel." In addition, a number of kinesthetic "channels" were supplied by the activities recommended in IRI programs, on the backs of posters, and in the teachers' editions of the workbooks and readers.

Student learning strategies were coupled with cluster-based teacher training and reinforced by radio-based training.

This combination of multi-channel materials and learning activities facilitated a more integrated, student-centered flow of instruction in the classroom. Together, these materials supported Guinean teachers as they expanded their repertoire of instructional practices, attempted new learning exercises, and experimented with different classroom configurations.

Although improvements in teacher practice are ultimately expected to impact student learning outcomes, neither time nor funding was available to conduct student assessments in the above-mentioned projects. Rather, assessments were administered to measure changes in teachers' instructional behavior and understanding of pedagogical techniques introduced by IRI programming. IRI-trained teachers were surveyed regularly during the life of each project, providing some longitudinal analyses data (no control comparison data is available). A summary of the findings is presented below and illustrates that teachers, too, stand to benefit from IRI.

A: Mali

As discussed above, the Mali *Formation Interactive des Enseignants par la Radio (FIER)* project introduced radio-based teacher training tailored to both a teacher listening group setting and in-class programming. Regarding the latter, programs were developed for grade 3 teachers in French and math, and for grade 4 teachers in French only. Teaching techniques emphasized in *FIER's* in-class programming included active learning, brainstorming, Total Physical Response (a participatory language learning method requiring students to respond physically to verbal directives), and cooperative learning (e.g., group work, role plays, and games). IRI-trained teachers were surveyed three times throughout the project (baseline, midterm, and final evaluations), to determine their levels of familiarity with each of these instructional strategies. Teachers were also observed during non-IRI lessons to gauge their actual adoption of these techniques independent of radio guidance.

The results shown in Figure 14 below indicate real improvements in instructional practice over the course of the project. Each evaluation shows steady gains in teachers' familiarity with, and use of, all key techniques emphasized by the program. Increases in teachers' facility with brainstorming are particularly notable, with the percentage of participant teachers familiar with, and the percentage using, brainstorming during non-IRI lessons escalating 59 percentage points from 2005 to 2007. Also of note is the percentage of teachers familiar with cooperative learning (93% in 2007 up from 36% in 2005), and the percentage of teachers observed using group work during non-IRI lessons (75% in 2007 up from 18% in 2005).

There remains a clear gap between the percentage of teachers familiar with key techniques and the percentage of teachers actually implementing them. However, given the relatively low percentages of teachers exposed to these methodologies at the outset of the program (ex., 5% of teachers familiar with Total Physical Response, 39% of teachers not familiar with any active learning techniques), that more than two-thirds of all teachers surveyed are familiar with these strategies at the time of final evaluation is viewed as a marked improvement in practitioner knowledge, proof of listenership, and an increased probability that such teaching methods will be integrated into future classroom instruction.

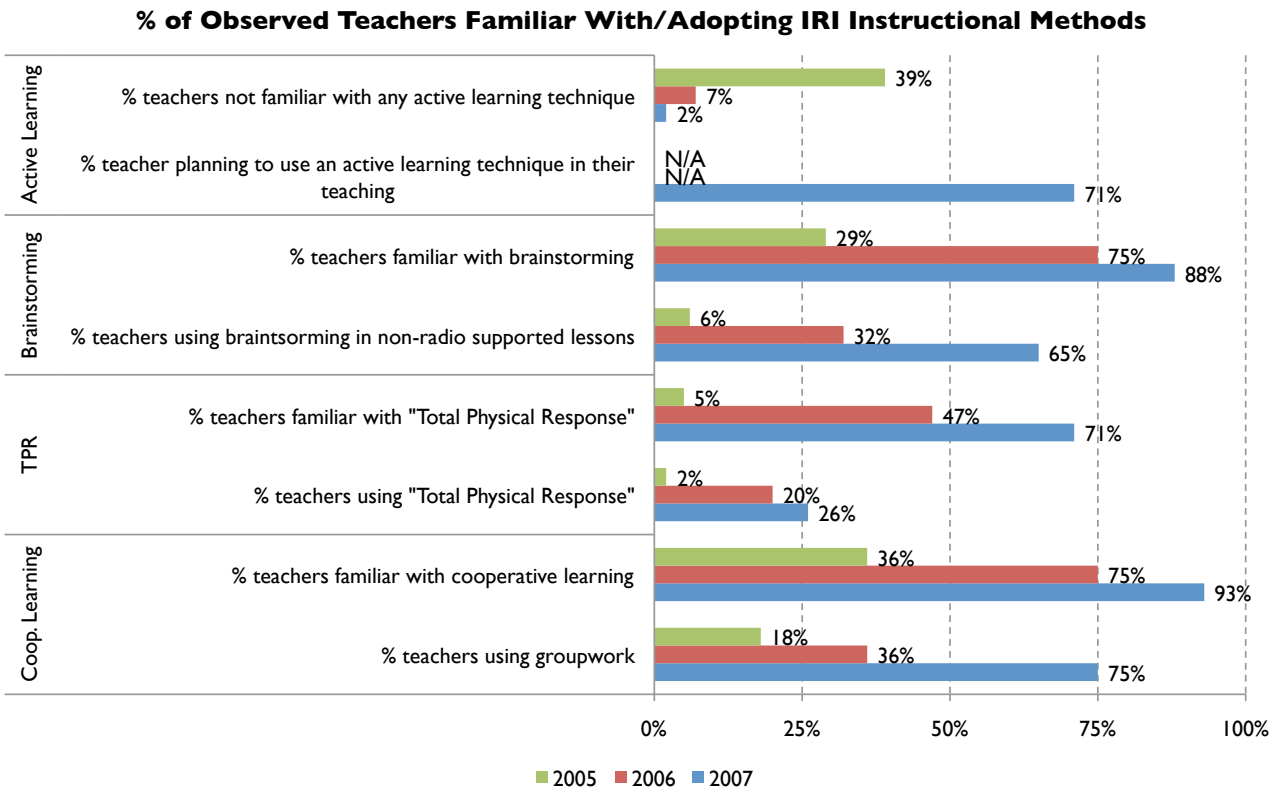


Figure 14. % of Observed Teachers Familiar With/Adopting IRI Instructional Methods

B: Madagascar

As in Mali, the *Appui Technique aux Éducateurs et Communautés (ATEC)* project in Madagascar broadcast IRI programs during school hours allowing teachers to simultaneously engage in professional development activities while leading their students in active learning exercises. Grades 1 and 2 participant teachers were observed during non-IRI lessons to assess their adoption of pedagogical techniques and concepts explicitly addressed by radio programming and modeled by radio teachers. In all, 27 practices were listed in the project's classroom observation tool and were generally associated with active, student-centered learning. These practices focused on six key areas targeted by the program:

- *Classroom management and organization* - The type of teacher-student interaction that is established in the classroom and the degree to which all students are involved in the learning process
- *Communication* - The nature of the communication between the teacher and the students, and the degree to which students initiate communication with the teacher or with each other
- *Classroom practices* - The degree to which the teacher uses practices that engage young learners in the learning process (games, songs, drawings, gestures, use of manipulatives, objects, physical activities), checks students' understanding throughout the lesson, or provides them with opportunities to apply, in novel or original situations, the new concepts targeted during the lesson

- *Classroom practices in language classes (Malagasy/French)* - Whether or not the teacher integrates, in the same lesson, two or more of the following elements: oral expression, phonetics, writing and reading
- *Student evaluation* - Whether the teacher gives children objective and specific feedback on their thinking, attempts to help them understand, or has them summarize what they have learned at the end of a lesson
- *Gender equity* - Whether the teacher values equally the participation of girls and boys and equitably encourages students from each gender group

Teachers were evaluated on whether each of the 27 practices was present in the lesson observed and the extent to which each was mastered. Figures 15 and 16 illustrate the percentage of teachers using the practices in the six key areas more than minimally.

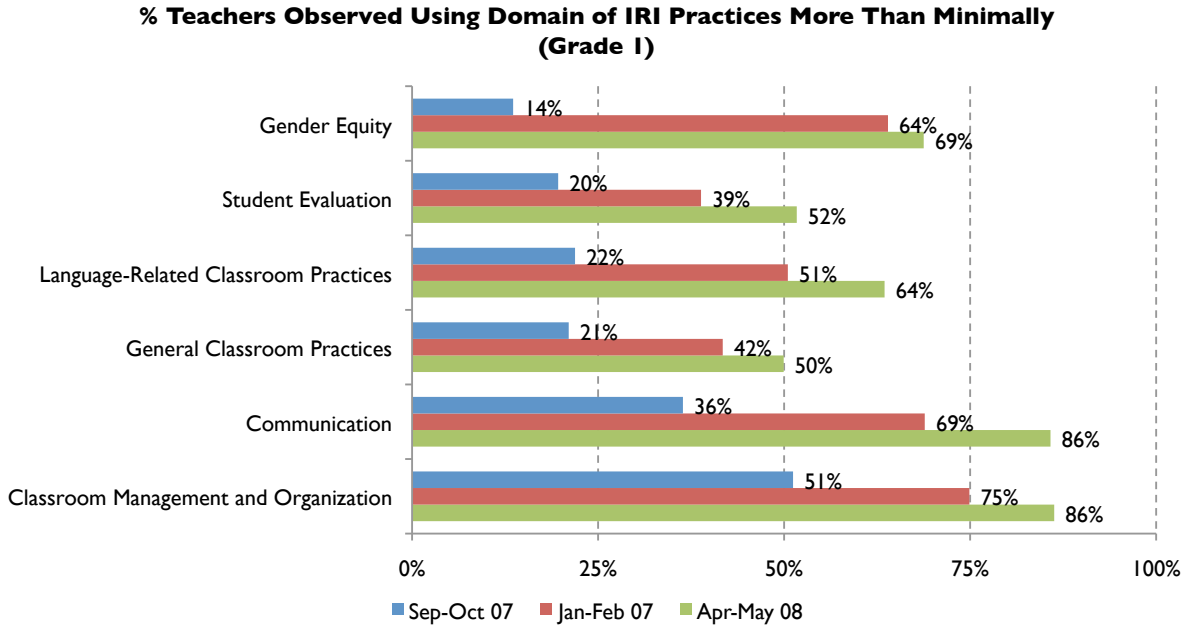


Figure 15. % Teachers Observed Using Domain of IRI Practices More than Minimally (Grade 1)

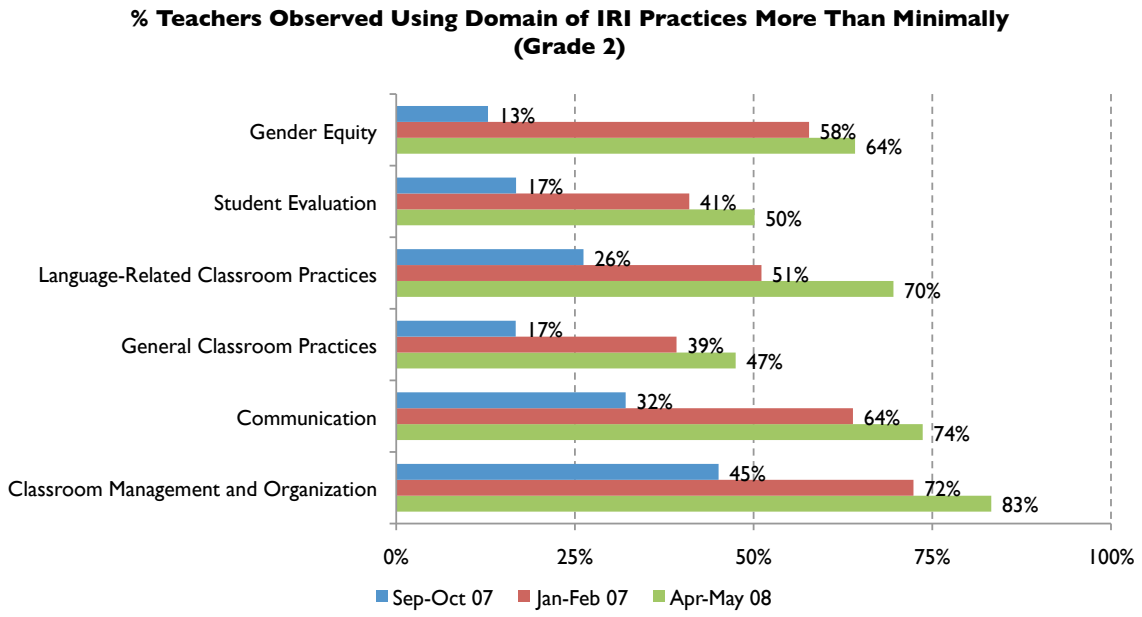


Figure 16. % Teachers Observed Using Domain of IRI Practices More than Minimally (Grade 2)

For both grades 1 and 2 teachers, steady improvements are observed from baseline testing in September-October 2007 to final evaluation in April-May 2008. Grade 1 teachers improved by a minimum of 31 percentage points in each of the six areas, with a marked improvement by 51 percentage points in the area of gender equity (64% of observed teachers in 2008 used gender equitable practices more than minimally, up from 13% in 2007). Grade 2 teachers improved in all six areas by at least 29 percentage points, where again, the most dramatic gains appeared in the area of gender equity (69% of observed teachers in 2008 used gender equitable practices more than minimally, up from 14% in 2007).

In the key area, "general classroom practices," which captures the widest range of student-centered teaching practices, grade 1 teachers demonstrated a 29 percentage point improvement from 2007 to 2008, and in grade 2, a gain of 30%. In other words, where 21% of grade 1 and 17% of grade 2 teachers were, at the time of baseline assessment, observed to use 12 general practices emphasized by the program more than minimally (i.e., beginning a lesson with an activity designed to activate students' prior knowledge of the subject, facilitating pair or work group, checking students' understanding throughout the lesson), 50% of grade 1 and 47% of grade 2 teachers met this criteria in the final evaluation. That one-half of the teaching population observed was actively implementing these techniques by the end of the project might not seem extensive on an absolute level, however, given the rather low levels of usage in the initial stages of the project, these achievements made over the course of only eight months of IRI programming are indeed encouraging.

C: Conclusion – Teacher Professional Development

Classroom observation results from projects in both Mali and Madagascar support IRI as an effective delivery mechanism for in-service professional development, where teachers are able to actively employ instructional

techniques in the classroom while undergoing radio-based training. In both projects, teachers have been observed not only to have a better understanding of pedagogical concepts emphasized by broadcasts, but have also been evidenced to use active learning and student-centered techniques in lessons independent of radio guidance. Steady, if not dramatic, improvements in instructional practice have been recorded in both projects over relatively short timelines, boding well for continued teacher-targeted programming.

SECTION 4: Student Learning Outcomes for Marginalized Populations

In evaluating the impact of IRI across various student populations, the researchers were also interested in looking at the impact on marginalized populations. UNESCO identifies girls as one such group of learners. Globally, girls suffer disproportionately in access to quality education (they comprise 57% of out-of-school populations) and they also perform poorly, on average, compared to boys (UNESCO, 2008). Similarly, school achievement among another group of learners, Orphans and Vulnerable Children, continues to fall while this population of children is on the rise. Unfortunately, this problem is most pronounced in countries that are also most affected by HIV/AIDS (which also tends to severely impact the population of teachers), and reaching out to this demographic continues to be of great concern to both local governments and donor agencies.

As discussed in Section 2 of this report, IRI in recent years has been implemented in more areas that are in the midst of, or emerging from, conflict. Learning conditions in these areas are more severe, and the demands on IRI even greater. Learners in fragile states comprise a third population; one that appears more and more in recent years as a target for IRI programs. The fourth population of learners is one that has long been a focus of IRI – students in rural areas.

The concern for these and other marginalized learners is not new nor are the efforts to bring quality, scalable education to them. As a result of the ubiquitous reach of radio, IRI has been looked upon as a means to reach marginalized children, and more so in recent years. This section highlights what is known of the impact of IRI on the learning outcomes of four key marginalized groups: girls, Orphans and Vulnerable Children, learners in Fragile States, and those in rural areas. While all IRI projects include some combination of one or more of these marginalized groups, limited data is available that looks at the learning outcomes for these students specifically. For example, data for students in Zambia were coded by the type of center students visited, and not by their OVC status (which, not surprisingly, is a sensitive piece of information to capture, and capture accurately). Thus, the type of center a learner attended was used as a proxy for a child's OVC status. In other cases, rural and urban classifications were missing in the data, or student gender was not available. Therefore, the following analyses are based on all available data, as reported by the project, and are not intended to be representative of findings across all IRI projects.

A: Girls and Boys

Early on, EDC was interested to see if IRI had a differential effect on boys and girls. From prior reports, the results for learning among girls have been encouraging. Hartenberger and Bosch (1996) found that across four projects, IRI girls in two projects appeared to have benefitted more than IRI boys; in the other two projects the researchers found that both boys and girls benefitted equally.[14] Early findings in science in upper primary schools in Papua New Guinea and English in lower primary in South Africa also reveal that girls made greater pre- to post-test gains than boys.[15]

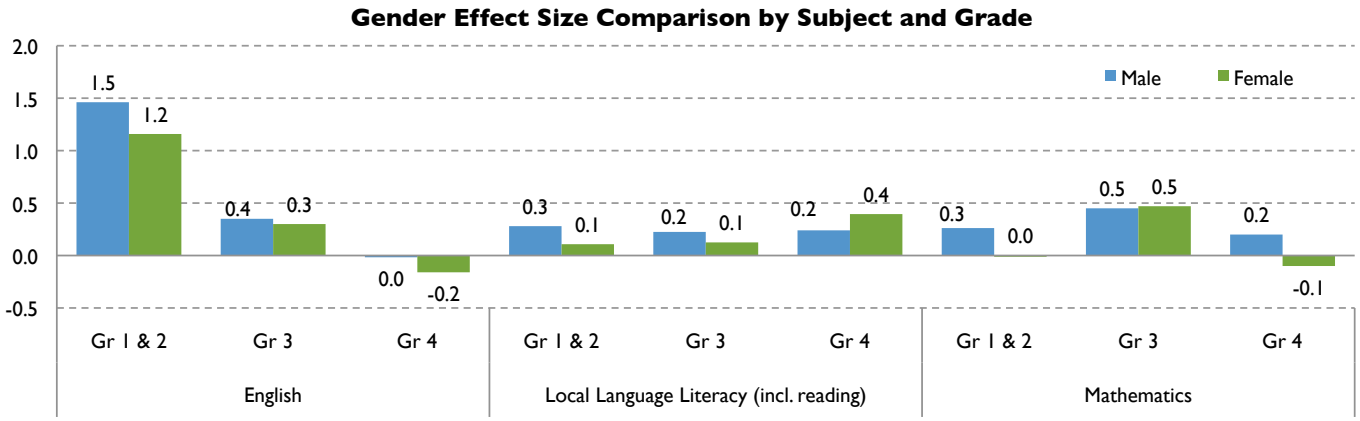
Do more recent IRI experiences sustain these early findings? The data by subject or individual grades appears mixed, as shown in Figure 17 below, but overall, reveals a slight gap between boys' and girls' achievement. While the available data suggest that IRI boys enjoyed a larger boost over non-IRI boys than IRI girls did over non-IRI girls, the difference between IRI boys' and IRI girls' performance, on average, appears small. In other words, the data show that girls, on average, lag behind boys by a magnitude of 0.2 (on the effect size scale). This means that, on average, the mean score for boys is at the 58th percentile of the score for girls.

Before identifying this as a pattern of recent data, it is necessary to reiterate a few key issues that may be at play. First, the margin by which girls underperform may be negligible.[16] Second, experience shows if children are not attending school and listening to programs, they cannot learn from the programs, and that when attendance is generally poor, girls' attendance tends to be more variable than that of boys. Unfortunately, in the six projects that provided the data for this gender analysis (See Figure 17), attendance information was not available and there is no control in this data for student attendance. Finally, of the six countries in this analysis, three are in or emerging from conflict (Sudan, Somalia and Haiti), while one (Zambia) continues to face a growing HIV/AIDS epidemic. We do not know what effect these conditions have on girls' learning outcomes.

[14] The projects reviewed by Hartenberger and Bosch included Science grade 4 from Papua New Guinea, English grade 2 from South Africa, and Math and English for adults from Honduras.

[15] The report states that "while 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" (Bosch, "Twenty Three Years of Improving Educational Quality", Education and Technology Notes, Vol. 1 No. 1. 1998; P 2)

[16] Given the narrow slice of data available for this analysis, it appears that the margin between boys' and girls' achievement (with girls lagging behind boys) could be considered marginal, if not negligible. Most importantly, this difference has not been tested for statistical significance, and therefore my not be signification different from zero. Secondly, the severe lack of data compromises the generalizability of this achievement gap. As such, it is strongly recommended that future data collection include a deliberate effort to identify and disaggregate data by gender to support a generalizable analysis of the gender-based achievement gap.



Note: Data for English includes student scores on tests administered by EDC and its partners in four countries--Zambia, Sudan, India, and Pakistan--across different years. English grade 1 and 2 is based on six records (combination of countries and years), grades 3 and 4 on one record each. Data for local language literacy are from four countries -- Zambia, Sudan, Somalia and Haiti. Literacy grade 1 and 2 data is based on six records, grade 3 and 4 on two records each. Data for mathematics are from two countries -- Zambia and Sudan. Mathematics grades 1 and 2 is based on four records, grade 3 and 4 on one record each.

Figure 17. Gender Effect Sizes by Subject and Grade

Boys' and Girls' Achievement in English and Local Language Literacy

In the early primary grades (grades 1 and 2) in English, the data show that both boys and girls in IRI classrooms show impressive gains over their peers in non-IRI classrooms (See Figure 17 above). Most notably, a boy in a grade 1 or 2 IRI English classroom performed at the 93rd percentile of his non-IRI peers while a girl performed at the 88th percentile of her non-IRI peers. When unpacking the English language data by country, mean scores for females mirror the general trend of mean scores for males (See Figure 18). That is, when boys did better, so too did girls. If an achievement gap between boys and girls exists, this data is suggestive at best. Furthermore, any gap demonstrated by these data is primarily driven by a large disparity in student achievement scores from a single country (Pakistan). Without appropriate data on girls' and boys' attendance in Pakistan, it is impossible to conclude what effect IRI had on those boys and girls who attended, or whether the learning data is driven more by differences in boys' and girls' attendance rates.

Pakistan aside, the remaining data suggest that girls' achievement lagged by a margin of 0.2 on the effect size scale, except in the case of India, where girls' achievement exceeded that of boys by a margin of 0.3. In Sudan and Zambia, this means that the mean boys' achievement score in English was at the 58th percentile of girls' scores. In comparison to the average gap across all subjects and grades, the limited data available suggests a slightly larger girls' achievement gap in English.

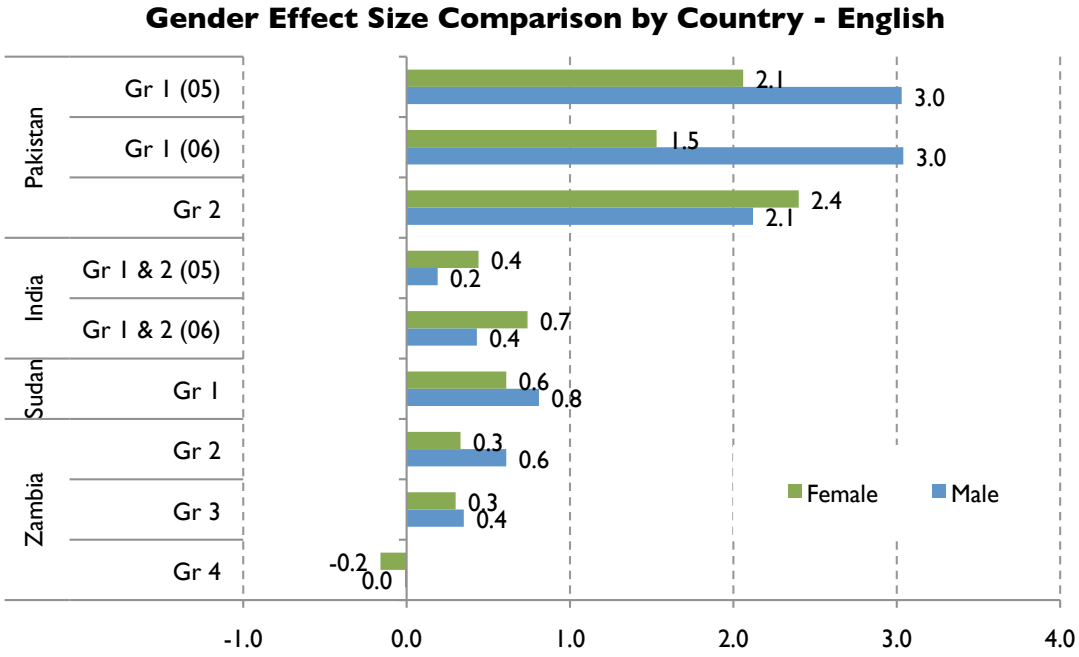


Figure 18. Gender Effect Size Comparison by Country - English

In local language literacy (which includes both reading and writing), the data in Figure 19 show more variability in achievement compared to English. In four of the eleven records shown, girls outperform boys. In four other records, negative effect sizes were found for girls. As discussed previously, the four countries that provided the eleven records for this analysis are either conflict areas or severely affected by HIV/AIDS. On the one hand, it may be tempting to the reader to draw conclusions about the promising impact of IRI in Haiti grade 4 or Somalia grade 1; on the other hand, however, the data show that girls severely underperform in Sudan grade 1 and in Haiti grade 3. These widely varying results do not appear to support any clear conclusions, for which more data is undoubtedly needed. It is also important to remember that the process of teaching and learning of local languages varies greatly from country to country, while English language instruction tends to follow a more uniform approach. Without a deeper knowledge of how levels of conflict and variations in local language curriculum may have influenced the results shown, and with the limited, biased[17] data that is available, it may be too early to draw conclusions of the general pattern of impact of IRI on girls' versus boys' achievement in local language literacy. Lastly, none of the early studies referenced were conducted on local language literacy, and there is no baseline from which to compare these recent data.

[17] The four countries that provided data for this analysis are all extremely difficult areas – affected either by conflict or high rates of HIV/AIDS. This bias in the data limits the generalizability of any findings.

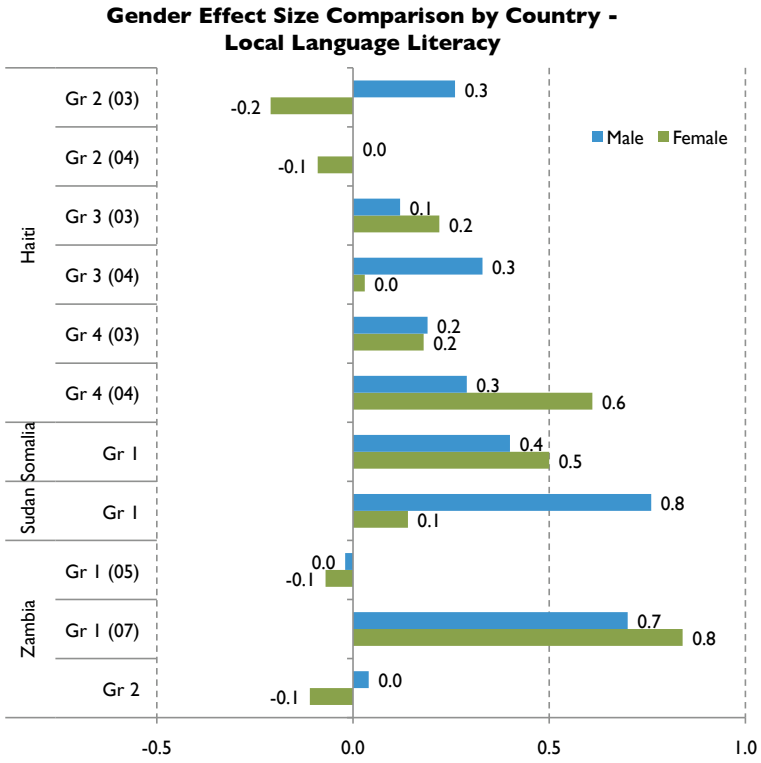


Figure 19. Gender Effect Size Comparison by Country - Local Language Literacy

Boys' and Girls' Achievement in Mathematics

When examining the available data in mathematics across four grades, two conclusions can be drawn. First, there is a dearth of information for grades 2 through 4, which renders it inconclusive. With only one record available in each grade, it is inappropriate to draw conclusions about the impact of IRI on girls' and boys' math achievements in grades 2, 3 and 4. Second, the data suggest that in grade 1, girls' achievement, on average, lags behind that of boys by 0.2 units on the effect size scale.

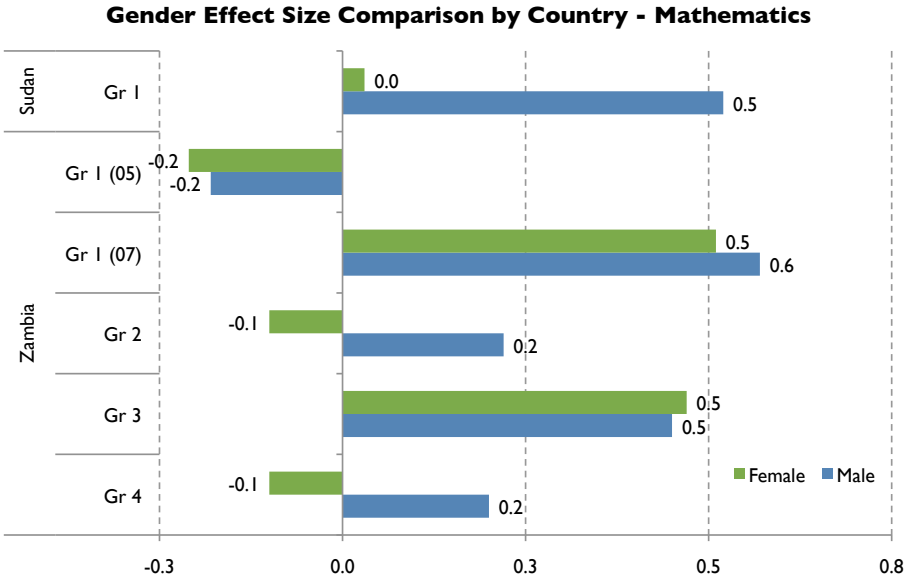


Figure 20. Gender Effect Size Comparison by Country - Mathematics

Looking closely at the gap between boys' and girls' math performance, we see that, in general, when boys perform better, it is likely that the girls will also perform well. However, when boys perform poorly, it is likely that girls will perform poorly and perhaps even more poorly. Therefore, the data suggest that over and above a gender-based achievement gap, there appear to be other significant factors affecting the impact of the IRI programs on boys and girls alike. These may include variations in program implementation, the extent of teacher training, or the frequency with which students actually heard IRI programs, all of which may affect student achievement scores irrespective of gender.

B: Rural and Urban Students

Another group of students that tend to have poor access to quality education are those in rural areas. Common obstacles facing rural schools in developing countries, such as remote school locations, poorly trained teachers, and high teacher turnover rates, have adversely affected learning outcomes for rural students compared to their urban peers. In response to this discrepancy in achievement, EDC has seen a steady growth in the number of projects that target this population in recent years. Early analyses of IRI experiences in Bolivia, Thailand and South Africa indicate that rural students demonstrated higher learning gains than their urban counterparts (Bosch, 1998). Data from recent projects, however, is more modest - urban and rural students appear to be achieving at comparable levels.

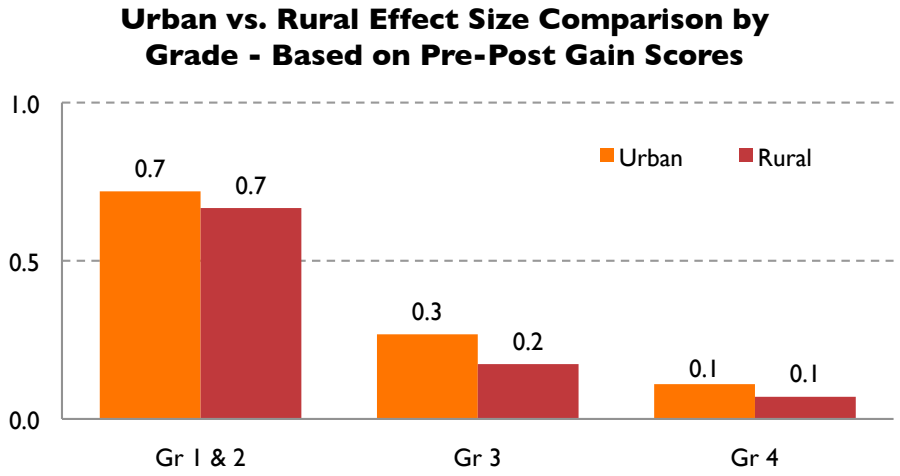


Figure 21. Urban and Rural Effect Size Comparison by Grade (Gain Scores)

Note: Data for grades 1 and 2 are based on seven records (combination of countries and years) from India, Haiti, and Pakistan. Data for grade 3 are based on four records from Haiti. Data for grade 4 are based on two records from Haiti. All effect sizes are averaged across country and subject.

As shown in Figure 21 above, rural IRI students enjoy approximately the same boost in achievement over their non-IRI peers as do urban IRI learners. While the data do not evidence the rural advantage seen in early results, these outcomes do show that rural students continue to benefit from IRI programming despite an

increased interest in recent years on IRI as a means to reach remote learners.[18] These data suggest that on average, a grade 1 or 2 student in a rural IRI classroom tends to place at the 76th percentile of his non-IRI rural peers, and the same holds true for urban students. A similar pattern appears in grade 3 across subjects, but with more modest overall effect sizes. In grade 4, however, the data shows that neither urban nor rural students demonstrate learning gains.

While sufficient records were available to draw these conclusions, it is important to note that these data are not representative of all EDC projects. The assessment information presented above includes only those records which had both pre- and post-test data, and which represent effect sizes derived from gain scores.

English and the Urban-Rural Achievement Gap

The data for English in grades 1 and 2 provide the most promising evidence that IRI is bridging the rural-urban achievement gap. Here, the mean English score for rural IRI students in grades 1 and 2 is at the 100th percentile of rural non-IRI English students. By comparison, the mean English score for urban IRI students in English (in the same countries, grades and years) is at the 94th percentile of urban non-IRI students. These data reiterate the findings of early IRI experiences in Bolivia, Thailand and South Africa. Indeed, as both the India and Pakistan IRI series were modeled on the South Africa IRI series, we are able to draw a comparison of student assessment results between these two projects. In South Africa, rural IRI students were reported to achieve learning gains 15% higher than those attained by urban students. More recent data from India and Pakistan suggest a 13% boost for rural IRI students over urban students.[19]

English results for grades 3 and 4, while available, are limited to post-test data only. Comparable effect sizes based on pre- to post-test scores (as used here), therefore, could not be calculated and the outcomes are not discussed here. Post-test only findings, however, are presented in summary at the end of this section.

Mathematics and the Urban-Rural Achievement Gap

In mathematics, the available data do not sustain findings from previous studies. In Bolivia, studies cite that rural IRI students demonstrated learning gains over their non-IRI peers 12 percentage points higher than the gains of urban IRI students over their respective peers. More recent data (See Figure 22) do not evidence a

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[18] Anecdotally, EDC has responded to more donor and host country requests to implement IRI for remote and hard-to-reach student populations in recent years than it had a decade ago. With such increased attention, it is also important to recognize definitions of "urban" and "rural" have also changed, and the "rural learners" observed a decade ago might not be as physically remote as those targeted in more recent years.

[19] These percentages, while illustrative, are not quite directly comparable because the latter takes into account the variability of student scores, while the former does not. Specifically, data from South Africa did not provide the variability of student scores, which is a necessary element to calculate effect size. Without this information, it is impossible to know whether all students did better, or a small subgroup of students pulled the distribution of scores upwards. As a result, it is likely that the 15% learning gains from the South Africa data may be overstated.

rural student advantage over urban student performance. A more appropriate and direct comparison to the Bolivia data may be results from Guyana, where the IRI programs were based on the Bolivia series. The data from Guyana, however, could not be considered in this study because there was no control group available, and thus, no effect size can be calculated.

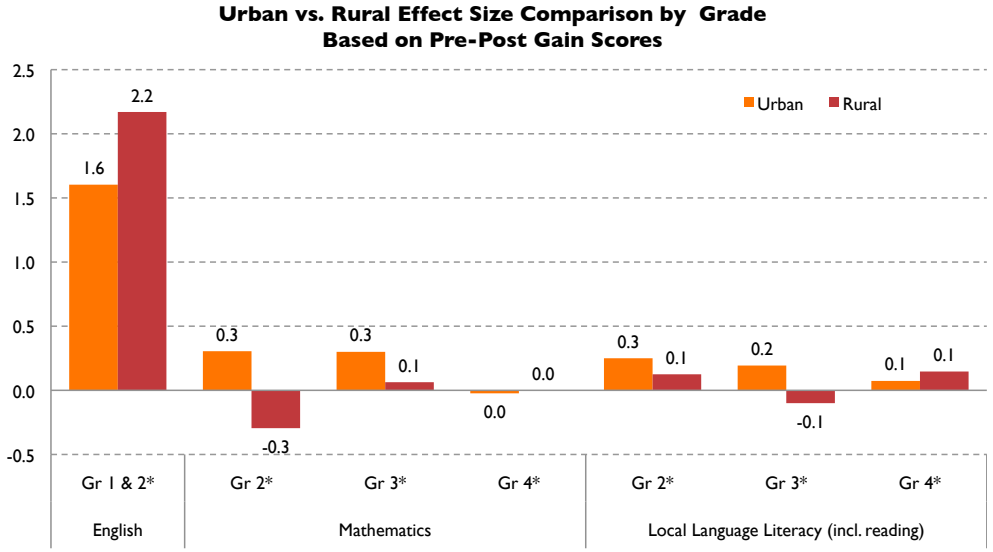


Figure 22. Urban and Rural Effect Size Comparison by Subject and Grade (Gain Scores)

Note: Data for English includes student scores on tests administered by EDC and its partners in two countries –India and Pakistan. English grade 1 and 2 is based on three records. Data for Mathematics are from two countries – Zambia and Haiti. Mathematics grade 2 is based on two records, grades 3 and 4 on two records. Data for local language literacy are from Haiti. Literacy grade 2 is based on two records; grade 3 and 4 are based on three records each.

Local Language Literacy and the Urban-Rural Achievement Gap

As with the gender-based analysis, data from early IRI experiences is not available for the analysis of urban-rural achievements in local language literacy.[20] Lacking previous, or even a variety of current records for comparison, it is not possible to draw reliable conclusions about the urban-rural achievement gap in local language literacy from the Haiti data available. However, careful insight into the Haiti data in isolation can be made, and these suggest that rural, Haitian IRI learners lag their urban counterparts by a small margin. Across grades 2, 3 and 4, the average effect size advantage for urban students is 0.2 units.[21] This means that, on average, urban learners in Haiti performed at the 58th percentile of rural learners in Haiti, across grades 2-4. In an effort to conduct a more thorough analysis, it is suggested that current and future projects deliberately collect and disaggregate student assessment data for urban and rural students.

[20] Data for Honduras (1994) is available, however, this was for Spanish among adult learners. Since the gains among this group cannot be compared to those of learners in primary grades for obvious reasons, this study was not considered here.

[21] Average of the difference between each set of rural/urban pairs. Sum 0.2, 0.3 and 0.0; then average across 3 grades.

Additional Student Learning Data on the Urban-Rural Achievement Gap

As mentioned, the data above only represent those records for which both pre- and post-test data were available. For purposes of completeness, results from post-test only records are also summarized in the table below. However, the reader is reminded that the calculation of post-test only effect sizes and pre- to post-test effect sizes use different formulas, and comparisons between the two should be avoided.

Given these limitations on interpretability, the post-test only data presented in Figure 23 below is also based only on Zambia. Therefore, it is clear that additional data is needed in grades 3 and 4 in both English and mathematics to appropriately determine the impact of IRI on student learning for rural versus urban students.

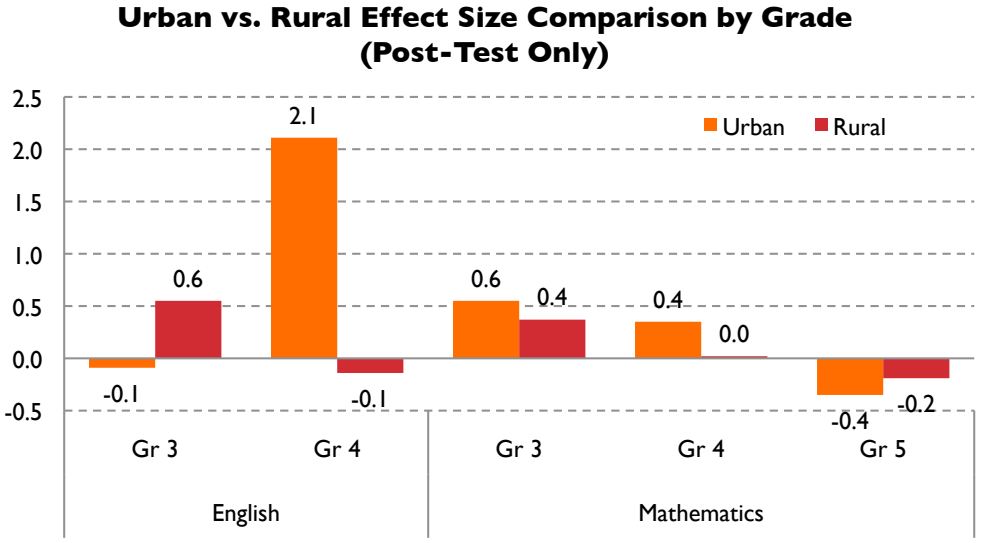


Figure 23. Urban and Rural Effect Size Comparison by Grade (Post-Test Only)

Note: Data for English and mathematics includes student scores on tests administered by EDC and its partners in Zambia. English grades. 3 and 4 are based on one record each. Mathematics grades. 3 and 4 are based on one record each.

Urban, Rural and Isolated Student Achievement Comparison

In Pakistan, results for English grades 1 and 2 rural and urban students were further divided into urban, rural and isolated schools (data are based on pre- and post-test student scores). Isolated schools were rural schools that were classified as difficult to reach because of the challenging terrain. As a result of their location, students in these schools tended to be even more isolated than those in rural schools, resulting in poorer access to technology, quality teachers, and the routine supportive functions that were provided by the central education offices to each school (these supportive measures could reasonably reach the urban and rural schools). These data present a unique opportunity to unpack the potential for IRI to reach the most isolated learners. These results are presented in Figure 24 below.

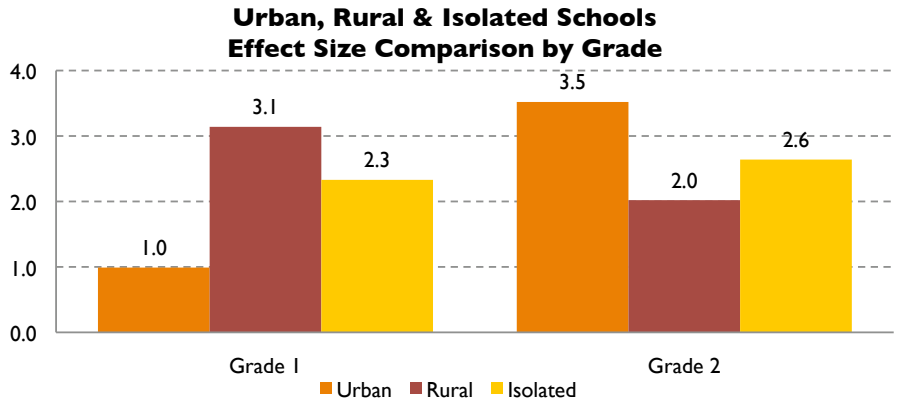


Figure 24. Pakistan - Urban, Rural and Isolated Schools Effect Size Comparison by Grade

The results for student achievement scores in isolated IRI classrooms are impressive in an absolute sense (in both grades, isolated learners' post-test effect sizes are significant and large) as well as in a relative sense (in both grades, isolated learners show learning gains that are between their rural and urban peers). To interpret these effect sizes, the data suggest that an average rural student in a grade 1 IRI classroom would place above the 100th percentile of his non-IRI rural peers, while an average urban student in a grade 1 IRI classroom would place at the 84th percentile. To compare, an isolated learner in a grade 1 IRI classroom would also place above the 100th percentile of his non-IRI peers.

In grade 2, the rural students place at the 98th percentile of their non-IRI peers while, in contrast to grade 1, urban students fare better than rural students, placing at the 100th percentile, or higher, of their non-IRI urban peers. Isolated learners fall between urban and rural learners by comparison of effect sizes, and place above the 100th percentile of their non-IRI peers.

With such large effect sizes for students in all three of the categories, the impact of IRI in this particular project is clearly astounding. For the most isolated learners, however, what is notable is that they, too, have performed comparatively well in English language learning.

C: Students in Fragile States

Of particular interest to the researchers is the potential IRI may have to address student learning needs in fragile states.[22] Of the experience EDC has had implementing IRI in such difficult areas, data from two countries – Sudan and Somalia – are presented here. While the quantity of available data is clearly limited,

[22] The OECD (2008) provides the following definition of a fragile state: "States are fragile when governments and state structures lack capacity and/or political will to deliver safety and security, good governance, and poverty reduction to their citizens. Establishing and maintaining a functioning and legitimate state is therefore central in fragile contexts." Regarding the overlap of fragile and conflict-affected countries, the World Bank (2008) provides the following distinction: "fragile states are not always conflict-affected and conflict-affected countries are not necessarily hampered by fragile institutions – but there are important commonalities, as many fragile states are affected by conflict and many conflict-affected countries are plagued by weak institutions and low capacity."

the results are nonetheless encouraging. As shown in Figure 25 below, those students who participated in IRI classes had a distinct advantage over their non-IRI peers, and this advantage was consistent across subjects. The greatest advantage that these IRI students had was in English (effect size 0.8 in Sudan) followed by mathematics (effect size 0.6 in Sudan) and local language literacy (average effect size of 0.6 across both Somalia and Sudan).

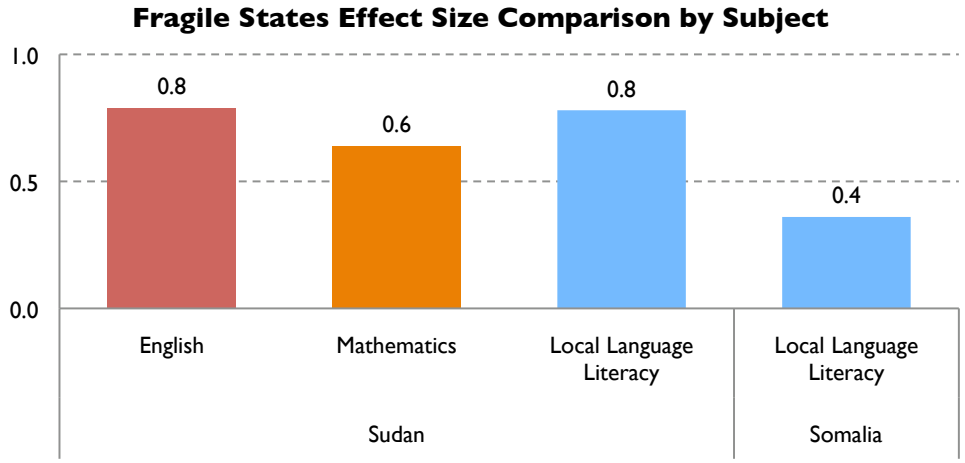


Figure 25. Fragile States Effect Size Comparison by Subject

These data present medium to large effect sizes for students in Sudan and Somalia. To put this in perspective, Sudanese and Somali students participating in IRI classes are benefitting from a 16-29% advantage over their peers in non-IRI classrooms.[23] In light of the multitude of factors that children in these conditions are faced with (including hunger, poverty, lack of access to health care, water, and proper sanitation), it is quite probable that the impact that IRI can have on their learning is understated in these data. As these conditions improve, the opportunity to attend school and to do so regularly increases, and thus, the likelihood that children will hear IRI and demonstrate higher learning gains (as seen in these data), also improves. While the available data are extremely encouraging, additional data is needed to make more broad conclusions regarding the impact of IRI on student achievement in fragile states.

D: Orphans and Vulnerable Children (OVCs)

The impact of IRI on a fourth marginalized population, Orphans and Vulnerable Children, is also of interest to the researchers. UNICEF (2008) defines Orphans and Vulnerable Children (OVCs) as those children who have been separated from their parents due to a variety of reasons, and as a result, suffer from poorer overall well-being and development. As with learners in fragile states, the magnitude of the difficulties that these

[23] An effect size of 0.4 translates as follows: the mean of the IRI group is at the 66th percentile of the non-IRI group. An effect size of 0.8 translates as follows: the mean of the IRI group is at the 79th percentile of the non-IRI group. The range of advantage for the IRI students, over and above the 50th percentile ranking of the non-IRI group, is therefore between 16 and 29 percentage points.

potential learners face is astounding. In many cases, the loss of (or separation from) a parent can mean the simultaneous loss of income, a home, a supportive network, and the basic necessities of food and clothing. Under such overwhelming pressures, the state in which students arrive to school (if they arrive at all) and the demands placed on the education system to meet their needs vary significantly. Needless to say, there is a direct relationship between the number of OVCs in a given education system and the demand on the system to provide more services to children. In Zambia, for example, the number of OVCs continues to rise everyday, and as a result, the education system is further taxed to provide basic needs to these underserved children, over and above the provision for education.

While an increase in OVCs means a greater need for education plus supportive services, the demand for quality instruction also increases. It is for these precise reasons that EDC has seen a rise in the demand for IRI where the number of marginalized groups of children, such as OVCs, is increasing. Similar to the results discussed above in fragile states, EDC's experience with OVCs is limited, and the amount of data available from these experiences is even more sparse; data is only available for a single project, Zambia.[24]

The World Food Programme (2004) reports that 30-40% of orphans in Zambia are out of school. As previously discussed, IRI has been implemented in Zambia since 2000 and has served both in-school and out-of-school orphans. Orphans (children who have lost one or both parents) have largely been exposed to IRI either during their attendance in community schools or IRI centers. Community schools are those schools established and maintained by local communities and offering IRI programming in addition to other instruction, while IRI centers offer solely Interactive Radio Instruction. (In some cases, IRI centers founded by the project were later titled community schools after meeting pre-designated criteria.) For the purposes of this report, results from community schools and IRI centers are used as a proxy for results for OVCs. This is consistent with project data evidencing larger percentages of orphans attending IRI centers and community schools in comparison to the population enrolled in formal primary schools. As such, a comparison of the post-test results from students in formal schools and those in community schools and IRI centers may provide some indication of the impact of IRI on OVCs.

Using data from 2006 for grade 2 students, Figure 26 below shows the impact of IRI for students in both groups in four subject areas. While the impact of IRI in local language literacy and English in this particular grade and year is not very encouraging (see previous sections of this report for a complete treatment of this topic and results), there appears to be a small advantage for IRI students in community schools and IRI centers in mathematics and lifeskills, over their non-IRI peers. In mathematics, the advantage enjoyed by IRI students in community schools and IRI centers, however, is small when compared to the advantage IRI students in the formal schools enjoyed (respective to their non-IRI peers in the same setting). An effect size of

[24] This report relies on existing data sets, among which only data from Zambia were coded to differentiate between OVCs and other student groups. This is not to assume that other EDC projects do or do not address similar populations, whether successfully or otherwise.

0.1 in mathematics for students in non-formal IRI schools (community schools and IRI centers, combined) indicates that a student in this group would place in the 54th percentile of a non-IRI group in a community school. A student in a formal school using IRI, however, would place in the 76th percentile of his non-IRI peers. Conversely, in lifeskills instruction, IRI students in community schools and IRI centers demonstrate a mean that is at the 54th percentile of non-IRI students in community schools. To compare, IRI students in formal schools do not have an advantage over their non-IRI peers (effect size of 0).

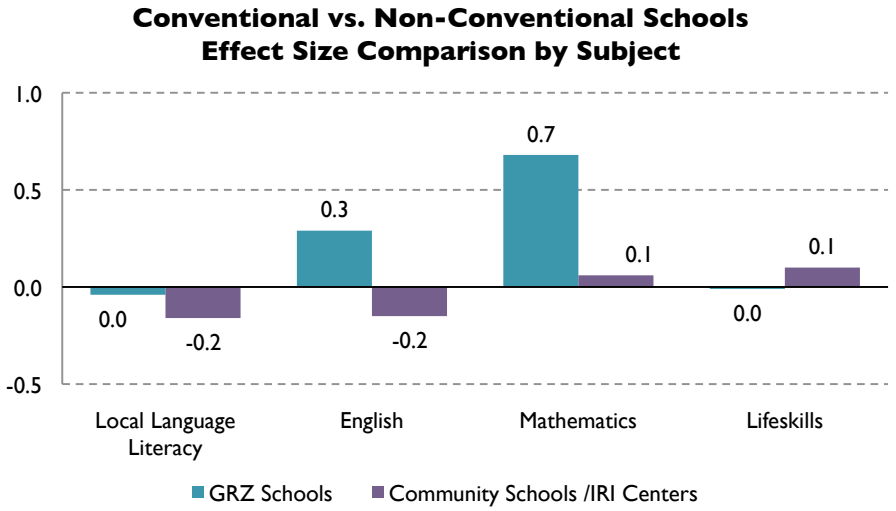


Figure 26. Zambia - Conventional and Non-Conventional Schools Effect Size Comparison by Subject

When comparing the effect sizes for students in formal schools to those for students in community schools and IRI centers, there are distinct differences between these two populations that must be kept in mind. For example, students in community schools and IRI centers differ significantly from their peers in formal schools – economically, socially, and in terms of the resources available to them in school. As such, a direct comparison and conclusion cannot be made from the data available regarding the differential impact of IRI on the two populations. Instead, the data available provide some initial indication of the potential impact of IRI on OVCs. While more data is required for more conclusive evidence, additional variables, such as the quality of teacher training in formal schools versus that in community schools and IRI centers, would also be necessary.

E: Conclusion – Learning Outcomes for Marginalized Populations

In analyzing the impact of IRI on marginalized populations, four such groups of student populations were selected. A significant limitation of the data was the unavailability of student attendance information. Since IRI is primarily a classroom-based intervention and because student learning outcomes were assessed on those students who attended formal or project-supported classrooms, the frequency with which children actually come to school sets the stage for any impact IRI could have on their learning. Among marginalized populations, attendance is an even more tenuous variable. Recognizing this limitation as well as the limits on the quantity of data available, the data from EDC's recent projects were interpreted in light of findings from previous research.

First, the data available suggest that the impact of IRI on narrowing the gender-based achievement gap is not as significant in recent experience as was seen in previous results. However, EDC has also seen a shift in the contexts where IRI is implemented: the range of subjects and grades covered has expanded in recent years, as have the numbers of children served, particularly in remote areas. In general, the data analyzed by subject suggests that when boys perform well, so do girls (and vice versa). When looking at the achievement gap between boys and girls by subject, the data show that girls lag behind boys in English, albeit by a slight margin. In mathematics and local language literacy, the data do not lend themselves to generalizations.

Second, when looking at the relationship between IRI and the urban-rural achievement gap, the findings were more complex. Since the definition of urban and rural blends together and is particularly gray when comparing across countries, analyzing the differential impact on urban and rural students can be problematic. Since this report depended on the categorization provided by the project and made available in the data and reports, the findings must be interpreted with caution. Using the information available, the data show that IRI bridges the urban-rural achievement gap in English based on data from grades 1 and 2, while results in mathematics and local language literacy were less conclusive. Compared to early IRI experiences that demonstrate a clear rural advantage in learning gains, the findings from recent IRI experiences are more modest. Several possible reasons for this narrowing are cited, ranging from a recent shift in the demands placed on IRI programs to serve a larger and more diverse student population, to the limited number of projects that even reported this variable as a part of the student learning data. The Pakistan project provided data that allowed the researchers to look specifically at isolated learners, compared to urban and rural learners. From these data, results suggest that IRI can be as successful for isolated learners as it is for urban and rural students.

Also of interest was the impact of IRI on the achievement of students in fragile states. Of the available data, the present analysis is limited to Somalia and Sudan. The data from these two countries suggests large effects of IRI on student learning outcomes in mathematics, English and local language literacy. However, with data from only two projects, it is not possible to make generalizations about these findings.

The fourth and final marginalized population studied is Orphans and Vulnerable Children (OVCs). While there is no apparent advantage for OVCs in local language literacy, English, mathematics and lifeskills as compared to students in formal schooling systems, the limitations of the data must be kept in mind as well as the formidable challenges that are faced by the children themselves and the education system that tries to serve them. First, assumptions about the data were made that data from community schools and IRI centers served as a proxy for OVC learning outcomes as they generally serve larger-than-average OVC populations. Similarly, it was assumed that data from the formal schools represented non-OVC learning outcomes because non-OVCs comprise the majority student population in formal schools. As such, a comparison of the effect sizes for formal schools to those for community schools and IRI centers combined, is based on the best available proxies.

It goes without saying that even before marginalized children can step into a classroom, they must first contend with basic needs for survival. If they do attend, they are often subject to high truancy and attrition rates. Student learning data used to establish the impact that IRI can have on such populations – including OVCs, learners in fragile states, rural children, and girls - must be understood in the sometimes dire educational contexts in which IRI is being used. Across all the data presented in this section, it is all the more important to note that without adequate information on student attendance, quality of teacher training and consistency of teacher attendance, it is nearly impossible to draw definitive conclusions regarding the marginal[25] impact of IRI on student learning.

[25] The marginal effect of IRI on student learning is the portion of the total effect that can be attributed to the IRI programs, alone. This portion can be statistically determined after controlling for variables such as student attendance, quality of teacher training, teacher attendance, broadcast quality, etc. However, since data on these control variables were not available for any of the data sets that formed the basis of this report, the researchers are unable to partition the effect. Regardless, it is expected that these variables play a significant role since they are essential intermediaries between IRI exposure and student learning. Recommendations for collecting such data are made in this report.

IV: Summary and Overall Conclusions

In this report, the researchers set out to review recent EDC experiences with Interactive Radio Instruction and its impact on student learning outcomes. Based on previous analyses, our hypothesis was that learning outcomes for students would improve when learners were exposed to IRI. Analyses were conducted on existing data sets by comparing effect sizes. Overall, 15 EDC projects provided 37 effect size records and data were examined through several lenses: by subject, by country, and by marginalized population. The researchers found this supposition to be tenable, albeit in some specific grade levels and specific subjects more so than in others. As discussed in the preceding sections, at times the lack of sufficient data prohibited the researchers from reaching broad conclusions regarding the impact of IRI on student learning outcomes. This was the case for some subjects, for upper primary grades, and for some marginalized populations. At other times, the data provides a collage of convincing evidence. This was seen in the analysis for early grades and in English and mathematics, and for some of the marginalized populations for whom the data was analyzed.

The researchers were continually reminded of the varying nature of EDC's IRI model from country to country, which includes a significant local capacity-building effort. By design, IRI programming can vary both within and between contexts as it responds to the local needs and range of locally available resources. This characteristic of IRI development at EDC renders it all the more difficult to make sweeping conclusions in a composite report. Nonetheless, several notable points have emerged and are summarized here:

1. **By grade**, the largest effect sizes (on average, across subjects) were observed in grades 1 and 2, with more varied effect sizes in grade 4. Interestingly, more information is also available for the earlier grades, and less so as grade levels increase.
2. **By subject**, the largest effect sizes were observed in English, followed by local language literacy, mathematics, and finally social studies. Also of note, the greatest amount of information (i.e., records) was available for English and the least for social studies.
3. When unpacking the data by **grade and subject**, general patterns suggest that IRI has a strong impact on student learning outcomes in grade 1 across three subjects: math, local language literacy and English. Somewhat weaker, but still clearly positive, effect sizes for grades 2 and 3 are also consistent in these three subject areas, and for grade 3 the pattern includes social studies. Findings by subject fluctuate more in the higher primary grades, although this may be due to the availability of fewer records. Grade 4 student achievement in local language literacy, English, and social studies appears to benefit from exposure to IRI; however, results vary by country and are less stable with respect to math and science.
4. In **early childhood education**, while effect sizes are not available for pre-primary IRI programs, assessment results based on skill development reveal real and consistent benefits for early learners. Benefits to pre-primary IRI children have been seen in conventional classrooms as well

as in IRI centers headed by project-trained volunteer educators. Successes in pre-primary IRI have been evidenced in both urban and rural settings.

5. For purposes of **in-service teacher training**, IRI has proven to be an effective tool through which to deliver professional development content. While student learning outcomes are not available for review, classroom observation results evidence marked improvements in both teachers' familiarity with student-centered and active learning methodologies as well as their actual use and mastery of radio-emphasized techniques.
6. **By country**, the data suggest that IRI had a positive impact on student learning outcomes in each country, though the magnitude of the effect varied greatly. Furthermore, when looking at data within each country, the researchers found the results by subject and grade to vary. For example, in Haiti, exposure to IRI was more beneficial to students in local language literacy than in mathematics. In Zambia, however, IRI has had the greatest impact on student learning in local language literacy as well as mathematics, but less so in social studies.
7. **By gender**, the data suggest that IRI does play a role in narrowing the achievement gap, albeit this role is stronger in earlier grades and also for English. Less impressive, but still positive, impacts of IRI appear in mathematics and local language literacy.
8. **By location (urban and rural)**, the data suggest that where urban students demonstrate gains, so do their rural peers, and vice versa. However, there does not appear to be any noticeable narrowing of performance gaps, except in the early grades and in English.
9. **In fragile states**, the data from two countries, Sudan and Somalia, suggest that exposure to IRI has had a noteworthy impact on student learning outcomes.
10. **For Orphans and Vulnerable Children**, the use of proxies for measuring the impact of IRI exposure on learning is a formidable limitation in this analysis, and the findings can be considered, at best, suggestive. By comparing data from conventional schools (with lower-than-average OVC populations) and data from community schools and IRI centers combined (where a higher-than-average OVC population is recorded), it appears that students in community schools and IRI centers still lag behind their peers in formal schools. With the available data, however, it is impossible to extract the impact of exposure to IRI from the impact of each of the two different schooling models.

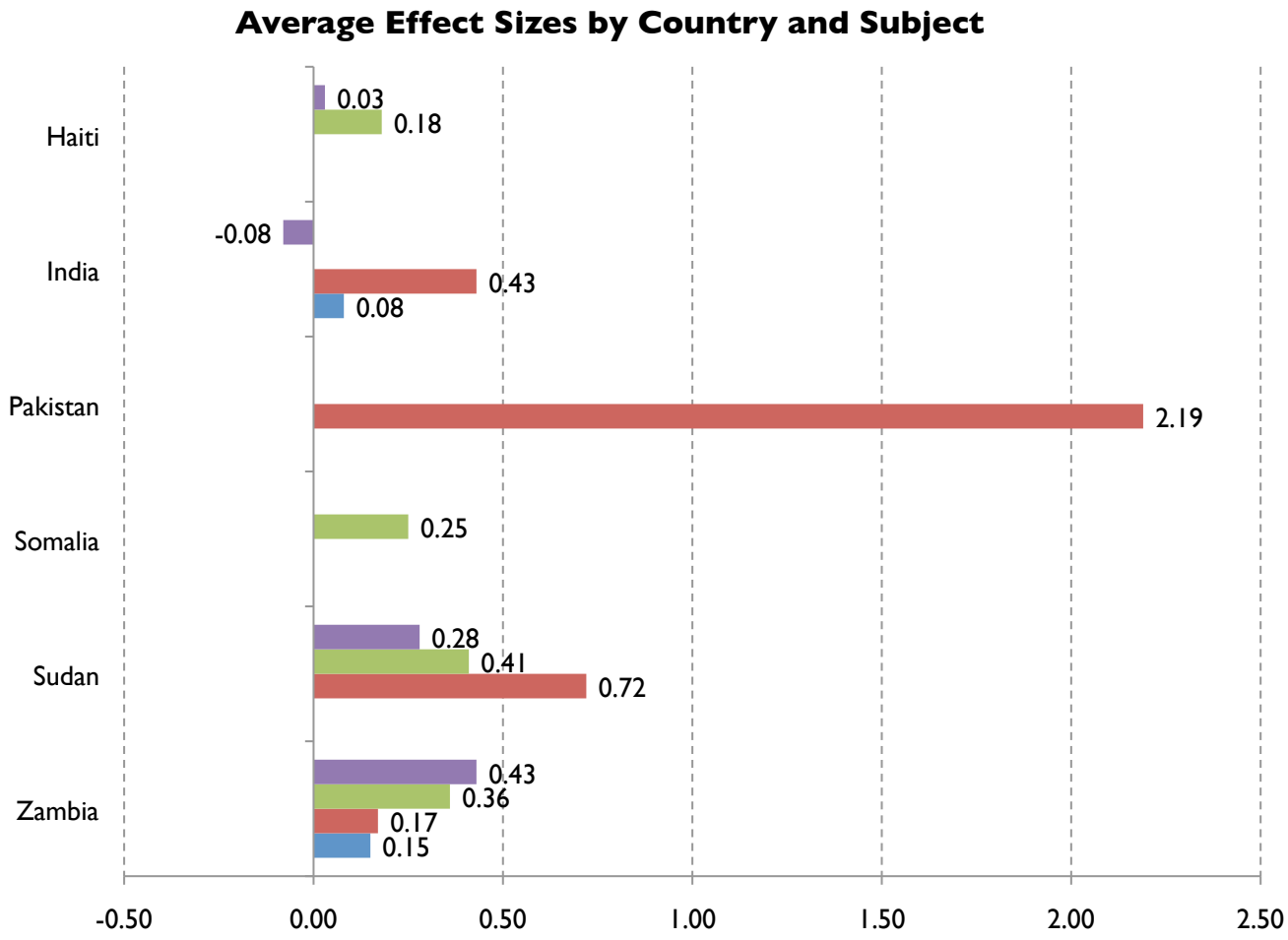
It is clear that IRI has met success in a variety of contexts and in combinations of subjects and grade levels. Figure 27 below is an attempt to create an overall picture of IRI results across these many variables. Here, effect sizes have been averaged across grade level and year to obtain a composite metric for each subject assessed. Results have not been further collapsed, as inter-country IRI models (as earlier discussed) are not considered sufficiently comparable.

Overall, positive summary effect sizes are observed in a large majority of the cases presented here. Though effect sizes may, in some places, appear to be modest, they do evidence tangible benefits in student learning with exposure to IRI. This is especially true given that most of these findings suggest that IRI learners do have an advantage over their non-IRI peers over the course of only one academic year.

A closer look at overall results reveals the largest absolute, average effect size was observed in Pakistan over two years of implementation of an English IRI series for students in grades 1 and 2. The researchers believe that the substantial learning outcomes for IRI students may be partly attributable to the extensive monitoring effort that was conducted by the project ensuring the correct implementation of IRI programming. Elsewhere, effect sizes of 0.25 and greater show that learners benefited from a minimum 10 percentage point "boost" in rank with participation in IRI. This was achieved in all countries shown in Figure 27, except in Haiti, and was true across mathematics, local language literacy, and English instruction.

It is recognized that the effect sizes presented in this study are smaller in comparison to those cited in earlier IRI literature. While explanations for such differences are left to speculation, one of these may be that local resources and expertise available to both develop and evaluate high-quality IRI programming may be more limited in more recent projects, especially as EDC has expanded its work into progressively more complicated learning environments. Another possibility, rather than being implemented only in specific project contexts, several recent IRI projects have been applied at national scales, posing a significant challenge for assessments attempting to capture impacts in student learning within whole countries and finite project timelines.

From the present library of data, it is clear that in addition to exposure to IRI, country-specific circumstances, quality of project implementation, and the extent to which students actually do listen to programs, factor heavily into the impact that IRI can have on student learning. A review of learning outcomes in and of themselves brings to light some of the successful, and not-so-successful, IRI experiences EDC has most recently observed.



	Zambia	Sudan	Somalia	Pakistan	India	Haiti
Mathematics	0.43	0.28			-0.08	0.03
Local Language	0.36	0.41	0.25			0.18
English	0.17	0.72		2.19	0.43	
Social Studies	0.15				0.08	

Figure 27. Summary Table - Average Effect Sizes by Country and Subject

Annex 1: IRI Programs Implemented Worldwide
(Source: World Bank, EDC)

COUNTRY	PRINCIPAL FUNDER	YEAR BEGUN	PROJECT TITLE
Bangladesh	BRAC/Aga Khan F.	1994	English, Math (no information)
Bolivia	USAID/Bolivia	1987	Radio math
Bolivia	USAID/Bolivia	1992	Radio Health
Bolivia	USAID/Bolivia	1994	Early Childhood Development I: AJARI
Bolivia	USAID/PVO	1995	Early Childhood Development II: AJARI Bolivia
Bolivia	USAID/Bolivia	1997	Maternal Child Care
Cape Verde (PALOP countries)	USAID/UNESCO; UNDP/ Dutch Govt.	1992	Radio math (pilot testing in Mozambique, Angola, Guinea Bissau, Sao Tome e Principe, and Cape Verde)
Costa Rica	World Bank	1988	Radio Math and Radio Spanish
Costa Rica	USAID	1989	Mental Arithmetic: The Numbers Family
Costa Rica	USAID/Costa Rica	1991	Environmental Education
Costa Rica	World Bank	1997	English in Action
Dominican Republic	USAID	1981	Radio Assisted community Basic Education (RADECO)
Dominican Republic	USAID	1988	Radio Math and Spanish
Dominican Republic	USAID/DR COEDUCA	1993	Mental Arithmetic
Dominican Republic	World Bank	1993	Teacher Training
Dominican Republic	MOEs	1997	English in Action (each country developing its own version from common master plan)

COUNTRY	PRINCIPAL FUNDER	YEAR BEGUN	PROJECT TITLE
Ecuador	USAID/Ecuador	1988	Radio Math Pilot
Ecuador	ABEL/Plan Int'l	1997	Early Childhood Education
El Salvador	USAID/El Salvador IADB	1992	Mental Arithmetic (adaptation of Honduras series)
El Salvador	USAID/El Salvador IADB	1996	Radio Spanish program to begin in 1998
El Salvador	USAID/El Salvador	2003	Educación Inicial a Través de la Familia (EDIFAM)
Guatemala	USAID/Guatemala	1990	Radio Math and Radio Spanish
Guinea	USAID/Guinea	2005	Guinea LINKS
Guyana	IADB	2003	Basic Education Access and Management Support (BEAMS) Programme: Innovative Technologies;
Haiti	ABEL/USAID/Haiti	1995	IRI Civics, Creole, Math
Haiti	USAID/Haiti	2002	Distance Education Inside and Beyond the Classroom
Haiti	USAID/Haiti	2008	Programme Haïtien d'Appui à la Réforme de L'Éducation(PHARE)
Honduras	USAID/Honduras	1987	Mental Arithmetic: The Numbers Family
Honduras	USAID/Honduras	1992	Adult Basic Education
Honduras	USAID/Honduras	1995	Educatodos 1-6
Honduras	USAID/Honduras	1999	Juego y Aprendo
India	USAID/India	2002	Technology Tools for Teaching and Training (dot-Edu T4) Project (Phase I and II)

COUNTRY	PRINCIPAL FUNDER	YEAR BEGUN	PROJECT TITLE
Indonesia Govt.	ADB	1993	Civics, Math, Teacher Training (no information)
Kenya	USAID	1980	Radio Language Arts (English)
Lesotho	USAID/Lesotho	1987	Let's Learn English
Madagascar	USAID/ATEC Madagascar	2006	Support Technologies for Educators and Parents (STEP)
Malawi	USAID/Malawi	2007	Malawi Interactive Radio Instruction – Tikwere!
Mali	USAID/Mali	2004	Mali Teacher Training via Radio (TTvR)
Nepal	UNICEF	1996	Early Childhood Education
Nepal	USAID/Nepal	1997	Rural Health Worker Training
Nicaragua	USAID	1974	Radio Math
Nigeria	USAID/Nigeria	2001	Nigeria LEAP
Nigeria	USAID/Nigeria	2004	Community Participation for Action in the Social Sector (COMPASS)
Pakistan	USAID/Pakistan	1992	English in Action
Pakistan	Asian Dev. Bank	1999	Radio math program
Pakistan	USAID/Pakistan	2002	Education Sector Reform Assistance (ESRA) Program
Papua New Guinea	USAID/PNG	1986	IRI Science Education
Somalia	USAID/Somalia	2001	Interactive Radio Instruction for Somalis (IRIS)
Somalia	USAID/REDSO	2005	dot-Edu Somalia Interactive Radio Instruction Project (SIRIP)
South Africa	USAID/SA OLSET	1992	English in Action

COUNTRY	PRINCIPAL FUNDER	YEAR BEGUN	PROJECT TITLE
South Africa	USAID/SA	1995	Early Childhood Education
Sudan	USAID/Southern Sudan	2004	Southern Sudan Interactive Radio Instruction (sSIRI)
Sudan	USAID/Southern Sudan	2006	HEAR Sudan
Tanzania	USAID/Tanzania	2006	Radio Instruction to Strengthen Education (RISE)
Tanzania	USAID/Tanzania	2002	Timebound Program to Eliminate Child Labor in Tanzania
Thailand	Thai Government	1980	Radio Math
Venezuela	Mendoza Found.	1991	Radio Math
Venezuela	CENAMEC/WorldBank	1991	Radio Math
Zambia	USAID/Zambia	2004	Quality Education Services Through Technology (QUESTT)
Zambia	USAID/Zambia	2003	Zambia Community Radio Education to Mitigate Multi-Sector Impacts of HIV/AIDS

**Note*: For completeness, all IRI programs known to EDC are listed in the table above. However, not all of these programs are aimed towards student learning gains, had summative evaluation data, or reported such data. As such, those programs were not analyzed for this report.

Annex 2: Effect Sizes Based on Student Post-Test Scores

Country	*Grade Level*	*Year of Assessment*	*English*	*Mathematics*	*Local Language*	*Science*	*Social Studies*
Haiti	Gr 2	2003		-0.08	0.04		
	Gr 2	2004		-0.08	0.26		
	Gr 3	2003		-0.06	0.17		
	Gr 3	2004		0.18	0.18		
	Gr 4	2003		-0.16	0.19		
	Gr 4	2004		0.40	0.21		
India	Gr 1&2	2005	0.30				
	Gr 1&2	2006	0.56				
	Gr 4&5	2007					0.08
Pakistan	Gr 1	2005	2.10				
	Gr 1	2006	2.28				
	Gr 2	2006	2.18				
Somalia	Gr 1	2005			0.25		
Sudan	Gr 1	2007	0.72	0.28	0.41		
Zambia	Gr 1	2005					
	Gr 1	2007		0.54	0.76		
	Gr 2	2006	0.29	0.68	-0.04		
	Gr 3	2006	0.32	0.46		-0.01	0.20
	Gr 4	2003	0.16	0.54			
	Gr 4	2007	-0.08	0.06		-0.07	0.09

Annex 3: Effect Sizes Based on Student Post-Test Scores (By Gender)

Country	*Grade Level*	*Year of Assessment*	*English*		*Mathematics*		*Local Language*		*Science*		*Social Studies*	
			M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
Haiti	Gr 2	2003			-0.26	0.11	0.26	-0.21				
	Gr 2	2004			0.00	-0.09	0.20	0.38				
	Gr 3	2003			-0.17	0.40	0.12	0.22				
	Gr 3	2004			0.33	0.03	0.28	0.06				
	Gr 4	2003			-0.28	-0.04	0.19	0.18				
	Gr 4	2004			0.29	0.61	0.14	0.29				
India	Gr 1&2	2005	0.19	0.44								
	Gr 1&2	2006	0.43	0.74								
Pakistan	Gr 1	2005	3.03	2.06								
	Gr 1	2006	3.04	1.53								
	Gr 2	2006	2.12	2.40								
Somalia	Gr 1	2005					0.26	0.39				
Sudan	Gr 1	2007	0.81	0.61	0.52	0.03	0.76	0.14				
Zambia	Gr 1	2005			-0.18	-0.21	-0.02	-0.07				
	Gr 1	2007			0.57	0.51	0.70	0.84				
	Gr 2	2006	0.61	0.33	0.22	-0.10	0.04	-0.11				
	Gr 3	2006	0.35	0.30	0.45	0.47			0.00	-0.02	0.21	0.18
	Gr 4	2007	-0.01	-0.16	0.20	-0.10			-0.04	-0.08	0.10	0.11

Annex 4: Effect Sizes Based on Student Post-Test Scores (By Location)

Country	Grade Level	Year of Assessment	English		Mathematics		Local Language		Science		Social Studies	
			Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Haiti	Gr 2	2003			-0.62	0.03	-0.53	0.30				
	Gr 2	2004			-0.08	-0.05	0.00	0.59				
	Gr 3	2003			0.10	-0.28	0.49	0.06				
	Gr 3	2004			0.01	0.30	-0.02	0.40				
	Gr 4	2003			0.14	-0.68	0.65	-0.08				
	Gr 4	2004			0.06	0.65	-0.09	0.44				
Somalia	Gr 1	2005					0.25					
Zambia	Gr 2	2006	-0.51	0.18	0.14	0.07	-0.36	-0.21				
	Gr 3	2006	-0.09	0.55	0.55	0.37			0.16	-0.13	0.09	0.36
	Gr 4	2007	2.11	-0.14	0.35	0.02			-2.05	-0.11	0.74	-0.01

Annex 5: Effect Sizes Based on Student Pre-Post Test Gain Scores

Country	Grade Level	Year of Assessment	English	Mathematics	Local Language	Science
Haiti	Gr 2	2003		-0.03	0.14	
	Gr 2	2004		0.02	0.13	
	Gr 3	2003		0.07	-0.04	
	Gr 3	2004		0.23	-0.15	
	Gr 4	2003		0.1	0.19	
	Gr 4	2004		0.14	0.01	
India	Gr 1&2	2005	0.36			
	Gr 1&2	2006				
Nicaragua*	Gr 1	1978		0.58		
Pakistan	Gr 1	2005	3.05			
	Gr 1	2006	1.84			
	Gr 2	2006				
Papua New Guinea*	Gr 4	1990				0.37
Somalia	Gr 1	2005			0.36	
South Africa*	Gr 2	1995	0.76			
Sudan	Gr 1	2007	0.79	0.64	0.78	

*Effect Size calculation based on findings from earlier review of research. (*Ref.* Bosch, Andrea. *Interactive Radio Instruction: Twenty-Three Years of Improving Education Quality.* Education and Technology Notes, Vol. 1, No. 1, World Bank, Washington DC, 1997.)

Annex 6: Effect Sizes Based on Student Pre-Post Test Gain Scores (By Gender)

Country	Grade Level	Year of Assessment	English		Mathematics		Local Language		Science	
			M	F	M	F	M	F	M	F
Haiti	Gr 2	2003	0.80		-0.13	0.09	0.07	0.24		
	Gr 2	2004			0.05	-0.01	0.08	0.21		
	Gr 3	2003			0.05	0.15	-0.08	0.00		
	Gr 3	2004			0.16	0.39	-0.08	0.08		
	Gr 4	2003			0.10	0.10	0.26	0.12		
	Gr 4	2004			-0.04	0.36	-0.14	0.11		
India	Gr 1 & 2	2005			0.25	0.50				
Pakistan	Gr 1	2005	0.05	0.12						
Papua New Guinea*	Gr 1	2006	2.20	1.88						
	Gr 4	1990							0.27	0.46
Somalia	Gr 1	2005					0.35	0.51		
South Africa*	Gr 2	1995	0.72							
Sudan	Gr 1	2007	0.99	0.66	1.00	0.37	1.21	0.54		

*Effect Size calculation based on findings from earlier review of research. (*Ref.* Bosch, Andrea. *Interactive Radio Instruction: Twenty-Three Years of Improving Education Quality.* Education and Technology Notes, Vol. 1, No. 1, World Bank, Washington DC, 1997.)

Annex 7: Effect Sizes Based on Student Pre-Post Test Gain scores (By Location)

Country	Grade Level	Year of Assessment	English			Mathematics		Local Language	
			Urban	Rural	Isolated	Urban	Rural	Urban	Rural
Haiti	Gr 2	2003				0.11	-0.29	0.16	0.15
	Gr 2	2004				0.50	-0.30	0.34	0.10
	Gr 3	2003				0.43	-0.26	0.39	-0.34
	Gr 3	2004				0.16	0.45	0.09	0.09
	Gr 4	2003				0.13	-0.26	0.48	-0.02
	Gr 4	2004				-0.01	0.28	-0.26	0.16
India	Gr 1 & 2	2005	0.30	1.35					
Pakistan	Gr 1	2006	0.99	3.14	2.33				
	Gr 2	2006	3.52	2.02					
Somalia	Gr 1	2005						0.34	

References

Anzalone, S. *Using Instructional Hardware for Primary Eudcation in Developing Countries: A Review of the Literature.* Institute for International Research, Prepared for Harvard University Project - BRIDGES. Washington DC: USAID, 1987.

Bosch, Andrea. *Interactive Radio Instruction: Twenty-Three Years of Improving Education Quality.* Education and Technology Notes, Vol. 1, No. 1, World Bank, Washington DC, 1997.

Bosch, Andrea & Crespo, Cecilia. *Jugando en el Pidi: Active Learning, Early Child Development and Interactive Radio Instruction – Supporting Caregivers, Parents and Young Children.* LearnTech Case Study Series, No. 4. Washington DC, 1995.

Cohen, J. *Statistical power analysis for the behavioral sciences (2nd ed.)*. Hillsdale, NJ: Erlbaum, 1988.

Dirir, Mohammed. *Somalia IRI Report.* Education Development Center, Inc., 2005.

Early Childhood and Family Education Activity (EDIFAM). *Proyecto IRI en El Salvador: Una Propuesta Aplicada a la Educacion Inicial y Parvularia,* 2005.

Education Development Center, Inc. *Southern Sudan Interactive Radio Instruction (SSIRI) – Grade 1 Evaluation,* 2008.

Education Development Center, Inc. *Etude D'Evaluation du Programme de Formation Interactive Des Enseignants Par la Radio (FIER)*, 2008.

Evans, Norma & Pier, Daniel. *Interactive Radio Usage and Its Impact on Grades 1 and 2 Teachers and Students – Midterm Study of the Appui Technique aux Educateurs et Communautes (ATEC) Program, Madagascar*. Education Development Center, Inc., 2008.

Glaser, R. "Instructional technology and the measurement of learning outcomes." *American Psychologist*, 1963. Issue 18, P 510-522.

Hartenberger, L. & Bosch, A. "Making Interactive Radio Instruction Even Better for Girls: the Data, the Scripts and the Potential." ABEL 2, USAID Award # HNE-5832-C-00-4075-00, 1996.

Ho, Jennifer & Mitchell, Jonathan. *Impact, Results and Progress: DBE 2 Monitoring and Evaluation Report FY2008*. Education Development Center, Inc., 2008.

Leigh, Stuart. *Changing Times in South Africa: Remodeling Interactive Learning*. LearnTech Case Study Series #8, USAID, Washington DC, 1995.

Letshabo, Kathleen. *Learning at Taonga Market – Evaluation of Interactive Radio Instruction. Grades 1, 2, and 3.* Education Development Center, Inc., Multiple reports 2000 - 2007.

Letshabo, Kathleen. *Somali Interactive Radio Instruction Program (SIRP) –Grade 1 Evaluation 2006/2007*. Education Development Center, Inc., 2007.

OECD. *State Building in Fragile States*. (accessed August 2008). http://www.oecd.org/document/53/0,3343,en_2649_33693550_38692341_1_1_1_1,00.html 2008.

Rothstein, Richard. *Class and Schools*. Economic Policy Institute, 2004.

Royer, James. *EDA/Edikasyon a Distans pou Ayiti Project – Final Report*. Education Development Center, Inc., 2003

Royer, James. *Literacy Enhancement Assistance Program Student Assessment Report.* Education Development Center, Inc., 2003.

Royer, James. *EDA/Edikasyon a Distans pou Ayiti Project – Final Report for the 2003-2004 Project*. Education Development Center, Inc., 2004.

Royer, James. *Dot-EDU India State-wise Student Assessment Reports. Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh.* Education Development Center, Inc., Multiple reports 2004-2007.

Royer, James. *Pakistan Education Sector Reform Assessment Program – IRI Student Assessment Report.* Education Development Center, Inc., Multiple reports 2004-2006.

Sanchez, Yvette & Evans, Judith. *Dot-EDU Honduras Interactive Radio Instruction for Kindergarten Pilot – Summative Evaluation.* Education Development Center, Inc. 2005.

Snow, C., Burns, S., & Griffin, P. *Preventing Reading Difficulties in Young Children.* National Academy Press, Washington, DC, 1998.

Tilson, T., Jamison, D.T., Fryer, M., Godoy-Kain, P., Imhoof, M. *The cost Effectiveness of Interactive Radio Instruction for Improving Primary School Instruction in Honduras, Bolivia and Lesotho*. Paper presented at the CIES Annual Conference in Pittsburgh, Pennsylvania, on March 15, 1991.

UNESCO. *Primary Education: Access and Equity – Girls*. Website, accessed September 3, 2008. *http://portal.unesco.org/education/en/ev.php-URL_ID=30870&URL_DO=DO_TOPIC&URL_SECTION=201.html*

World Bank.*Fragile and Conflict Affected Countries*. (accessed August 2008) http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/STRATEGIES/EXTLICUS/0,,menuPK:511784~pagePK:64171540~piPK:64171528~theSitePK:511778,00.html 2008.

Zambia Education Broadcasting Services. *Interactive Radio Instruction Evaluation Report, Grade 1*. Education Development Center, Inc., 2001.

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