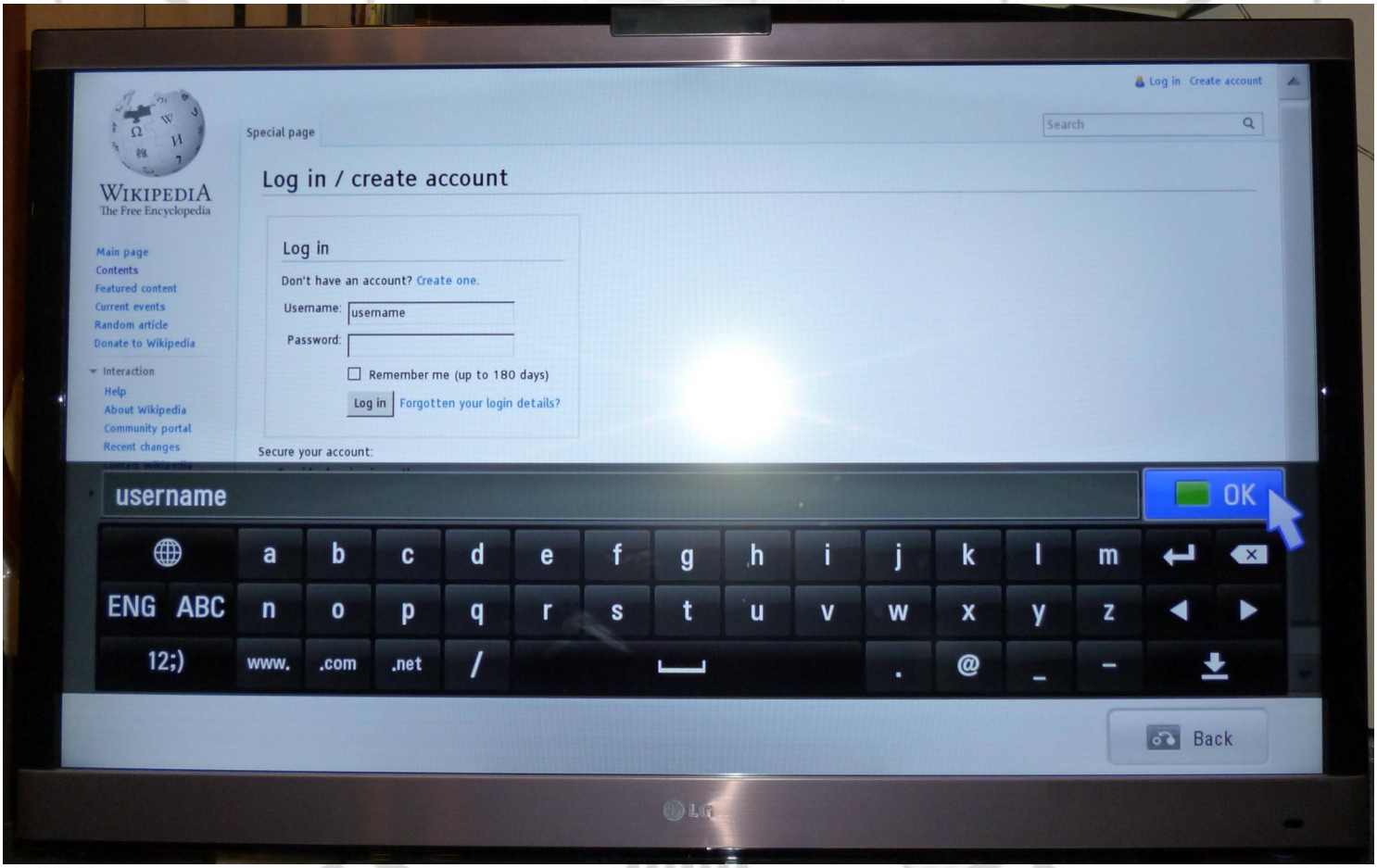
The Media Streaming Journal

June 2023



Covering Audio and Video Internet Broadcasting

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Welcome to The Media Streaming Journal

Welcome to the latest edition of The Media Streaming Journal.

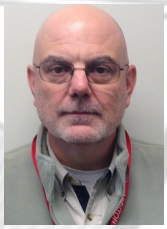
This month's edition covers Interactive Audio Instruction. This content delivery method has proven effective in several settings; and can be used for educational or vocational material such as skills development or professional development.

Please feel free to contact either the Publication Director (Derek Bullard) or myself if you have any questions or comments regarding The Media Streaming Journal.

Namaste

David Childers

The Grand Master of Digital Disaster
(Editor In Chief)



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The Media Streaming Journal

What is in this edition of the Media Streaming Journal

Handbook for Interactive Audio Instruction

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Handbook for Interactive Audio Instruction
Published in 2021 by the United Nations Educational, Scientific and Cultural Organization

Interactive Audio Instruction (IAI) has a long and distinguished history in the field of education. It was initially created to teach subjects at primary level, but has evolved over the years to respond to a number of educational needs. This method of delivery has proven effective in formal, non-formal and informal settings, including at home with parental guidance in times of school closure. IAI has been used to train adults, youth, preteens, early years learners, and preschoolers. Sometimes the content is academic, but it can also be vocational in nature and address skills for youth employment or the professional development of teachers and health care practitioners.

Regional Office
for Southern Africa

United Nations
Educational, Scientific and
Cultural Organization

Handbook for Interactive Audio Instruction

Planning and implementing radio lessons in sub-Saharan Africa

Education 2030

UNESCO Education Sector

Education is UNESCO's top priority because it is a basic human right and the foundation on which to build peace and drive sustainable development. UNESCO is the United Nations' specialized agency for education and the Education Sector provides global and regional leadership in education, strengthens national education systems and responds to contemporary global challenges through education with a special focus on gender equality and Africa.

The Global Education 2030 Agenda

UNESCO, as the United Nations' specialized agency for education, is entrusted to lead and coordinate the Education 2030 Agenda, which is part of a global movement to eradicate poverty through 17 Sustainable Development Goals by 2030. Education, essential to achieve all of these goals, has its own dedicated Goal 4, which aims to ***"ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."*** The Education 2030 Framework for Action provides guidance for the implementation of this ambitious goal and commitments.

United Nations Educational, Scientific and Cultural Organization

Education Sector

Education 2030

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Handbook for Interactive Audio Instruction

Planning and implementing radio lessons in sub-Saharan Africa

Table of content

Foreword

The COVID-19 pandemic has created the largest disruption of education systems in history, affecting nearly 1.6 billion learners in more than 190 countries across the globe. Closures of schools and other learning spaces have affected 94 per cent of the world's student population.

The majority of these learners, especially those in Sub-Saharan Africa, have no reliable connection to the Internet. To reach them during lock down situations, locally-adapted, technology-based solutions for alternative education that do not require high performing Internet connections should be sought. Many countries are looking into interactive audio instruction (IAI) as an option to ensure continued access to education, including for the most remote, isolated and at-risk learners.

Radio is the great equalizer. It can be highly effective in reaching marginalized populations and addressing people about their local concerns in their own languages. Radio can be used to support distance learning and retention in hard to reach and rural communities through live tutoring. The advantage of live-tutoring lessons via community radio is that they can be designed in accordance with the specific national curriculum and the needs of the targeted community and reach remote populations with no connection to the Internet. Such lessons can be designed in an interactive manner whereby students use their mobile phones to text questions to a moderating teacher.

IAI lessons are critical in guaranteeing the sustainability of education during crises such as COVID-19 which lead to school closures and interrupt education. In the period following the crisis, the programmes can be adjusted to serve as a complement, rather than an alternative, to classroom teaching. In addition to supporting core curriculum subjects, IAI programs work particularly well when they focus on life skills, for instance related to health, safety and sexuality.

For these reasons, policy-makers are increasingly looking at IAI as a promising avenue for ensuring the continuity of learning, thus prompting the development of this handbook.

This handbook is designed for education policy-makers, curriculum developers, and those charged with the professional training of teachers and facilitators. It is also written for members of the education development community interested in learning about IAI's myriad uses as a solution to the challenges they face in programme design and delivery.

Hubert Gijzen
UNESCO Regional Director
Regional Office for Southern Africa

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1. Introduction

Interactive Audio Instruction (IAI) has a long and distinguished history in the field of education. It was initially created to teach subjects at primary level, but has evolved over the years to respond to a number of educational needs. This method of delivery has proven effective in formal, non-formal and informal settings, including at home with parental guidance in times of school closure. IAI has been used to train adults, youth, pre-teens, early years learners, and pre-schoolers. Sometimes the content is academic, but it can also be vocational in nature and address skills for youth employment or the professional development of teachers and health care practitioners.

At its origin, IAI was known as 'IRI' because it was disseminated entirely by radio. As new media channels arose and distribution became possible via cassette tapes, CDs, MP3 files, and the internet, mobile phones, web streaming and podcasting, the new – and more accurate – name 'IAI' was coined. Although IAI and IRI are often used interchangeably, the term IRI is technically a subset of IAI. In any case, the medium is secondary to the methodology. What makes IAI is not the machine that plays it but rather the techniques employed by its designers to ensure the listener interacts with the programme content and maximizes their learning.

IAI has experienced a resurgence of interest as recent pandemics caused by Ebola and COVID-19 led to widespread school closure. In areas without easy and affordable access to the internet, radio remains the only cost-effective means of reaching large numbers of out-of-school children. Even where broadband is available, it is a challenge to find educational solutions that work for the youngest learners who struggle to sit still through a webinar-style class. For these reasons, policy-makers are increasingly looking at IAI as a promising avenue for ensuring the continuity of learning, thus prompting the development of this handbook.

Textbox 1: The origins of classic educational radio

Beginning in the 1920s, both private and public broadcasters around the world designed programmes specifically for primary, secondary, and tertiary education in order to leverage the oral and aural power of radio to complement the written curriculum (Haworth and Hopkins, 2009).

Students could listen to broadcasts either in traditional classroom settings or individually via "distance" education programmes. Where students had access to a radio transceiver—a device able to both transmit and receive information—they could interact with the programmes.

From the 1920s to the 1970s, a number of countries stand out as pioneers in implementing educational radio and defining many of its contours: Britain, India, Australia, and the United States.

This handbook is designed for education policy-makers, curriculum developers, and

those charged with the professional training of teachers who are interested in learning about the potential of IAI to act as a solution to the programme design and delivery challenges they may face.

This document is organized into eight chapters that review the history and uses of IAI as an educational resource, including its methodology, achieved results, and potential to support provision in emergency or crisis situations. Intended as a practical tool for policy-makers, the handbook discusses the cost of IAI and the elements that contribute to its sustainability. It examines how to assess whether IAI is suitable in a particular context, describing common challenges, conditions for production, and partnership opportunities, and offering a detailed checklist with which to evaluate IAI's potential for success in a given situation. The handbook also considers how to plan for the implementation of IAI.

A decision tree is presented to illustrate the available options, guide the programme planning and development timelines, and advise on the propitious development context in terms of partnerships for successful implementation. The four appendices include a video introduction to this report (appendix A), a summary of notable implementation examples with links to key documentation (appendix B), a complete catalogue worldwide programming (appendix C) and case studies outlining the programming created in the Southern African Development Community (appendix D).

Radio remains the only cost-effective means of reaching large numbers of out-of-school children in many parts of the world.

2. Background

History of educational radio

Radio enjoys the distinction of being the world's first mass communication technology. Twenty-five years after Guglielmo Marconi's first radio transmission in 1895, this new medium expanded in popularity around the world as listeners tuned in for the latest information and entertainment. It did not take long for educators to see the potential of radio broadcasts, with their popularity and reach. By the 1960s, they began creating the world's first educational technology to supplement text-based instruction in schools (Haworth and Hopkins, 2009).

History of IAI

In 1973, the United States Agency for International Development (USAID) funded the Institute for Mathematical Studies in the Social Sciences at Stanford University to initiate what would become the first formal example of 'Interactive Radio Instruction' (IRI), a project called Radio Mathematics implemented in Nicaragua. Children who were unable to complete their formal schooling because of their agricultural livelihood were gathered into informal learning groups in the afternoon and taught basic primary school mathematics using many of the techniques outlined below.

The results were startling, as researchers found that these children quickly matched and even exceeded the mathematics achievement of nearby formal school pupils, despite the fact that many of them were not fluent in Spanish, being the children of Haitian immigrants. Building on previous uses of educational radio and progressive pedagogies, 150 first-grade mathematics lessons were presented daily in Nicaragua by 1975.

These early programmes created many of the features that still define IAI: they were based on the national curriculum and they focused on the active participation of children, in particular 'active responding' (either through speaking aloud, written work, or physical action). They made use of deferred responses, repetition and reinforcement, mixed drills, concrete materials, and conversations between the students and the radio teacher.

Textbox 2: Broadcasting vs narrowcasting

Broadcasting: IRI is a broadcast technology. Broadcasting is the distribution of audio lessons to a dispersed audience of students across a region/country via radio transmitters. Anyone with a radio can then tune into programming.

Narrowcasting: With narrowcasting, lessons are played in single class at a time of the teacher's choosing via a cassette tape player, a CD-ROM player, or an MP3 player. Thus, with narrowcasting, lessons are transmitted to a localized or specialist audience.

This instructional approach began to be developed into increasingly refined productions. The lessons were collected and systematically tested until a set of rules was established and best practices were identified.

In 1980 IAI was first used in Africa and Asia by Kenya and Thailand respectively, and it also continued its spread across the Caribbean and Latin America. It has proved to be an inexpensive, portable, one-to-many technology that requires minimal training to use and is aligned with traditional oral means of imparting information. Since that first experiment in Nicaragua, IAI has consistently provided significant improvement in educational outcomes in country after country and has been successfully used as part of primary school instruction across the globe.

Today IAI is implemented in a wide variety of learning environments and languages in almost 40 countries, a list of which can be found in Appendix C. Many of these series have been digitized and are available for download from the Global Digital Library Radio website.

IAI and non-radio technology

IAI was initially called IRI because in its first iterations, it was broadcast exclusively on radio. But as radio does not always reach every location - and because radio requires synchronous participation and does not allow for rewinding and replaying content – cassettes, CDs and MP3 players have all been introduced as alternative distribution mediums. Where an asynchronous solution is needed and internet connectivity is available, IAI can also be distributed via podcast. None of these new delivery channels, however, have altered the pedagogical design of IAI itself. Its methodology has remained unchanged, even as the distribution mediums have significantly advanced.

IAI methodology has remained unchanged, even as the distribution mediums have significantly advanced.

Mobile screens also allow for creative new ways to evolve IAI, without removing the subtle advantages that a purely audio delivery can provide.

With the invention of the video iPod, quickly followed by the smartphone, tablet, and pico projector[1], learners were able to use new classes of portable devices that included screens. These screens suddenly enabled the sharing of instructional videos, which has many self-evident advantages. However, mobile screens also allowed for creative new ways to evolve IAI, without subtracting the subtle advantages that a purely audio delivery can provide (Richmond, 2020). Creative new applications of IAI have since sprung up, including Interactive Video Instruction, blended learning environments that mix IAI with other online and screen-based content, and the integration of IAI into learning apps that are installed on tablets and smartphones. These applications offer new channels for delivery, but they also facilitate new pedagogical approaches that make IAI suitable for a wider audience.

1 A pico projector is a handheld projector powered by a rechargeable battery. Using LED bulbs to reduce the power requirements of digital projectors, these small projectors were created to serve as projectors for compact personal devices such as mobile phones.

Educational systems under duress

Education is recognized as a human right, enshrined in the Universal Declaration of Human Rights, and protected by normative instruments and legal frameworks. This is a cornerstone principle of the Education 2030 Agenda and Sustainable Development Goal 4. Under normal circumstances, school systems around the world face challenges such as unequal access; undertrained teachers; and inadequate infrastructure, including teaching and learning materials (Lewin, 2017).

In emergency scenarios, the provision of quality inclusive and equitable education for all is hindered by even more daunting challenges. There are noteworthy efforts to simplify and streamline educational systems (see the Minimum Standards for Education by the International Network on Education in Emergencies), but as yet no one has an expedient solution.

This is unfortunate given that local and national shutdowns are increasingly common occurrences, as a result of events such as natural disasters, and civil wars. The COVID-19 pandemic and the earlier Ebola outbreak have caused international disruptions that have led to mass school closures. With no end in sight to either governmental or biological challenges we should be prepared for more closures driven by disease, climate instability, and political turmoil.

These startling events have highlighted the need for educational services that are designed to run at home, as noted in *The Economist* (2020). Situations where children cannot gather in large numbers call for a delivery mechanism that is accessible to the majority of the target population and does not require the continuous physical presence of the teacher. And finally, like the provision of lifeboats on a large ship, they must be ready for immediate deployment as sudden disasters leave no time for system design and material creation.

Whereas both boys and girls benefited from the IAI intervention, girls showed greater overall growth.

The level of achievement amongst rural students served by IAI has been as high as for urban students.

We have built educational systems to offer prototype solutions, and some obvious examples spring to mind but each has its own flaws. Paper-based solutions like correspondence systems exist, but they rely on a minimal level of literacy within the home, and they depend on infrastructure (like an efficient postal service) that may not be available to many of the world's most rural inhabitants. More high-tech solutions like online courses are not yet useable for many learners due to issues of access, cost and digital literacy (UNESCO, 2012).

Radio: The hidden solution

IAI is a prime contender to provide the backbone of such an emergency educational system. Radio is a free service to anyone who can afford a receiver, and radio receivers are among the cheapest technology in the world, running on very little (if any) external electricity. Radio is the single most accessible source of information in the world, and it does not require

any literacy skill to use (UNESCO, 2012). It runs on the power of spoken language — humans' method of sharing information since well before the beginning of recorded civilization — and is also perfectly suited to sharing music, which is an inspiring source of entertainment. Many policy makers turn to high-tech solutions like online learning, because of the often unfounded assumption that newer delivery systems are always superior. Due to its track record as the original technological support for education, radio has a much longer history of positive results, and IAI in particular has over three decades of documented effectiveness (Yasin, 2020).

The most obvious obstacle facing educational radio is its one-way nature: it speaks but does not hear, and invites the listener into a passive state. This is certainly true of 'classic' radio education[2] but IAI has found creative solutions to these challenges[3].

The one-way nature of the medium can be overcome when tasks are assigned to the listener, and response time is built into the broadcast so those tasks can be completed immediately. An older and more responsible partner for the listening learner provides a source of live encouragement and reinforcement for the completion of the tasks. And, because there are no visuals to a broadcast and listening can happen while one is working, students can be occupied with practising skills or even carrying out other responsibilities (such as chores) while they listen.

IAI during crises

Ideally the designers of a series[4] of IAI programmes know the conditions of the listeners so they can carefully tailor the expectations to their skill levels and access to learning materials.

When IAI is to be used in a formal school setting, it must be created with the capacities and resources of the average educator in mind. When IAI is to be used at home, it should be created with the basic abilities of the average parent, carer or guardian in mind and must only rely upon the educational materials commonly found in the listeners' homes and communities. This requires careful thought, planning, and focus group testing, which takes time.

The nature of emergencies often eliminates that time, which leaves two options: to prepare a series well in advance of any unforeseen emergency and keep it on standby, or to select an existing IAI series developed for another context and quickly repurpose it for use at home.

Obviously, the ideal solution is to have an IAI series custom made for the content, conditions, and culture of its beneficiaries. But when that is not possible, there is a lot of utility that can be harvested, adapted and repurposed from another series, even one produced for another country and in another language. Some resources to help in this regard include the IAI Repurposing Toolkit (EDC, 2020; Morris and Farrell, 2020).

2 Classic radio refers to the traditional format of one-way delivery, including variations such as news broadcasts, edutainment programming and podcasting. Even call-in shows, which allow some listeners to interact with the host, fall into the classic domain as the vast majority of the audience is only listening passively.

3 IAI refers to the modification of a classic radio broadcast whereby listeners are assigned simple tasks, and short pauses are built into the broadcast to allow them time to complete those tasks in conjunction with the broadcast. Tasks can range from verbally answering a question to following physical instructions from the radio teacher to play a game or practise a skill with fellow listeners.

4 An IAI series is a collection of episodes that interlink to build learners understanding of topics over time. The length of a series depends on the breadth of the content being taught – some series are as short as 20 episodes – though most school grades are covered in series that are about 100-150 episodes long.

3. Understanding IAI

Definition of IAI

IAI is a pedagogical approach that requires learners to engage with, and respond to, a recorded audio lesson. While classic audio instruction most often resembles a lecture during which learners listen and take notes, IAI resembles a child-centred classroom where learners answer questions, apply new ideas, work in pairs and groups, demonstrate knowledge at the chalkboard, play games, and sing or dance to songs. The production of good IAI uses the skills of master teachers (employed as scripters) to carefully plan content and scaffold ideas across episodes that are then brought to life by actors, musicians, and sound engineers.

IAI methodology has remained unchanged, even as the distribution mediums have significantly advanced.

Mobile screens also allow for creative new ways to evolve IAI, without removing the subtle advantages that a purely audio delivery can provide.

IAI activities are based on the assumption that learners will follow the recorded instructions and engage with the learning tasks. This is accomplished by building pauses into the programmes so that learners have time to respond and complete assigned tasks, and by training a live teacher, facilitator, or mentor,[5] depending on the learning context, to guide learners through the instructions.

IAI is both a methodology and a medium of distribution for content. It can be used to teach any subject matter to any age group and although it is most commonly used to teach social and emotional learning (SEL) and academic subjects to the youngest learners, it has also been successfully used to teach entrepreneurial skills to youth and to train teachers on the fundamentals of pedagogy and classroom management. IAI distributed by radio can have an enormous impact on learning at scale, with very low per-learner costs. IAI programmes loaded on a local device, like an MP3 player, and played at convenient times during a lesson, can reach areas without radio connectivity and give the local educator control over pacing.

The recorded content of IAI guarantees high-fidelity distribution of instruction at scale. The relative ease of producing audio recordings enables the inexpensive production of IAI in multiple languages, thus allowing for mother-tongue instruction as well as instruction in other official languages. These and other advantages outlined in this report make IAI a powerful tool for a wide range of school systems.

5 A teacher is usually defined as someone delivering instruction in a formal school who has had some training in how to teach. Many non-formal and informal learning environments use a facilitator or a mentor, sometimes on a volunteer basis, to guide learners though IAI programmes.

Three agents in the learning equation

IAI programming revolves around the interaction of three agents: the audio characters; the live students; and the teacher, facilitator, or mentor[6] such as an older peer. The interaction happens between combinations of these agents—between audio character and teacher, between audio character and student, and between student and teacher. At all times the live teacher and students are following directions and responding to information shared by each other, and by the audio player.

The characters in the audio programme are often referred to as the radio teacher and *radio children* for a lack of a better term. Each has a name and backstory, carefully designed to serve an instructional purpose (see the section below on creating a fictional world).

To avoid confusion amongst the different agents in the learning equation, this handbook uses the three terms *radio characters* (both radio teacher and radio children), *teacher*, and *learners*.

Research findings on IAI

IAI packages instruction into a familiar and accessible[7] medium

Radio is a familiar and engaging medium for most of the world's inhabitants. As noted above, it is the most commonly owned technology device across the globe—indeed, ownership rates in some African countries exceed 90 per cent, and 80 per cent of people in the developing world listen to the radio at least once a week (Winthrop and Smith, 2012).

The audio channel is a natural way for humans to learn, as witnessed by the power of oral language in all cultures.

Radio has three immediate advantages for education. First, it is highly accessible. The degree of ownership and reach of broadcasting mean that it has democratizing features: it can deliver instruction to both the privileged and underprivileged, in both rural and urban areas.

Secondly, the audio channel is a natural way for humans to learn, as witnessed by the power of oral language in all cultures. In most cultures, learning is conveyed through language via spoken tutoring, songs, and stories, and IAI capitalizes on this practice. Many countries, such as Cabo Verde, have used some or all of these components in

6 IAI can be used by all these figures, including parents, in a cross-section of environments ranging from formal systems to home-based education. As ***teacher, facilitator, or mentor*** is a long phrase, for the sake of simplicity, this handbook uses the term teacher in a stand-alone capacity in many places to capture the idea of any live person acting as a listening guide for the students.

7 While radio is the most easily-reached communication signal in the world, it remains inaccessible to the deaf. Services exist that can adapt radio programming for this population, (such as close-captioning services for HD radio, or content adaptation services to translate audio into sign language) but they vary widely region by region.

their distance education system. Similarly, programmes can be transmitted via broadcast over a traditional radio or narrowcast via mobile phones or MP3 players (see Textbox 2). Such versatility provides access to more diverse learning opportunities for students and teachers (Burns et al., 2019).

Radio is highly accessible…

…and imposes only very low entry barriers to learning.

Third, in contrast to other technologies like online learning, radio imposes only very low entry barriers. Listening to the radio is possible even while working on other things, enabling learning amongst students who might be outside doing other tasks. It imposes no literacy demands on learners; it is technically simple (most radios only have two dials); and the cost is low enough to be affordable for most schools. Furthermore, using the equipment requires little to no training and its low power consumption makes radios useable off-grid. Teachers and students can simply tune in and the learning begins (Burns, Montalvo, and Rhodes, 2010).

IAI provides more equitable access to learning

As noted earlier, education is plagued by learning gaps related to gender, geography, and socio-economic status, among others. IAI has been shown to be particularly effective at reducing such gaps. In terms of gender, a 2008 evaluation of Zanzibar's Radio Instruction to Strengthen Education (RISE) programme revealed substantial gains in the Kiswahili, mathematics, and English test scores of students participating in the programme. Whereas both boys and girls benefited from the IAI intervention, girls showed greater overall improvement (Education Development Center, 2015, p. iv).

Rural students generally have fewer resources and access to less well-trained teachers, and as a result, their achievement levels are lower than those of their urban counterparts. IAI appears to lessen these disparities. For instance, studies in Bolivia, Thailand and South Africa reveal that the level of achievement amongst rural students served by IAI has been as high or almost as high as for urban students (Anzalone and Bosch, 2005).

Educational radio programming is often the only technology able to provide educational opportunities in the most challenging conditions. For example, the Organisation of American States InterAmerican Teacher Network used radio in South America to reach teachers in the vast, remote regions of the four countries that encompass the Amazon region. These teachers could not participate in professional development otherwise (Inksater, 2017). Radio has been used to deliver education in post-conflict settings like South Sudan, Somalia, and the Democratic Republic of Congo, as well as during pandemics. In 2014–2015, when an Ebola outbreak in Liberia resulted in national school closures, the Education Development Center (EDC) used World Bank funding to design IAI programmes that were broadcast throughout the country so that students could continue learning.

During the coronavirus outbreak, many Latin American countries turned to radio to sustain education (Cobo, Hawkins, and Rovner, 2020).

Textbox 3: IAI and student achievement

After almost three decades of experience, the ability of IAI to improve the quality of education is established and well documented. Evaluations have yielded consistent and significant evidence that IAI can increase learning (Murphy et al., 2002). Changes in educational quality have been measured through controlled studies of learning gains, conducted by external evaluators, and through assessments of classroom activity in projects around the world. These studies have found increases in achievement across subject matter, ages and genders, and both rural and urban locations. Students in IAI classes, on average, outperform those in control groups with an effect size of 0.5 standard deviations (Anzalone and Bosch, 2005, p. 15; Leigh and Cash, 1999; Tilson et al., 1991).

IAI shows documented gains in student learning

Since the 1980s, studies of IAI in more than two dozen countries have shown that it has driven statistically significant and consistent improvements in student achievement and that increased exposure to IAI is associated with higher levels of student achievement (see Textbox 3). For instance, pre- and post-intervention studies of the EDC's IAI programmes in Guinea demonstrated improved academic performance for students in grades 2, 4, and 6. In Indonesia, in a two-year IAI programme with 6,071 kindergarten students, pre- and post-test comparisons between students learning with IAI (treatment group) and without it (control group) showed that the IAI group performed better on language, cognitive, and physical and psychomotor development (Ho and Thukral, 2009).

Other larger-scale studies also report a positive relationship between exposure to IAI and student achievement. South Africa's English in Action programme (1992–2009) focused on improving the English language skills of two million students (Open Learning Systems Education Trust, 2010). Evaluation of the data from the programme suggests a correlation between IAI access and learning gains—that is, the more English in Action programmes the students were exposed to, the higher their test scores were (Leigh, 1995).

Multi-subject and multi-country evaluations of IAI programmes employing control groups have shown similar results. Assessments of student performance in a variety of subjects (mathematics, science, English, and Spanish) in several countries (Thailand, Bolivia, Honduras, New Guinea, Nicaragua, and South Africa) show that students who received IAI instruction had better exam results than their control group peers. Effect sizes ranged from small (0.24) in Thailand to large (0.94) in Bolivia (Corrales, 1995; Leigh, 1995; Tilson et al., 1991).

Radio programming is often the only technology able to provide educational opportunities in the most challenging conditions.

More than two dozen countries have shown that IAI has driven statistically significant and consistent improvements.

More recent data corroborate this research. Ho and Thukral (2009) documented the positive outcomes of students in grades 1–4 who participated in IAI, using 2003–2007 data from a range of countries. For instance, in Zambia, IAI stimulated medium positive effect sizes (0.41) in mathematics amongst grade 1 students. Indeed, students from grades 1–4 who participated in this community-based IAI programme performed at much higher percentiles than those who did not participate. IAI literacy programmes in Zambia, Sudan, Somalia, and Haiti showed similar effect sizes (p. 19). Finally, English-language IAI in Zambia, Sudan, Pakistan, and India demonstrated positive results, particularly in grades 1 and 2 (with effect sizes of 1.70 and 1.24, respectively) (p. 21). The effect sizes the English in Pakistan programme are particularly impressive because the learning gains were on a very large scale, as over 40 million students participated.

In Mali, the ongoing USAID Selected Integrated Reading Activity (SIRA) project uses IAI to improve first and second graders' literacy in the local language of Bamanankan. The project has great reach, providing high-quality instruction to some 300,000 first and second graders across 4,000 schools and supporting the performance of some 7,500 teachers. At baseline, only 3 per cent of learners met Mali's national reading standard of 31 correct words per minute. At the midline evaluation, approximately two years after the intervention was implemented, 14 per cent of students could meet the standard (Education Development Center, 2018).

IAI provides job-imbedded professional development for teachers

Though IAI is traditionally seen as a delivery mechanism for student learning, it has also provided demonstrable benefits to *teachers*.

Essentially, each IAI programme is a small, structured, in-class professional development session. Teachers, like students, react verbally and physically to prompts, commands, questions, and exercises posed by radio characters.

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The power of IAI as a professional development tool is that programmes are highly scaffolded and provide live coaching and support to teachers in ways that other technology cannot.

The power of IAI as a professional development tool stems from the fact that programmes are highly scaffolded and provide live coaching and support to teachers

in ways that other technology tools cannot. The approach is repetitive; thus, over time, teachers are often able to internalize the teaching method cultivated by IAI (Gaible and Burns, 2007; Thukral, 2016). Research suggests strong linkages between this use of IAI and changes in teachers' instructional practices. Studies in the Democratic Republic of Congo and India, for example, have documented that changes in teaching practice are most influenced by how much teachers listen to IAI and participate in continuing professional development activities in which IAI plays a central role (Education Development Center, 2014; Ho and Thukral, 2009; Royer, 2006, cited in Thukral, 2016).

Further, unlike other modes of professional development, IAI compensates for novice teachers' lack of experience. In a traditional classroom, a teacher may learn how to use a science kit in a face-to-face workshop or online course and then muddle through as they use the kit with their learners. In contrast, because it is so directive, IAI can tell the teacher how to use the kit, including while they are actually with their students, in a way that mitigates degradation of instructional quality (Burns, 2011).

IAI has proven its impact on teaching quality

IAI serves as readily-deployable, school-based professional development, which has resulted in documented improvements in teaching quality.

Fidelity of implementation: Because IAI is dynamic and so highly scaffolded, teachers can implement active, intellectually engaging practices directly in class via the prompts of the radio instructor. What is so valuable about this is that, unlike with other forms of professional development, there is little to no latency (time between training and implementation) with IAI. There is also a higher degree of fidelity, which is the degree to which an intervention is delivered as intended (Burns, 2011). Taken together, these factors yield positive educational benefits for students.

For example, research suggests that when IAI is combined with ongoing professional development and support guides and teaching materials, teachers can implement new instructional approaches with a high degree of fidelity (Education Development Center, 2014; Thukral, 2016). As a case in point, a 2014 EDC study in the Democratic Republic of the Congo concluded that the new knowledge and skills developed by teachers as a result of IAI-based professional development was 'positively and significantly linked' to their adherence to the programme of reading activities (p. 8). Indeed, 14.3 per cent of teachers' overall knowledge of teaching reading was found to be predicted by how faithfully they applied the programme (p. 8).

IAI compensates for novice teachers' lack of experience while minimizing degradation in the quality of instruction.

When IAI programming is combined with ongoing professional development and support, teachers can successfully implement new instructional approaches with a high degree of fidelity.

The confidence engendered by implementing an approach with quality can result in teachers being more willing to implement innovative instructional techniques, both with and without actual IAI broadcasts. For example, in Madagascar's 2006–2007 project Appui Technique aux *Éducateurs* et Communautés (ATEC), the number of teachers using targeted active learning behaviours rose from 58 to 96 per cent (Evans and Pier, 2008).

Influence on teachers' content knowledge and instructional practices: Though student learning has been the primary focus of most evaluations of IAI, its impact on teachers' development has also been documented. Radio instruction has proved effective in imparting basic content knowledge to teachers as well as students — particularly when combined with printed materials and supported group study (Anzalone and Bosch, 2005; Burns, 2011; Perraton, 1993).

Several studies highlight IAI's positive impact on teachers' knowledge and instructional practices (Education Development Center, 2014; Evans and Pier, 2008; Ho and Thukral, 2009). For example, in Madagascar and Mali, in contrast to its typical use as an in-class instructional tool, IAI was employed exclusively as a professional development tool to build teachers' skills in student-centred methods (Thukral, 2016). Observational data indicated that in both countries, teachers had "a better understanding of pedagogical concepts emphasized by broadcasts . . . [and also] used active learning and student-centred techniques in lessons independent of radio guidance" (Ho and Thukral, 2009, p. 37).

Teachers report that IAI has increased their motivation, enabled them to overcome embarrassment at their lack of subject mastery, changed their approaches to teaching and learning, and made them more gender-sensitive in their classrooms.

Changes in teachers' attitudes and dispositions: Self-reported evidence of IAI's impact on teachers' attitudes shows that IAI has increased their motivation, enabled them to overcome embarrassment at their lack of subject mastery, changed their approaches to teaching and learning, and made them more gender-sensitive in their classrooms (Burns, 2006; Hartenberger and Bosch, 1996). Such findings dovetail with research that suggests shifts in teachers' beliefs and attitudes are contingent upon evidence of change in students' learning outcomes (Guskey, 2002).

Impediments to effective IAI

IAI is not an elixir and, like any technology, must be suited to its purpose. The effective functioning of audio-based instruction for teachers depends on the 'fit between available resources, the policy environment, specific educational needs and goals, and the advantages that IRI/IAI has to offer' (Anzalone and Bosch, 2005, p. 33).

Where the fit has been poor, IAI has suffered from problems in the following five areas:

Curriculum: At its core, IAI is a vehicle which conveys the national curriculum. But while IAI must remain true to the content of that curriculum, it has creative licence to improve on the methods many teachers still follow in their classes.

Designers must pay special attention to creating IAI activities that are highly learner-centred and interactive.

Otherwise, programmes may promote instruction that is highly teacher-centred and focused on rote learning.

Equipment: Radio's effectiveness can be adversely impacted by problems with equipment procurement and quality (especially of wind-up radios), damage and theft, transportation issues associated with radio delivery, and limitations of off-grid power sources.

Radio reception: The receptivity of FM signals can be unreliable because of terrain or distance, and the quality of short- and medium-wave signals can vary during the day and be interrupted during inclement weather, especially in mountainous areas. There is also the possibility of providing roaming radio stations to serve those areas that are not serviced by national or community stations. A roaming station can setup a broadcast centre in these areas for a week or so to conduct the lessons, and then move to another. It may also serve to temporarily replace an existing station that becomes non-operational, e.g. due to a breakdown. A further benefit would be that it could be deployed very quickly, in the event of a disaster or pandemic, to reach affected areas and disseminate critical information.

Reception issues can be addressed by narrowcasting lessons from CD or MP3 players or on mobile phones.

Mobile Radio stations can be quickly deployed to reach areas in radio shadow, replace broken equipment or provide hyper-local content especially in response to a localized emergency.

Programme scheduling: A frequent obstacle to adopting IAI is that the radio broadcasts must coincide with the school timetable. This can be mitigated by using narrowcasting, which provides more flexibility for teachers' planning and delivery.

Broadcasting costs: While radio has extremely low per-listener costs, airtime is rarely free so there are recurring costs for broadcasting content.

Methodology of IAI

Interactivity and modelling

The IAI approach is distinguishable from classic radio instruction in that it expects responses from and interactivity between the listeners. The interactivity happens between the student and the radio, the student and the teacher, and the student and their peers. This approach lends itself well to child-centred instruction. When a programme does not demand this high level of interactivity, it may be labelled 'classic educational radio' but it cannot be considered IAI.

When a programme does not demand this high level of interactivity it may be labelled 'classic educational radio' but it cannot be considered IAI.

An important aspect of the radio characters and their actions is that they perform the dual function of representing the learners' world and modelling ideal behaviour.

The teacher's role while using IAI is complex and operates on three different levels. At the most basic it is to ensure that the children are listening and following along. At an intermediate level the teacher is also encouraging and engaging with the learners and reinforcing the material.

At the highest level the teacher is elaborating on the content, relating it to the students' experiences, continuing the practice activities after the broadcast, taking advantage of opportunities to focus attention on individual learners, and generally integrating the radio lessons into the wider instructional day.

For example, in educational systems where girls frequently underperform boys in a subject such as mathematics, the IAI writers ensure that the female radio child is strong in mathematics and often helps the male character with his homework.[8] Gender sensitivity is also built into the directions provided to the teacher, who is carefully but quietly instructed to call on female pupils more frequently than male pupils. This enables the teacher to overcome any unconscious bias he or she may have, particularly in a mixed classroom setting.

The teacher's role while using IAI is complex and operates on three different levels. At the most basic it is to ensure children are

8 This type of strategic positive modelling is used to address other social issues as well, such as tribal and religious tension.

listening and complying. At an intermediate level the teacher is also encouraging and engaging with the learners and reinforcing the material. At the highest level the teacher is elaborating on the content, relating it to the students' experiences, continuing the practice activities after broadcast, taking advantage of opportunities to focus attention on individual learners, and generally integrating the radio lessons into the wider instructional day.

Creating a fictional world

IAI series should be set in a fictional world but be designed to represent the familiar surroundings of the average listener.

This fictional world is filled with characters including school pupils and members of the surrounding community. The radio teacher is the primary character who talks directly to the radio students as well as to the live, listening teacher and learners. Supporting characters serve the purpose of providing interesting experiences and storylines for the radio students when they are out of school, which give them opportunities to apply their learning. Two supporting character prototypes that are commonly used are the wise grandparent figure who can give advice, and the fun-loving, mischievous friend, often a talking folktale animal.

The stories are carefully crafted to operate from within the cultural context of the listening audience to create a familiar yet novel learning universe.

The storylines are strategically integrated into the lives of the fictional characters to maximize the impact of the learning content. They are designed to enable the students to return to concepts and reinforce skills in expanding revision cycles. Songs and games are also used wherever possible to crystallize the learning. These three things — music, play-based interaction, and storytelling— work to draw learners IAI and motivate their full engagement with the learning materials. Series use them to different effect depending on the context and the age of the target learners; play-based learning works well for the lower grades, while programmes for youth and adults feature age-appropriate storylines instead. Music is used to a greater or lesser extent depending on the cultural expectations of the listeners.

Episodes and programme structure

Each IAI episode is broken into segments, and each segment has a clear learning objective. The segments vary in their activity type, with each building on the complexity of the ideas presented in the last. An episode may have only a few segments, or as many as nine or ten, depending on the needs dictated by the content. Episodes continually advance the storylines, but they also feature opportunities to circle back and review content in cycles.

Each IAI segment has a clear learning objective.

The three features of music, play-based interaction, and storytelling work to draw learners into the IAI world and motivate their full engagement with the learning materials.

Series are structured to match the educational system of the host country. They may therefore be grouped into three terms with holidays between them, or organized according to semesters. The total number of episodes in a series also varies.

Some series are very short and are designed to be repeated for learners throughout the year—this approach works very well with early childhood development (ECD) learners who crave the familiarity of repeated programming. Other series are extended to introduce new content daily for several months, and some contain enough content to last for the entire school year.

Print material support

Most IAI series involve a combination of audio recordings and print materials. Normally the print materials are created for the teachers, although student materials are also created when the budget allows, and make for a richer learning experience.

Teachers' support materials normally take the form of a Teacher's Guide, which provides an outline of the content of each IAI episode and contains all the information a teacher needs to prepare for each lesson.

Student support materials may include things like story readers, workbooks, and simple lab equipment.

Teachers' support materials normally take the form of a Teacher's Guide, which provides an outline of the content of each IAI episode and contains all the information a teacher needs to prepare for each lesson. This might include a list of the learning objectives and major

activities featured in each episode, along with a list of materials to bring to the lesson, content to write out on the board, and lyrics to any songs that will be sung. The guide also often includes homework for the teacher to assign after the broadcast, and warm-up activities to lead students through before the broadcast.

Student support materials are similar to those found in a traditional classroom and vary considerably according to the content being taught. They may include things like story readers, workbooks, and simple lab equipment. While student materials tend to enhance the learning experience, the quantities required for some classes and their consumable nature means that they can substantially increase the cost of IAI.

A more sustainable solution is to expand the Teacher's Guide to include directions on teaching and learning using locally available resources, and to train the teacher to produce materials and explain assignments.

While this does increase the burden on the teaching staff, it dramatically reduces costs.

Building resiliency into systems

Formal education systems rely on a set of essential components, including students; teaching staff with a basic understanding of pedagogy; educational content and materials; school facilities; and systems for accreditation, assessment, and centralized administrative oversight (Lewin, 2017). Resilient systems are able to continue running even if they lose functionality in some of these key areas. But it is commonly understood that students, teachers, and educational materials are indispensable, and reducing a system further than this does not at first appear possible.

IAI has never been used to replace the teacher and could not succeed if that were the goal.

There is room to further simplify an educational system, however, if we examine exactly what roles a teacher plays in facilitating learning. The teacher has many roles, but they can be roughly organized into two sets—one set of simpler behaviours that require little training to master, such as providing feedback and encouragement, and a more advanced set that requires professional development, such as designing pedagogically appropriate learning activities. A highly functioning teacher has the full spectrum of skills, while very often an undertrained teacher is competent in the first set but needs more training time to master the advanced ones.

IAI has never been used to replace the teacher and could never succeed if that were the goal. In every scenario IAI needs an adult teacher to facilitate the learning, even if that teacher is not fully trained. However, the more skilled the teacher, the more impactful an IAI series will be.

It is obvious that the ideal educational system requires the most highly skilled teachers possible, but this takes considerable time and investment. It is much quicker to recruit a cohort of professionals with the simpler skill set, and then work to improve their skills through a professional development programme. This is the solution that has been used in many educational systems to address the challenge of equitable access for all learners. When education is provided free and to all, and a national system experiences a sudden surge in primary enrolment, it must match the demand for teachers by fast-tracking the recruitment and training of new staff.

For the under-skilled teacher, IAI provides the instructional skills support and live pedagogical modeling that helps her to build foundational skills and move into a more advanced skill set

IAI has proven to be a useful tool to support both new and experienced teachers. For the former, IAI provides the instructional skills support and live pedagogical modelling that helps the teacher build on his or her foundational skills and move into the more advanced skill set. And for fully skilled, experienced teachers, the same IAI programming relieves them of the bulk of the lesson-planning burden and the heavy lifting of direct instruction, freeing up time and energy to work on fine-tuning custom explanations for individual students, or providing remedial support at different levels.

For a fully skilled, experienced teacher, the same IAI programming relieves the bulk of the lesson-planning burden and the heavy lifting of the direct instruction, freeing up time and energy to work on fine-tuning custom explanations for individual students.

IAI materials can be designed in such a way that they also support people who have had no formal teacher training at all. This did not seem necessary to do at any large scale before the worldwide school closures, but the emergency caused by COVID-19 suddenly placed a great instructional burden on young learners' family members — their parents, older siblings, caregivers, and guardians — the only people who have physical access to the learners. IAI can help family members to become temporary facilitators of learning, providing an emergency expansion of the teaching resource pool. In the short term, this introduces resiliency into educational systems so that they can retain the three basic components of their system: students, teachers, and learning materials. IAI allows students to learn in any physical environment, so long as they have access to radio and guidance from an older helper. This may not be ideal, but in an emergency scenario it is a viable distance learning system for areas without home internet access (for online instruction) or an efficient postal delivery service (for paper-based correspondence courses).

IAI can be used in formal systems, non-formal/informal systems, and emergency environments.

IAI can help support family members to become temporary learning facilitators, which represents a large but impermanent emergency expansion of the teaching resource pool.

In the long term, post-COVID-19, the IAI materials can continue to provide utility, particularly as a set of support services for educational systems address core efficacy issues as they recruit, train, and hire new teachers. Any national body of formally trained teachers has a great cross-section of skills, and IAI can help to reinforce many capacities including lesson planning, classroom management, formative assessment, and organizing group and pair work. IAI models skills related to all of these areas.

IAI applied by teachers with different levels of experience

IAI can be used in all three types of educational environment: formal, non-formal/informal, and emergency environments where the other two systems struggle to function. The student beneficiaries remain the same in all environments, and the instructional methodology does too (with minor differences). It is likely that teachers with varying degrees of training and experience will be able to use the programmes competently.

IAI is useful to both a fully trained teacher and an untrained parent in the same way that a recipe book is useful to both a skilled chef and a person who is cooking for the first time.

IAI is simultaneously useful to a fully trained teacher and an untrained parent in the same way that a recipe book is useful to both a skilled chef and a young person who is cooking for the first time. Normally, a new cook must follow the recipe to the letter if they have any hope of creating a palatable meal. But a chef also consults recipes, even if she does not follow them in detail. The difference is that a chef may introduce changes to a recipe when she is inspired by a better idea or wants to suit specific tastes. Given the choice between eating the chef's and the novice's food prepared from the same recipe, no doubt everyone would prefer the chef's meal.

This analogy makes it clear that IAI programming is helpful to both fully trained teachers and complete novices – what varies is the way in which they use them. Recipe books cannot automatically make a novice into an expert chef.

Role of the trained teacher

A trained teacher generally knows how to manage the classroom and is able to monitor the students' attention, enactment of instructions from the radio, and interaction with the content and each another. He or she listens to their answers and provides

feedback, reinforcement, and elaboration on any confusing topics. The trained teacher also operates at a higher conceptual level, integrating the programme into wider instruction—synchronizing the content of his or her own lesson with that provided by the radio, and extending and adapting assignments given by the radio teacher.

The lower competency of the untrained teacher has less of an impact on student outcomes, however, because the learners are still receiving direct instruction from the radio and benefiting from its accurate content knowledge, carefully planned lessons, and interactive methodology.

Note that even as teachers operate at this highest conceptual level, their basic efficacy does not require them to possess any content knowledge, or provide any actual content instruction. Obviously, it is highly desirable if he or she can provide these things, and the IAI encourages that wherever possible. But the programmes are carefully designed to not depend upon it, as even well-trained teachers can make instructional mistakes.

Role of the untrained teacher

With IAI, an untrained teacher in a non-formal/informal learning environment carries out the same functions as a formally trained teacher, though perhaps at a less effective level. The lower competency of the untrained teacher has less of an impact on student outcomes, however, because the learners are still receiving direct instruction from the radio and benefiting from its accurate content knowledge, carefully planned lessons, and interactive methodology.

A teacher with only very basic skills may choose to simply act as a type of enforcement officer, directing learners to comply with the radio teacher's instructions. But research shows that after about 50–60 programme episodes, an undertrained teacher will grow in confidence and begin to mimic the instructional skills demonstrated by the radio teacher, providing more feedback, encouragement, and elaboration for students (Thukral, 2016).

Role of guardians

A guardian, e.g. a parent, caretaker, or older sibling, is also likely to have minimal teaching skills but his or her role will be to monitor compliance with, and later embellish, the directions provided by the radio teacher.

A major difference is that while even an untrained teacher has a group of students and a classroom, a guardian may only have a single learner at home. If the IAI programme has been specifically designed for the home environment, there will be no elaborate expectations of this guardian; but if it is a series designed for classroom use that has been repurposed for home use, this guardian will have to be creative and adaptive.

A guardian must set up the learning space to mimic a classroom, and also classmates with whom the learner can participate in group activities. This may involve other family members being invited to role-play, or the guardian themselves switching between the role of teacher and peer.

IAI uses outside the classroom

There is a wide selection of examples of the use of IAI outside a formal schooling system, including in scenarios of non-formal learning and in-service training, and for health education and youth employment.

Non-formal learning scenarios:

In Tanzania, the Mambo Elimu IAI programme targeted out-of-school learners who were working as child labourers. It was held in community-based learning centres, staffed by local volunteers, and accelerated learners' acquisition of primary content in mathematics, Kiswahili, English, and life skills. The project began in 2002 and ran in its initial form for 5 years, though adapted program continues to run in both Tanzania and Zanzibar today.

In-service training scenarios:

In Malawi, the Tikwere IAI programme (2007–2012) provided professional development services to both teachers and trainees. To accommodate formal teachers, the IAI was played in the evenings and during school holidays. Teachers gathered in listening circles at their schools to learn new skills, and then reflect together on their application in the classroom. Meanwhile practicum teachers also participated in an Open Distance Learning programme facilitated by IAI broadcasts. Cohorts of trainee teachers would gather weekly in school-based groups at the end of the day and listen as the IAI led them through reviews of their course work and practical discussions on the application of instructional skills. In Colombia, IAI provided training in the Escuela Nueva methodology to local listening groups which formed around small collections of teachers who were unable to travel to training sites due to insecurity in the Pacific region.

Health programming:

In Zambia, the Common Elements Training Approach curriculum gives mental health training to community-based lay counsellors. This was delivered through IAI and imbedded into an android tablet-based training app. Participants used IAI to learn how to address such mental health issues as depression, trauma, substance use, and suicide prevention.

Youth programming:

In Rwanda, youth were taught how to advance toward their employment goals through a work readiness curriculum delivered via IAI, using an online streaming service accessed through their phone's data connection. Professional attitudes and behaviours were taught using a combination of Rwandan characters with youth-centred storylines and practical assignments to complete as homework.

4. Assessment of potential for successful IAI

Common educational challenges IAI can address

IAI has been used in over 30 countries to surmount a wide selection of educational obstacles. This section gives a brief overview of how IAI has been exploited in a variety of countries to tackle different issues.

Building teacher skills

Modelling of best instructional practices in Sudan and Honduras:

IAI can supplement content knowledge and model best practices for teachers to emulate, as shown by the South Sudan IAI series Learning Village and Radio-Based Education for All RABEA. Teachers with multi-grade classrooms are often able to use IAI lessons to provide continuous support to one grade even when simultaneously supporting another, as is evident in a video from rural Honduras (Education Development Center, 2018).

Supporting the rollout of a new curriculum

Delivery of new content and instructional approaches in Malawi:

IAI can demonstrate the application of new content and approaches to teachers who are not familiar with the expectations of the curriculum, as shown by the Malawi IAI series *Tikwere*.

Supporting community schools

Critical instructional support for untrained teachers in Zambia:

IAI provides instructional support to a school, which is the most complicated component in an educational ecosystem. When rural communities do not have access to a government school, they often take the initiative to build and staff their own schools. While they may have the resources to construct premises and organize some administrative oversight and informal teachers, they are usually unable to procure high-quality instruction on their own. IAI can provide that service for them, for free. An example of this is Zambia's IAI series *Learning at Taonga Market*.

Temporarily replacing schools

Empowering parents to teach at home in Liberia:

IAI can equip a parent or older sibling to role-play as a teacher inside the home, allowing students to continue with daily instruction even when schools have been forced to close. IAI works in low-resource environments and can be used by unskilled teachers, so when Ebola forced the closure of schools in Liberia, the instruction continued uninterrupted because the students shifted to learning at home using the family radio with the help of older siblings to access the IAI series *Advancing Youth Programme* (AYP).

Targeting underserved populations

Reaching out-of-school students in Tanzania:

IAI can reach pupils who are not enrolled in school at all, and informal groups can gather in basic shelters like churches or under trees. These programmes, such as Tanzania's IAI series *Mambo Elimu*, can provide critical education services to child labourers without disrupting their work and can even accelerate them through material so that they can catch up to their peers, allowing them to transition into formal schools if desired.

Addressing sensitive subject matter

Comprehensive sexuality education:

Teachers sometimes struggle to keep up with quickly changing information (e.g. about COVID-19) and may be uncomfortable relaying what they know about subjects that have traditionally been considered adult topics (e.g. sexuality). This can have catastrophic effects when students need accurate health information. **IAI can provide to all listeners accurate information that has been curated by content experts.** It can also broach difficult topics, relieving a parent or teacher of the need to use direct vocabulary or provide detailed descriptions.

Vaccinations and early marriage in Somalia:

Parents are generally supportive of basic education programming for reading and mathematics but might be wary of advice on health or other life skills when the source of the information is unknown. **With IAI, sensitive health topics such as vaccinations and early marriage can be addressed indirectly and imbedded into drama segments of the storyline in reading and mathematics programmes.**

Disabilities:

Many IAI programmes feature characters who happen to have disabilities. These characters often convey the normality of their daily lives, directly address challenges faced by disabled people, and model positive behaviour for their peers.

Curriculum fidelity

Delivering complex or overlooked content:

When IAI is designed to deliver a national curriculum, which it normally is, it often does a better job of this than a live classroom teacher can do alone. This is because the curriculum is often broad; extensive planning is needed to ensure it is fully taught end to end. Also, teachers themselves often have favourite topics that they dedicate more time to, or topics that they are unsure of, that they under-teach. **A well-written IAI series requires an intensive content planning process that carefully portions out time across the year to ensure it covers the full breadth of topics, including those that are often overlooked or make teachers uncomfortable.**

The shortcomings of IAI — the inability of the series designers to hear real-time feedback from learners and adjust instruction accordingly — must be offset by the careful planning and testing of every recorded lesson. This also requires the IAI writers to maximize opportunities for reinforcement between subjects, ensuring for example that the

language lesson incorporates content from the mathematics lesson.

This intense planning process involves instructional designers mapping out the entire year's learning objectives and carefully structuring them to build over time, reinforcing one another as they go.

A welcome effect of this process is that the entire curriculum is covered, and the time dedicated to each concept is carefully weighed against the importance of that topic according to the curriculum. In regular classrooms these decisions are made by teachers who often fail to plan lessons well in advance, and may dwell on pet topics at the expense of content that is less familiar or interesting to them.

Instructional time

Utilizing pre-and post-broadcast time:

An IAI recording is normally limited to only 30 minutes.

IAI designers make every effort to engage learners with the material both before and after the broadcast to offset the short programme length.

This often involves providing a written guide for parents and teachers featuring warm-up activities that will set the stage for the lesson. It also requires explaining and initiating practical activities that students must complete after the broadcast. Not only does this maximize the time spent on each concept, but the segmentation allows each pupil to engage with the topic in short bursts, three times on a given day. This is an efficient use of time and improves retention and recall because the learners are returning to a topic repeatedly.

Gender and other biases

Addressing stereotypes through positive character modelling:

IAI writers have full control of the characteristics and behaviour of the radio characters. They also guide the actions of the teacher as he or she interacts with the learners.

IAI writers carefully structure the characters' interactions to model ideal responses and encourage and reward gender-sensitive speech and actions.

They also create storylines that teach important life lessons alongside academic content, most of which are reinforced by the wise grandparent character who has the cultural authority to demonstrate moral leadership. Most IAI series for primary learners portray equal achievements between male and female characters in order to eliminate negative stereotypes.

A quality media product that is developed locally and speaks to children in their mother tongue fosters trust, pride and reassurance for populations under duress.

Conflict, crisis, and fragility

Flexible solutions and authentic voice representation:

IAI programming boils an educational system down to its three most basic parts: student, teachers, and the pedagogically appropriate delivery of content. The use of radio also guarantees access and removes many of the stumbling blocks and bottlenecks that beset formal education systems in emergencies. For example, during COVID-19, schools closed because people were not permitted to assemble in large groups; however, with IAI, students could continue learning alone at home. This ironically means that access to educational programming may increase as a result of the shutdown of schools. Suddenly those children who were out of school prior to shutdowns may now have access to education on the radio. IAI also provides an uninterrupted service to nomadic or internally displaced people, or populations who face food insecurity and cannot afford to staff a school. This continuity of service is very important for the students' educational outcomes and mental health. A familiar routine like attending school can be very reassuring to children during times of upheaval. And a regular, quality media product that is developed locally and speaks to children in their mother tongue fosters trust, pride and reassurance for populations under duress. In countries such as Mali, the Democratic Republic of the Congo, Haiti and Somalia, IAI has provided continuity in education despite violent unrest or even war. [9]

Conditions for production and usage

Enabling policy environment

IAI as an educational strategy can be supported through the cultivation of an enabling policy environment. Such an environment should be geared toward selecting ICT solutions that are based on evidence of impact and feasibility in context, rather than novelty. Another step toward creating this environment is integrating IAI into national education policies and frameworks.

First, an IAI strategy should be integrated into a nation's overall educational policy framework and strategies.

As part of their overall education policy, many nations have articulated distance education plans. IAI might already be a part of some distance education plans, and where it is not, it can be integrated. The stated purpose of IAI should be well defined and clear in the plan, specifying its goals, intended beneficiaries (both formal and informal), expected outcomes, and possibly the grades and subjects it will be used for.

9 At the height of conflict in Mogadishu, Somalia, a young girl named Najmo was able to continue to learn via IAI when the unrest prevented her from attending school (Education Development Center, 2006).

Likewise, governments seeking to use IAI, especially if they do not have a well-developed distance education plan, should integrate IAI into curriculum and training policies at the national level, given that IAI involves curricular content and requires capacity building for teachers. Integration into national education policy supports the sustainability of IAI initiatives and signals the government's commitment to using IAI.

Second, integrating IAI strategies into national education policies is critical because the use of distance strategies in general requires some level of political support if they are to be sustained. If IAI is integrated into policy, then government policy-makers and Ministry of Education decision makers are more likely to ensure that sufficient resources are allocated for the programmes' design, development, dissemination, updating, and sustainability, including recurrent costs. This can also help to ensure high-level leadership and cooperation across Ministries to bring IAI programmes to fruition (e.g. the Ministry of Finance and Ministry of Telecommunications, including National Broadcast authorities, as well as the Ministry of Education). This is pointed out in the World Bank's *Improving Educational Quality through Interactive Radio Instruction: A Toolkit for Policymakers and Planners* (Anzalone and Bosch, 2005, p. 21), which quotes Alan Dock:

> The diverse components of radio education must be well integrated into the administrative, budgetary, and professional structures of educational and broadcasting institutions. Changes in these structures (for example as a result of decentralisation of education systems) may jeopardise the continuity of the programme.

Third and finally, the inclusion of IAI in national education policy can also catalyse Ministry of Education leadership and dedicated management. These are critical to ensure that the many tasks involved all happen in an integrated fashion, with objectives as well as timelines aligned, including creating and disseminating the programmes, distributing the accompanying print materials, procuring radios/MP3 players, training teachers and school leadership, and enlisting community and parental support for IAI.

Policies to support access

Particular policies within a national framework can impact learners' access to IAI, and its success as an educational strategy. These include policies relating to equipment, class sizes, school fees, and equality.

Dissemination and equipment policy:

ICT policies in general should span low- and high-tech solutions and focus on functionality, not novelty. The choice of a dissemination mechanism will definitely impact access. If radio is selected, the Ministry of Education will need to ensure that all schools can access the broadcasts and develop solutions if some schools cannot get good reception or if there is uneven coverage across regions.

Ministries of education will need to develop policies governing the procurement, distribution, usage, and safe storage of equipment such as radios, MP3 players, tablets, and computers.

In terms of equity of distribution, it is important to consider, for example, whether there should be a minimum number of radios per school, based on the numbers of students and classes, and if the broadcast schedule is planned so that double-shift schools can access the programmes.

Class size policies:

Policies on class size should be established to help to ensure all children are able to hear the programmes, and therefore learn from IAI.

Generally, IAI works best in classrooms where all of the children can hear the programmes and have a chance to participate. In a classroom of over 100 children, for example, this can be difficult. Policies that limit class sizes create a more enabling environment for IAI.

School fees policy:

Fees often make school prohibitive for the poorest families. If a country is investing in a nationwide IAI strategy to provide education for all, a portion of that investment is lost if some children cannot afford to access the programmes in school.

As part of an enabling environment for IAI, we recommend the waiving of school fees overall if possible, and certainly in areas with low enrolment and high poverty levels.

Equity policy:

IAI is particularly effective in reaching isolated areas of a country, which are frequently home to marginalized and underserved populations. Young people without access to public schools might attend community schools, which tend to have fewer books and resources than public schools and might have teachers with little or no training. IAI can thus help community schools serve children and youth who do not have access to a public school.

To leverage a government's investment in IAI, we recommend a policy that extends access to IAI programmes, materials, equipment, and training to non-government/community schools.

Likewise, integrating IAI into policies for community schools could be helpful if they mandate IAI as a distance education strategy and training for the teachers.

Policies facilitating ease of student transfer between community and public schools and recognizing community school credentials/diplomas are helpful measures to ensure the alignment of what is offered in both types of school, which fosters equity.

Equity should also be considered when supplying equipment. Universal provision of equipment (and replacements as needed) is most desirable because it minimizes the risk of any school being left out.

Policies to support quality

Policies within a national framework can also impact the quality of IAI as an educational strategy, including those on consistency of use, teacher training, and assessment.

Mandatory use of IAI:

If IAI is going to be used to bolster educational quality, it must be used regularly and consistently in classrooms.

There should be a policy making clear that IAI programmes cannot be skipped and that teachers cannot opt out of using them.

The policy should also clarify for educators, especially teachers, what is expected of them when they are integrating IAI instruction with traditional learning.

Training teachers in IAI use:

For teachers to effectively use IAI, they need orientation and training, starting before the first programme series is launched.

The policy should clearly state that all teachers who will be using IAI in their classrooms must participate in IAI orientation and in-service training.

This can be folded into preservice and in-service protocols for new and existing teachers respectively.

In addition to mandating that teachers receive at least a basic level of training, a policy should also lay out expectations for their responsibilities as facilitators of IAI lessons (e.g. preparation, presentation, and feedback).

Educational leaders' orientation to IAI is critical in defining their roles in supporting its effective use. School-level and district leadership must make sure that teachers and schools are regularly using the lessons and have the proper materials and technology to do so. They must also help teachers/schools solve any challenges that arise e.g. in terms of poor reception or training gaps.

Educational leaders, especially school directors, are generally the ones who work with parent-teacher associations (PTAs) and school management committees (SMCs). Therefore, any policy on expectations vis-à-vis IAI will include how leaders can interface with parents on what IAI is and why it is useful.

In the current context of COVID-19, it might be advisable for a policy to define how programmes can be used when schools are not open, and include a communication plan to disseminate to parents and community organizations information on how broadcasts can be used in the home or with small groups of children.

IAI learning assessment policy:

An assessment policy should describe how the impact of the IAI programmes will be evaluated. This could cover several levels—national examinations, formal quizzes, and end-of-year tests on curriculum content, as well as teachers' own formative assessments in the classroom.

In some respect the formal, external assessment of the learning impact of IAI is like any other student assessment, and the policy should set out the minimum learning outcomes or standards sought by the IAI programmes before also creating and calibrating testing instruments to measure progress made against those standards. This should be coupled with the local, continuous and formative assessment that teachers undertake throughout the learning year in which they use classroom-level instruments to measure their pupil's learning, and adjust their cycles of instruction, practice and revision accordingly.

In other respects, IAI requires a more specialized approach to assessment. The assessment policy must acknowledge that what needs to be measured, in addition to the learning progress made by pupils, is the extent to which the IAI methods have been implemented – both in frequency and intensity. Otherwise, the exercise will measure student learning, but not necessary student learning from IAI. In this regard the assessment policy must require evaluation exercises to discover, through monitoring and other means, the percentage of daily IAI programming that teachers use in their classes, the fidelity of their adherence to IAI directions, as well as the amount of pre and post-broadcast activities they complete. The intense planning of the exposition of concepts across a series, and the scaffolding and reinforcement of content both within and between episodes, does not have a meaningful impact if individual classrooms are skipping even a small portion of episodes, or if they are only going through the motions of completing each program.

Individual student achievement measured through learning assessment instruments must be cross referenced with the data on IAI fidelity of use collected from their exact classrooms. This is the only way to make the important distinction between student achievement from the quality of a teacher's instruction, the quality of a teacher's use of the IAI programming, or both.

Another crucial policy consideration is the special sampling and test administration protocols that the IAI programs will require. Most educational systems have clear testing procedures established for nationwide assessments and invariably these involve rolling out a standardized test to certified examination centres that will be overseen by trained proctors or invigilators – all of which are hallmarks of a formal system. But when IAI is being used to reach learners on the edges of, or even outside a formal system (as it often is) these procedures must be revised. IAI learners may not be visible to system. Those learners that are visible may not have easy access to a certified examination centre. And those overseeing the IAI learner's education, be they formal, informal or nonformal teachers, may not qualify as

proctors. Therefore, assessment efforts that do not accommodate these realities may overlook a significant number of IAI learners and therefore misrepresent the impact of an IAI Series.

It is best to ensure a representative sample of learners are assessed by first making significant efforts to find and track the listening body of students, then formally draw a sample from all known participant groups, irrespective of their location or formal affiliation, before finally dispatching evaluation teams to test learners in each location. Then, while at each location, assessors should also investigate the characteristics of IAI usage as outlined in the paragraph above.

An assessment exercise of this intensity may not realistically reach every listener, but to make an informed judgement of the effectiveness of the programming it must be conducted with a representative sample size of pupils.

Production

Using government systems:

Part of the success of IAI is that it relies on production skills that are commonplace in all societies so it can be generated locally for a high-quality and authentic product. Storytelling, acting, music recording, and broadcast journalism are a few of the skill sets that are commonly drawn upon by educators when designing an IAI series. While other ICT-enabled education products rely on a limited pool of specialists found mostly in Silicon Valley, radio production does not. This is a powerful argument for making a local product that resonates highly with the listening public.

For the sake of capacity building and sustainability, all IAI programming should be produced by employees of the Ministry of Education, and set up in the equivalent of an educational media department or a distance learning division by highly skilled teachers who are fully aware of the realities of student life.

A government-run studio should be equipped to produce and maintain IAI materials for years to come.

When such an arrangement is not possible, writers can be hired from the private sector and installed within ministry offices for maximum collaboration with curriculum specialists and the guarantors of standards.

Private sector recording studios can also be used. In emergencies where governments need to quickly create or adapt programmes, non-local scriptwriters and producers can work with ministries as a stop-gap measure. This will dramatically lower production timelines and lead to a faster product in the short term. Scriptwriting and production for IAI takes many months to master, and decisions must be made regarding the benefits of capacity building versus the need for immediate distribution.

It is possible to develop a transitional plan where a small bank of programming is created externally to allow for an immediate broadcast launch while a local production

team is assembled and upskilled until they can assume responsibility for producing programmes later in the broadcast year.

Infrastructure considerations

When planning for the distribution of IAI materials to homes and schools, the foundational infrastructure must be considered. The scope for IAI provision varies according to the level of infrastructure available.

Dissemination networks:

When there is a single national broadcaster, this simplifies the contracting and logistics of coordinating with that entity. However, it also limits the numbers of daily broadcasts and the languages that they use.

Where there is a network of smaller regional, commercial, or community radio stations available, individual broadcasting agreements can be negotiated, and coverage can be patchworked together. There is a significant administrative cost and effort required to maintain this network of broadcasters, but it is often worthwhile because it increases the number of regional languages that can be broadcast.

Alternatives to radio broadcasting exist, such as Internet streaming, podcasting, and distribution through hardware such as MP3 players, phones, and tablets. However, in most cases radio remains the most cost-effective option.

Listening equipment and electricity:

The electrical requirements of the playback devices must be considered. Fortunately, most radios and personal media players have a low rate of electrical consumption that can be easily accommodated with solar power. Nonetheless, there is an upper limit to the volume that can be powered by solar batteries, and class sizes much be kept relatively small so that all the learners can hear the audio. Larger classes are better served by sound systems that use grid power.

INFRASTRUCTURE CONSIDERATIONS

1 DISSEMINATION NETWORKS

Single national broadcaster

This simplifies the contracting and logistics of coordinating with that entity. However it also limits the number of programs and languages that can be broadcast daily. Radios that are solar powered or wind-up do not require electricity but they do have to be distributed, secured and sometimes repaired or replaced.

Network of smaller regional, commercial or community radio stations

Individual broadcasting agreements can be negotiated and extensive coverage can be patchworked together. There is a significant administrative cost and effort to maintain this network of broadcasters. But it is often worth the effort because it increases the number of regional languages that can be broadcast.

Internet streaming and podcasting via phones, tablets, and computers

This can minimize the challenges of physically distributing equipment such as radios, if phones are commonly owned by teachers and/or if schools have or can be supplied with computers or tablets. Streaming allows for flexible timing in the use of the programmes but is dependent on the availability of consistent internet services, listeners' ability to pay for them and the equipment necessary to access them.

Hardware such as mp3 players, phones and tablets preloaded with programmes

Teachers and schools can use the programmes at their convenience as there is no one fixed broadcast time. This ensures access to programmes for schools that operate double or triple shifts. There are challenges involved with the physical distribution of equipment and its security, repair and maintenance.

2 LISTENING CONTEXT

Electricity

The electrical requirements of the playback devices must be considered; they often need to be recharged. Wind-up radios can be an option in low electricity environments. Most radios and personal media players have a rate of electrical consumption that can be easily accommodated with solar power as well.

Noise

Schools and classrooms can be very noisy, especially where classes are large or schools are located on busy streets. If this is the case, dissemination options should include rechargeable speakers for amplification, especially for tablets and phones. Solar charged batteries can only provide volume up to a certain level. When a higher volume is needed, as with larger classes, sound systems that operate off the power grid are generally more effective.

Community radio stations

The power that comes with trust

Community radio stations are a great resource. They normally share a mandate for community education that makes them eager partners. They are appreciative of free content, as it relieves them of the costly burden of producing so much of their own. They are often underfunded and underequipped, but often highly motivated with talented members of staff. Instead of charging for their airtime like a national carrier, they frequently accept donations of equipment and training for their staff in radio production and management.

What they bring to the relationship tends to be a captive listening audience and the trust of their constituents. This trust makes them valuable allies when producing training materials and community guidelines, driving listener outreach, and generally raising awareness of the value of IAI. This is particularly true when promoting the use of IAI at home. Schools have the weight of a centralized authority that drives change across the system, meaning that the administration of the school has a mandate to require teachers to use IAI. This authority does not exist at the family level, and so the promotion of practices must be taken up by grass-roots forces such as community radio.

Community radio stations can explain the simplicity of adopting IAI and address localized concerns about its use. They can effectively create a market for the product. They can also provide an outlet for local parental voices that report back their experiences and crowdsource solutions to family-level problems.

Community radio stations can also customize the broadcast features, such as language and schedule. Not only does this level of sensitivity make programming more equitable and accessible, but it also builds trust and ownership amongst the listeners who come to see the product as one that values their reality.

Assessment checklist

The two-part checklist below aims to help decision-makers identify in detail the context and resources available for designing and producing IAI programmes that can be sustained for many years. The checklist provides a big-picture view and is followed by a decision tree that supports good choices based on policy-makers' unique contexts.

CHECKLIST: PART 1

1 Equipment, Infrastructure, and Partnership Assessment

✔ **Availability of listening devices (circle all that apply in your context)**

- ☐ Radios with the capacity to receive broadcasts are affordable on the local market
- ☐ Radios with the capacity to receive broadcasts and deliver audio playback (MP3 players, CD drives) are affordable on the local market
- ☐ Where IAI will be used, most homes have radios
- ☐ In areas where IAI will be used, most homes have playback devices (CD/MP3 players)
- ☐ Where radios are not widely available in homes, communities have a central location that could be used to receive or play back a radio broadcast via loudspeakers (church, mosque, school, health centre, etc.)
- ☐ There is a high level of availability of affordable mobile phones with radio receivers
- ☐ There is a high level of availability of affordable mobile phones that can play reusable media (using memory cards)
- ☐ Most schools have regular, consistent connection to the internet and can download or stream audio programmes.
- ☐ Most schools lack resources for audio streaming over the internet
- ☐ Most homes have regular, consistent connection to the internet and can download or stream audio programmes.
- ☐ Most homes lack resources for audio streaming over the internet

✔ **Availability of electricity in IAI target sites (circle all that apply to your context and then circle which of the sub choices—All, Most Some, Few—are applicable).**

- Schools have consistent electrical power through a public or private grid
  ☐All ☐Most ☐Some ☐Few
- Schools have electrical power that is produced on site through solar cells or a fuelled generator
  ☐All ☐Most ☐Some ☐Few
- Schools' electricity supply is frequently disrupted
  ☐All ☐Most ☐Some ☐Few
- Schools do not have electricity
  ☐All ☐Most ☐Some ☐Few
- Homes have consistent electrical power through a public or private grid
  ☐All ☐Most ☐Some ☐Few
- Homes have electrical power that is produced on site through solar cells or a fuelled generator
  ☐All ☐Most ☐Some ☐Few
- Homes' electricity supply is frequently disrupted
  ☐All ☐Most ☐Some ☐Few
- Homes do not have electricity
  ☐All ☐Most ☐Some ☐Few

✔ **Availability of broadcast coverage (circle all that apply in your context)**

- ☐ Broadcast coverage by national radio is widespread; national radio can be a sole provider of IAI coverage
- ☐ Broadcast coverage in the target areas occurs through a combination of national radio and private radio stations

☐ Community radio stations provide coverage in target areas where public and private radio transmission is weak

✔ **Availability of production infrastructure (circle all that apply in your context)**

- ☐ Government has an existing radio studio with up-to-date equipment and appropriately trained personnel
- ☐ Government staff are not trained in audio production using up-to-date equipment
- ☐ Government has audio production staff and wishes to have them trained in IAI
- ☐ Government has ICT/multimedia staff who it wishes to be trained in IAI production
- ☐ Government has an outdated radio production studio or insufficient equipment
- ☐ Government does not have a radio production studio
- ☐ Local audio recording facilities with up-to-date equipment and appropriately trained personnel are available through commercial or non-profit entities
- ☐ There are limited or no up-to-date local recording facilities

✔ **Availability of production staff and time (circle all that apply in your context)**

- ☐ Government staff and studio are available for full-time production of an IAI series
- ☐ Government staff and studio are only available for limited production capacity
- ☐ Government staff and studio are primarily or entirely committed to other tasks
- ☐ Local studios and staff can be hired to supplement government capacity
- ☐ Local studios and staff cannot fully supplement government capacity

✔ **Production partnerships (circle all that apply in your context)**

- ☐ Government has an existing relationship with high-profile national actors or musicians who can participate in the series
- ☐ Government has educational media staff who are skilled voice actors or musicians and can participate in the series
- ☐ Production will require hiring local voice talent and musicians

✔ **Formative testing partnerships (circle all that apply in your context)**

- ☐ Government has existing model schools in which instructional materials are regularly tested that can be used for field testing IAI series
- ☐ Representative schools can be identified in IAI target areas for field testing of IAI episodes
- ☐ Field testing will require recruiting sample teachers and learners

✔ **Broadcast and equipment partnerships (circle all that apply in your context)**

- ☐ Government broadcast will be at no cost
- ☐ Government has existing partnerships with radio or telecommunications providers that can be leveraged to include all or some broadcast or equipment costs
- ☐ Government has existing education campaigns that could be expanded to include IAI sponsorship or partnership opportunities
- ☐ No current partnerships exist that could be leveraged; rates will need to be negotiated with broadcasters and equipment purchases reviewed for cost-efficient procurement and distribution

CHECKLIST: PART 2

2 Curriculum and Teacher Capacity

✔ **Availability of design personnel (circle all that apply in your context)**

- ☐ Government has trained IAI scriptwriters
- ☐ Government has materials development or instructional design staff who could learn to write IAI/IRI series, and wishes to have them trained
- ☐ Government has curriculum or teaching development staff who could learn to write IAI/IRI series, and wishes to have them trained
- ☐ Government prefers to use teachers to design and script series, and wishes to have them trained
- ☐ Government staff speak and write in all target languages
- ☐ Government staff speak and write in some of the target languages; speakers of other languages will need to be hired to ensure correct and contextually-appropriate programming
- ☐ Government has no staff that can participate in IAI design and scriptwriting

✔ **Availability of scriptwriting (circle all that apply in your context)**

- ☐ Government personnel can be dedicated full time to series design and development
- ☐ Government personnel can be dedicated part time to series design and development
- ☐ Government personnel are not available for design and development

✔ **Availability of training resources (circle all that apply in your context)**

- ☐ Government has regularly scheduled face-to-face teacher training into which IAI training can be integrated
- ☐ Government teachers receive in-service training on an ad hoc basis
- ☐ Distance-based teacher training (using IAI to train teachers in IAI) is an option
- ☐ Distance-based teacher training is not an option
- ☐ Broadcast time will need to be made available for training parents in using IAI at home

Based on the above, expand the lists below to consolidate both the challenges and specific target areas for the programmes you are considering.

List of educational challenges

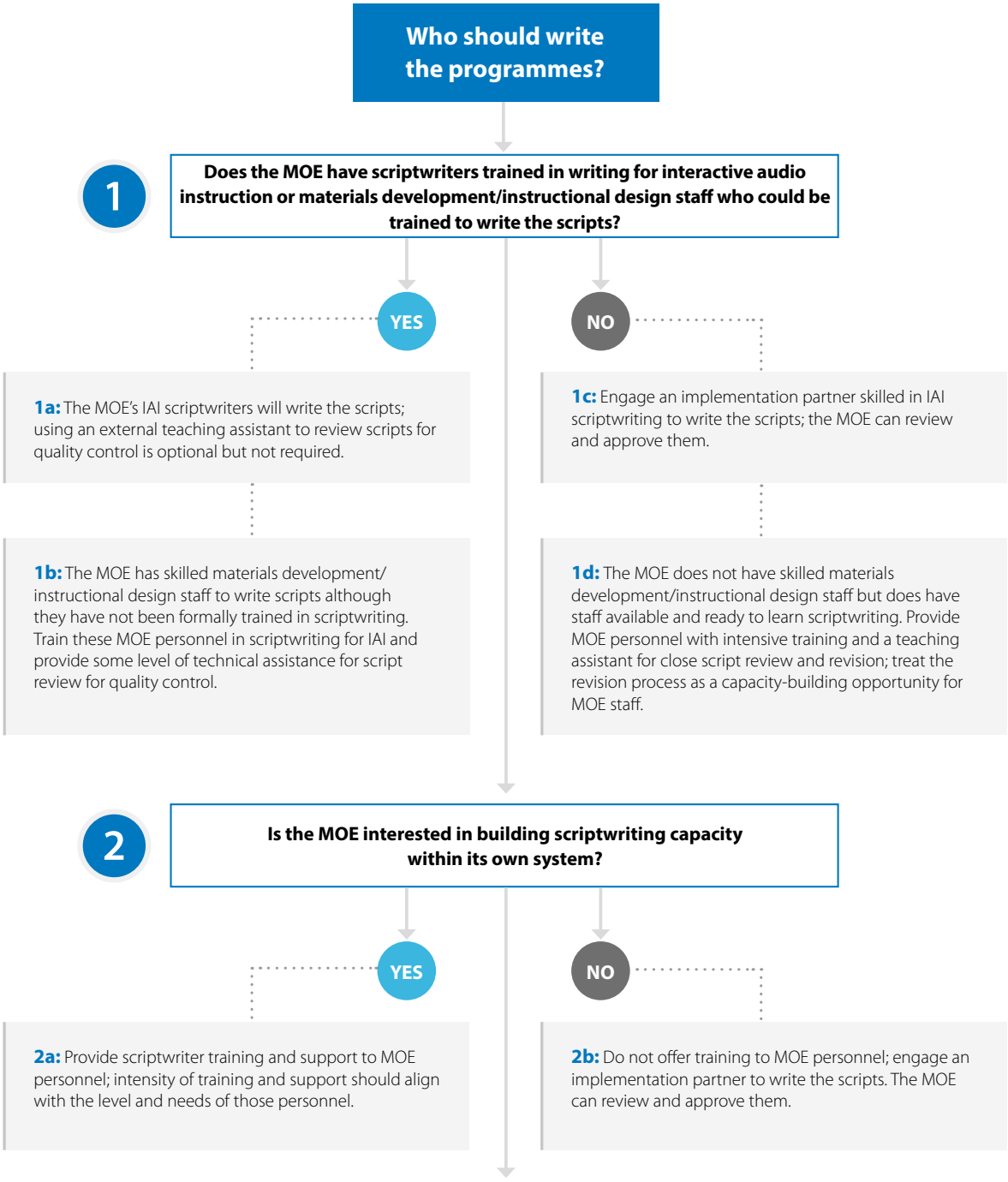
- ☐ Teaching staff
- ☐ Infrastructure
- ☐ Partnership potential

Types of programmes

- ☐ Grade levels
- ☐ Subjects
- ☐ Languages

Decision tree

Use this decision tree to help simplify the evaluation of complex options.



Who should write the programmes? *(cont.)*

3 **When does the MOE wish to air the programmes?**

3a: As soon as humanly possible—If the MOE has trained scriptwriters on staff who are ready to go (1a), deploy them; if the MOE does not have qualified personnel (1c) and is not interested in training scriptwriters (2b), engage an implementation partner to write the scripts; the MOE can review and approve them. If options 1b and 2a are in play, it could be possible to train the MOE's skilled personnel and provide a high level of teaching assistance such that scripts are developed, formatively tested, and recorded within a year. If 1d and 2a are the responses to the above questions, it is most likely that the training and script review process will take too much time.

3b: In a year (more or less)—If responses 1b and 2a are selected, train MOE materials developers and provide some TA; they should be able to produce scripts in time to formatively test and record within a year. If responses 1d and 2a are chosen, train the scriptwriters but provide a heavy level of TA support with script review and revision so that programmes will be ready by the end of the first year.

3c: Whenever they are ready—If response 1a is selected, the scriptwriters can simply do their work and seek out some script review/quality control services if they wish. If 1b or 1d is selected along with 2a, provide ongoing scriptwriter training and TA for review and quality control throughout the scriptwriting process; the level of intensity for both will depend on the skill of the trainees.

Who should record the programmes?

a: The MOE's in-house, experienced audio production staff—This is the ideal scenario; if the MOE has such experienced staff they likely have a well equipped in-house studio to do the recording and production.

b: The MOE's in-house multimedia/ICT staff, who are not experienced in audio production—If the MOE has an in-house studio that is reasonably equipped, this is a good option. Training can be provided, as well as TA on the production and recording processes. Some additional equipment might need to be provided. If the MOE does not have an in-house studio, it will be necessary to rent one where the MOE staff can be trained and do the recording and production. This option will likely take longer than the others and there will be additional costs for studio rental.

Who should record the programmes? *(cont.)*

c: A commercial studio, with its own producer and technicians, that the project or the MOE selects—This option is essentially outsourcing the production. If the studio staff have experience with audio production, this can work well; if not there will be a learning curve. This option is more costly than using MOE staff, but it can also be quicker than training MOE staff in production.

d: An external technical assistance implementer with experience in IAI—This option is good if there is no suitable studio with production personnel; it is likely the fastest option but could also be more expensive.

How do we distribute the programmes?

a: Radio broadcast—This is best if schools are not equipped with internet or equipment. It requires the physical distribution of radios and possibly speakers, and could require electricity, depending on the listening contexts. Solar charging can be used but has limitations in terms of sound volume.

b: Internet—This is best if schools have regular internet connectivity and electricity; it could require the distribution of tablets or computers.

c: MP3 players or other hardware—This is best for schools that are located outside of radio broadcast areas or in contexts where broadcast options are limited. It requires the physical distribution of speakers and equipment, preloaded with programmes. Solar charging options are possible although volume might be limited.

How should we train teachers?

a: Train them via radio broadcast/audio programme; it is too costly to bring them all together for face-to-face training or it is not possible due to COVID, conflict/violence, or great distances. Training over one-way audio does not allow them to ask questions.

b: Assemble teachers in groups at local levels during school holidays for intensive face-to-face training, which includes video spots to model good teaching with IAI. This can be costly and time consuming but allows for questions and discussion.

c: Use some combination of blended training; assemble teachers in groups at the local level for basic IAI training and then offer periodic audio refresher sessions. This option is probably the most practical in many ways, permitting some face-to-face interaction but with less cost than option b.

What types of support materials can we afford?

a: Everything—Initial and recurring costs are no object. Produce student workbooks, texts, and teacher guides to accompany the IAI programmes. Reprint and distribute them yearly.

b: Nothing—The MOE cannot bear the recurring print and distribution costs; they want the IAI programmes to be stand-alone.

c: Teacher guides—These can last a few years per teacher and are not as costly as student materials that need to be reprinted yearly.

5. Planning to implement IAI

Guidance on key decisions

Curriculum issues

Finalizing curriculum revision to extend IAI shelf life:

Once produced, IAI will be expensive to rerecord or redevelop in the near future.

To ensure the programmes are applicable for years to come, it is best not to begin the production of an IAI series if there is a scheduled curriculum revision in the coming years.

It is preferable to produce IAI immediately alongside the rollout of a new curriculum to ensure it remains applicable for the longest time possible.

Subject matter considerations

Challenging content and subject matter synergy:

Research has shown that the effectiveness of the programming tapers off after about 45 minutes of daily listening.

Most IAI episodes are limited to under 30 minutes so they can fit conveniently into radio station programming formats.

These limitations of time can also become limitations on content.

The more subjects that each episode must cover, the less instructional time each subject receives and the less impact the IAI series has. Education ministries should consider prioritizing some subjects over others so the IAI can focus on the most critical areas. Some possible programming arrangements include the following:

- A single subject for an entire series. Papua New Guinea showcased IAI focused on science only.
- Two to three subjects for an entire series. Malawi's *Tikwere* programme focused on a daily combination of English, mathematics, and Chichewa.
- Subjects have unequal emphases. Zambia's *Learning at Taonga Market* programmes gave daily coverage to some subjects, but covered others only twice a week.

Programming is most effective when learners' interactivity is maximized. While this can take many forms (e.g. answering questions, solving problems in workbooks), the most engaging activities are things like songs and games, especially for younger children.

As learners age, and the subject matter becomes more complicated, it is necessary to scale back the play-based learning activities in favour of more serious types of interaction.

Support material considerations

To maximize quality, a balance must be struck between the amount of support materials, the costs of sustaining their production and distribution, and the extent to which an IAI episode will be useful to a listening student who did not receive them.

Careful attention must be paid to creating programmes that work for the students who have no materials, as it is likely (particularly in emergency situations) that many households/schools will not have textbooks, reading books, workbooks, wall posters or displays.

Simultaneously, the quality of the IAI series will be greatly improved if support materials are developed for both teacher and student. Most series strive to involve only the materials available to a parent or teacher in his or her immediate environment — the 'Teaching and Learning Using Locally Available Resources' (TALULAR) approach. Usually each broadcast has the bare essentials, with additional and richer examples provided in the printed support materials. In such a situation, those who have the materials get a rich learning experience, but those who do not can still make sense of and benefit from the programme.

Parent and teacher training and skills

Introducing IAI into a non-formal educational setting requires a different training approach for homes than it does for schools. For homes, which are presumably receiving IAI because the schools are closed and people cannot safely gather in groups, the best approach is the direct training of parents via radio.

A training series targeting parents should be planned to take place over several days before the actual IAI lessons begin.

When IAI is being introduced into a working school system, the training should be divided into three parts: rollout, in-service, and preservice.

Rollout training is traditionally done through a cascade, where teachers of all grade levels gather during a holiday period for an intense session on how to start using IAI in their classes. In preservice training this same content is delivered in colleges and universities, though at a more routine pace, ideally as its own course. The in-service training covers topics in greater detail, as the participants are more familiar with IAI methods. It is spread out across the year and built into the school's programme.

These are not the only ways to complete training, as other creative approaches can be developed if the circumstances require it.

Other possible models include peer-to-peer training facilitated by experienced IAI users, where the content is delivered via a radio broadcast to small groups assembled nationwide.

This is a good model for situations where families of regular users are introducing the methodology to their neighbours, and for staggered rollouts where for example second-

grade teachers start using the programme first time and then train the third-grade teachers who will begin using it the following year.

Instead of using traditional cascade or radio-driven methods, training can be done via an online course (for individuals) or offline tablet-based app (for small groups). These methods allow the incorporation of video so that trainees can view best practices of IAI use in homes and schools.

Language of broadcast

Mother tongue instruction vs live translation:

Different countries have different approaches to languages of instruction, and IAI can be tailored to multiple languages. Mother tongue instruction can be provided to a national audience through a single nationwide daily broadcast. This was the strategy in Malawi, where Chichewa was chosen as the language of instruction. There are limits to the amount of time available on a single national channel, but programmes can be repeated in different languages if necessary. There would not be time for more than two or three, but a country with only a few national languages could follow this strategy.

Mother-tongue instruction can be provided to a national audience through a single nationwide daily broadcast.

But countries with multiple national languages that cannot fit into a single daily broadcast must choose another strategy, of which there are several.

Countries with more national languages than can fit in a single daily broadcast would have to choose another strategy, of which there are several. One alternative would be to replace a single national broadcast with a series of regional broadcasts from different stations, each in its own languages. This is most successful when listeners are living in naturally divided language groupings, each falling under its own broadcast shadow, which is not common (especially in urban areas). A second multilingual strategy is possible in countries where the parents or teachers already speak a lingua franca as a second language, such as English or French, even if the learners themselves do not speak it. In this instance a single daily broadcast is made with the understanding that the adults will understand it even if the children do not. The listening adult then has to provide a live translation of each direction into the mother tongue. This was the approach selected in Zambia, where broadcasts were in English instead of the other seven formal languages of instruction. The disadvantage of this approach is that it places an extra burden on the adult and requires longer broadcast pauses to accommodate the translation. The advantage is that it exposes

children to the lingua franca from an early age. The frequent short translations tend to help them learn it quickly.

Community involvement

Community radio station partnerships:

Parents do not normally follow the details of the daily activities that occur in classrooms. They may hear vague descriptions from their children about what happens, but even those parents who work on school management boards rarely enter the classroom and hear a lesson. However, this can change with IAI.

> ***Parents do not normally follow the details of the daily activities that occur in classrooms, but this can change with IAI.***
>
> ***And when they know what is happening in class each day, they may be more responsive to being given supporting roles.***

When IAI is broadcast over the radio it is transparent to all listening adults, and this demystifies the educational process. If they are facilitating IAI in their own homes, parents will tend to find it reassuring that all the planning, preparation, and delivery is already done, and they feel less burdened. If IAI is being used in school, they appreciate knowing what is being taught in class each day, and this opens the door for them to have more meaningful conversations with their children.

When parents know what is happening in class each day, they may be more responsive to being given supporting roles, both within the school and at home (Richmond, 2020). They can be encouraged to participate more in school life (e.g. on management boards and building committees, and as classroom volunteer aides). And they can be taught strategies to use at home that will reinforce their children's learning. While these behaviours are often promoted, they become much easier to take up when parents have IAI giving them full insight into the daily workings of a classroom.

Distribution infrastructure

Ideal radio conditions:

Radio is the best distribution mechanism when there is a nationwide network of coverage (through single or multiple stations) and when radios are widely owned. This will require discipline from the listening audience who must tune in synchronously each day. The requirements of this routine can help learners develop good listening habits, but it can be a disadvantage to those who are not able to listen daily during that particular slot. Unfortunately, it is also challenging to gather usage statistics and other monitoring and evaluation (M&E) data for radio.

> ***Playing back MP3 files is the best of both worlds. Like radio, it is completely free, but like internet streaming, it is conveniently available on demand.***
>
> ***Interactive voice response services delivered over an audio phone line are an excellent solution in places with a strong mobile network.***

Ideal streaming conditions:

Internet streaming is only possible when the infrastructure is both accessible and affordable. Downloading a daily programme quickly becomes expensive to users who are paying by the megabyte, so it is not an appropriate method for marginalized and financially disadvantaged populations. It does, however, allow users to access the programmes on demand and can be a useful supplement to a daily radio broadcast. Parents and teachers might not mind paying their mobile carrier to download the occasional programme they missed on the radio. Internet streaming also provides an excellent source of M&E data, as it is possible to track how many times each episode is accessed.

Ideal MP3 playback conditions:

Playing back MP3 files represents the best of both worlds — like radio it is completely free, and like internet streaming, it is conveniently available on demand. Many radios and phones also act as MP3 players, so often there is no additional hardware required. The major disadvantage is that it requires some means of manually distributing the programmes. They can be preloaded onto devices that are then sent out to the users, or they can be copied onto secure digital (SD) cards — memory cards — that are bought and sold in rural marketplaces. But these options take considerable resources, and once the devices or cards are distributed, as with a radio broadcast, it is very difficult to track the M&E data.

Ideal IVR conditions:

Interactive voice response (IVR) services delivered over an audio phone line are an excellent solution in places with a strong mobile network and population who may only own a feature phone instead of a smartphone. Parents and teachers can simply call a free hotline and then listen to a recording of the episode through their phone speakers. This solution also gathers the most valuable M&E data, as it is possible to track not only the identities of the users, but also the frequency and duration of their engagement. The major disadvantage of IVR is that regular network charges usually apply, so to be free to the user, a donor or host country government must cover the costs. When a year-long series of IAI amounts to 75 hours or more and is accessed by millions of families, these charges can be significant.

An ideal solution is to partner with the carrier so the IAI content is classified as a zero-rated service and the call time is donated by the network. However, this is a major commitment for a carrier.

Planning and timelines

Planning time and broadcasting pace

The amount of initial planning time required to develop quality IAI is significant and must be built into stakeholder expectations from the beginning. Under normal circumstances it will take a full year to be ready for broadcast, though in exceptional circumstances and with an experienced team that can be shortened.

Under normal circumstances it will take a full year to be ready for broadcast, though in exceptional circumstances and with an experienced team that can be shortened.

The reason for the extended development time is the sheer volume of work required to produce a quality product and ensure that all the curriculum content is adequately covered. This includes having enough internal review cycles to convey key concepts, enough practice activities to solidify comprehension, and enough cross-referencing between subjects to make efficient use of every broadcasting minute. There is also an extended quality assurance process to check that inaccurate information is not broadcast, unclear directions are not given, and realistic activities are assigned. Each script progresses through multiple stages of review as well as in-class testing with focus group teachers and learners. Rewriting and rerecording time is built into the production schedule.

While a teacher can plan a lesson relatively quickly, he or she can also adjust it in real time if it is not succeeding. IAI lessons are implemented without any oversight from the planners, so there is no room for misunderstanding directions or changing course midstream if a lesson is not hitting the intended mark. If an IAI lesson is poorly designed, it is damaging to all teachers and learners on a national scale and leads to an erosion of trust in the quality of the programme and use of the service. The only antidote to the high stakes that face IAI is a careful planning and testing process for all materials.

Inevitably the production pace (for IAI at least) must be set to match the broadcast pace; otherwise there will be a forced break in transition. Home-based users and formal schools alike resent breaks in coverage, and in addition to breaking down trust amongst the users it also disturbs the learning, which in turn leads to lower adoption rates.

If broadcasting must begin before the production is complete, there must be a healthy buffer of programmes that have already have been finalized before the series is initiated.

This buffer must be designed by taking into consideration the production team's size and writing speed, and it must account for potential disruptions such as staff illness and holidays, and other less likely but potentially more damaging issues such as political unrest.

Collaboration and partnership

Ministry of Education and donor synergies

Planning for broad administrative ownership:

IAI production and rollout touches every aspect of an educational system and requires coordination with all administrative divisions of a Ministry of Education from planning and curriculum to ICT and teacher education. Leadership of the initiative will depend upon a complex mix of dynamics unique to the government in question, so there is no correct formula to dictate who should direct the process.

Best practices will involve forming a steering committee composed of representatives from all corners of the Ministry, as IAI requires input and expertise from all disciplines.

Best practices also dictate that sustainability should be planned from the outset, and because one key to this is regular funding, the relevant authorities in planning and budgeting must be involved. Too often IAI is relegated to the oversight of the distance learning or broadcasting division of the Ministry of Education, which initially appears sensible, but quickly becomes problematic. Unfortunately, these departments are sometimes viewed as being outside the core functions of the Ministry, and therefore their perceived agendas are given lower priority. IAI has a high profile and national scale in times of emergencies, and a powerful role in the public imagination when it is broadcast on national radio. This, along with its potential to transform instructional practice across the board during business-as-usual teaching, points toward the need to ensure that the entire Ministry of Education and all its directorates take full ownership of the programming.

The high profile and national scale of IAI require that the entire Ministry of Education and all its directorates take full ownership to ensure the success of the programming.

Identifying messaging overlap:

In a multi-donor environment further coordination is needed, especially if different donors traditionally support the various technical areas within the Ministry. When done carefully, however, important synergies can be identified and harnessed. An unfortunate reality of many development efforts is that they are seen as the pet project of one donor's interests alone, which in some circumstances can lead to friction or even competition between donors.

One strategy to prevent this from happening is not only to involve all donors in the planning and oversight of the product, but to give them a stake in it as well. This can happen in different ways.

One simple technique is to open the platform for others to promote their key messages. When messages are broadcast on radio, the listening audience will be huge and the potential to promote this information to students and teachers can be valuable. There is no need to restrict cooperating partners' access to this potential. Provided that partners are suggesting messages that are relevant and long-term (programmes must be built to play for years on end), they can be imbedded cleverly into the series. For example, educational storylines that might be written to teach language skills (part of the core curriculum) can very easily include such important (but off-curriculum) topics as health and farming. This activity only requires a little bit of extra coordination and planning time, and the co-operation and goodwill it will inspire among partners is enormous.

Another more complicated strategy is to share the programme costs across donors with complementary technical focus areas. While the programme initiator may take on the major production costs, other costs like

training teachers and printing materials might be borne by other donors who traditionally support those areas.

Key stakeholders and partnerships

While there should be careful coordination within the government and donor circles, there are several other key stakeholders and relationships that require particular attention.

Distance learning units:

The equivalent of the distance learning section at the Ministry of Education is most likely going to be the IAI series production hub. It will require administrators, writers, and producers of the highest calibre to be hired or seconded. The large national impact that an IAI series can have, and the relatively small group of professionals who are contributing to the quality of that product, does not leave any room for poor staffing choices. Too often high-quality staff are assigned to arms of the Ministry with larger budgets, but it is critical that the distance learning unit is staffed and equipped appropriately.

Community broadcasting partners:

Attention has already been paid to the power of community radio stations in a previous section, but the topic is important enough to be repeated here. Even if they are not used as broadcasting partners for a national IAI series, and even if the series is distributed without radio infrastructure of any kind, community stations should be courted as partners for change. They are much-overlooked players in the development context. They have enormous potential to win the support of local parents, attract listeners, normalize the uptake of IAI, and promote best practices associated with its use.

Community radio stations are often overlooked, but have enormous potential to win the support of parents, attract users to the programme, normalize its uptake, and promote best practices associated with its use.

Parental knowledge, attitudes and practices:

Even the most educated parents often do not track the details of their child's learning process. This means they overlook simple but effective activities they can do to amplify the impact of education. Worse, they may harbour subconscious assumptions and beliefs that undermine what their children are struggling to learn in school. At no time is this more critical than during an emergency when schools are closed and parents are leading education efforts from home.

Understanding at an intimate level how parents act at home and what they believe in private is the key to shaping methods for their constructive involvement and harnessing their transformative potential.

All IAI should be produced alongside an outreach, awareness, and social and behavioural change communication (SBCC) campaign that endeavours to recruit parents into mindful, informed, and energetic supporting roles.

Religious bodies and civil organizations:

Educational topics have long attracted the attention of important social and religious groups. What goes into the curriculum is a highly political issue. While this remains true for educational services of all types, it is particularly true for IAI because of the visible and public nature of the lesson content that is being shared. If an influential group is only partially listening and does not have a complete understanding of the aims and design of the programme, it can quickly rise to oppose and even shut down a positive and valuable service like IAI.

It is advisable that programme designers be proactive and work beforehand to sensitize and secure support from important listening groups, rather than go into damage control and try to correct distorted perspectives.

Sample programmes and scripts should be shared with key community groups so that they understand the programme and appreciate its potential to improve their community's lives. They may also be able to share important information that can improve the quality and accuracy of the scripts.

Private sector resources:

The value of public-private partnerships has been highlighted in a previous section and is also worth a second mention. The potential value that a private sector partnership can bring to both sides is so high that dedicated efforts should be made to look for connections and synergies**.** In many cases, the broad reach of radio and popularity of IAI render support for such programming attractive to the private sector if they are allowed to be named as sponsors.

IAI is best produced by local scriptwriters, in compliance with capacity development practices.

6. Costs and sustainability of IAI

Creating good IAI is only possible when master teachers are trained as scriptwriters and learn to adapt their instructional skills to audio formats, and apply the rules of writing IAI scripts to child-centred programming. Studio staff, actors, and musicians need a similar training process.

The best IAI is truly local, produced by host-country government staff who combine the training principles with their native knowledge of the curriculum, culture, and context of their listening beneficiaries.

Therefore, IAI is best produced alongside optimal capacity development. This may necessitate a longer production timeline, but it will create a superior, home grown product and lead to civil servants being able to expand programming to new content areas. Once an initial IAI series is completed within the mechanism of a donor-funded project, the Ministry of Education staff will require only light technical assistance to produce subsequent programmes in other grades or content areas. An initial focus on primary school content may, for example, lead to later programming produced for early childhood education, in-service teacher training, upper primary learners, or youth employment.

Recurring costs consist of things like broadcast airtime and the printing and distribution of any support materials.

The most significant costs in IAI occur in the production phase and, in particular, at the beginning of that phase when staff are being trained. The costs associated with fully training and equipping a Ministry's IAI team, as well as producing a year's worth of programming and materials and conducting teacher training, can approximate one million US dollars per grade. Actual costs vary significantly according to the implementation context and details of the work, but this figure can serve as a starting point for planning purposes.

After scripts are written, recorded, tested, and finalized, the recurring costs are much smaller. Recurring costs consist of things like broadcast airtime and the printing and distribution of any support materials. It can also cover the periodic replacement of radios, or the retraining of teachers. These costs should be discussed in the planning phase, so the government has sufficient notice to arrange for them in the budget cycle.

Costing considerations

Production (investment costs)

Staff:

Production costs are those incurred when paying wages and training fees for the people involved in the production chain, which are typically paid according to the local market and salary scales. Ideally these are already Ministry of Education employees, although they do not have to be. Some of the job titles for IAI production personnel are listed below.

- Writers
- Studio producers
- Studio technicians
- Musicians
- Voice actors
- Focus group evaluators

A position that will likely need to be sourced from the international marketplace is that of IAI technical adviser.

A position that will likely need to be sourced from the international marketplace is the IAI technical adviser. This person must have a deep working knowledge of the rules and application of IAI, as well as the teaching experience and pedagogical mastery to design a classroom-level intervention. Without this role, true IAI production is not possible, and the other jobs bulleted above could possibly produce compelling radio but they would not be able to create quality IAI. The adviser is also important because s/he has the writing and studio experience to provide professional development advice to the rest of the production team. Finally, the adviser must have the requisite leadership skills to direct a well-functioning team, sharing expertise while also delegating components to team members so that they can make a truly local product. This is all detailed work that must be completed very carefully under considerable stress. There are few deadlines less forgiving than those of a national broadcast, and IAI programming in particular faces a fresh deadline every day.

Studio equipment:

Studios can be rented or installed within a MoE building or at a project site. Equipment costs can vary widely. A simple recording studio can be provided for under $5,000 USD, including the cost of the computer, while refurbishing a more elaborate studio can cost $30,000 USD or more. Below are the minimum specifications for a small and permanent or semi-permanent facility that can accommodate the recording of dialogue and potentially some limited music.

Providing a very simple recording studio can be done for under $5,000 USD, including the cost of the computer, while refurbishing a more elaborate studio can cost $30,000 USD or more.

Permanent recording studio specifications

- Two rooms next to each other, preferably with soundproofing and a window between them
  - » A control room (where the audio engineer is located) that is acoustically treated as a listening environment
  - » A studio (where the actors are located) that is acoustically treated as a recording environment
- Desktop computer
- Recording software
- An eight-channel recording console or interface
- Four microphones for recording (preferably of the same make and model)
- A microphone for talkback (the same make as the others or different)
- Four pop screens[10]
  Five pairs of headphones
- Four-channel headphone amp
- Four microphone boom stands
- A tabletop microphone stand
- Four music stands
- XLR cables (quantity depends on equipment purchased)
- TRS Cables (quantity depends on equipment purchased)
- Two studio monitors (speakers)

Impermanent recording studio specifications

It is also possible to set up a smaller and relatively mobile recording facility. This can be a flexible solution but requires caution because the choice of room to record in can dramatically affect the audio quality. Specifications for this type of set-up are:

- Desktop computer or laptop
- Recording software
- Two (XLR) channel audio interface
- Two microphones (preferably of the same make and model)
- Two pop screens
- Three pairs of headphones
- ¼-inch headphone splitter
- Two microphone tabletop stands
- XLR cables (quantity depends on equipment purchased)
- Two small studio monitors (preferred but not required in this set-up)

Initial training

Home-based training costs:

When IAI is intended for home use, parents must be trained as discussed in the section above on using IAI in emergencies. The costs of this training are modest and depend mostly on the advertising and broadcasting rates that apply in the host country.

10 A pop screen is a small permeable membrane set between a microphone and an actor and used to limit the recording interference cause by plosive sounds. Normally /p/ and /b/ sounds pronounced by the actor would otherwise blow short blasts of air into the microphone and can cause a distracting 'pop' sound in the recording.

These costs can be quickly ascertained by calling the preferred broadcaster and requesting its rate sheet. Key stakeholders from the Ministry of Education should be involved in designing the training content as well as the IAI adviser and other production jobs listed above. The final product will be a handful of training scripts, perhaps five or more, and a short public service announcement (PSA).

A more sophisticated public awareness campaign should involve social and behavioural change communication (SBCC) programming. Unlike PSA advertising, SBCC requires more research to inform its messaging and is therefore a more expensive enterprise. Creating SBCC is a specialized skill and worth more description than can be provided in the scope of this handbook. It is used in the advertising community and particularly amongst international development projects with a focus on health. Without SBCC messaging, listening rates may remain low. PSA advertising, even when accompanied by intense outreach efforts, only succeeds in raising awareness whereas SBCC increases public uptake of the service.

When IAI is intended for home use, parents can be trained via radio.

A second, larger and more sophisticated public awareness campaign should involve SBCC programming to promote the uptake of IAI in homes across the community.

Training costs in the formal sector:

The best way to introduce IAI into the educational system en masse is through a national in-service training effort, with delivery that is cascaded during a school holiday over two to five days.

The actual costs of this approach vary greatly by country, depending on such factors as the number of teachers and the charges for training. The training itself is more extensive than that provided to parents, as it encompasses more conventional teacher skills and expectations of pedagogical knowledge.

Support materials

Support materials can be developed at many different levels of complexity, and should be considered when the IAI is first planned because their design will dictate costs, and have a large impact on the sustainability and usability of the programmes.

Print costs of course depend on the features of each book, including binding type, page count and colouration.

A basic Teacher's Guide normally runs about 200 pages (assume one page for each lesson, and 150 lessons in a normal primary school year), which includes space for additional topics if needed.

A starting cost for a basic guide is $5 each, though there are many other factors (e.g. size of the print run and local printing prices) that can influence this. Guides for programming covering higher grades should plan for two pages per lesson, as the additional space is needed to cover complex topics in more detail and to provide more examples.

Providing radio or playback equipment can become particularly expensive, especially considering that many listeners will not have access to grid power; will need a system loud enough to reach large class sizes during periods of heavy rain and in the midst of other loud environmental noise; and may need a solution that involves battery regeneration or solar power.

The cost of a radio receiver or playback device with a power-generation source can range from $60 to $100 per classroom.

Usage (recurring costs)

After the initial cost of developing an IAI series, the recurring costs are limited to four categories: broadcast fees, family outreach, continued teacher training, and materials and equipment.

Broadcast fees:

These fees may cover radio station airtime or distribution charges like webhosting (for streaming IAI) or voice-call fees (for IVR).

The actual costs of each of these services differ widely and also vary between countries, so local research is required to calculate the annual cost. Any budget planning should factor in the costs of disseminating programming as an annual expense.

Teacher training:

When using IAI in the formal education sector, teachers must also be trained, and the different approaches to this vary significantly in cost. Assuming that teachers were initially trained during project rollout, the ongoing training falls into two categories: refresher in-service programmes and preservice course work. A continuing professional development (CPD) programme delivered regularly at school level can deliver the in-service refreshers, and this is not expensive especially when school-based CPD is already functioning. Creating preservice coursework is the only long-term training solution that integrates the fundamentals of IAI usage into the curriculum, and is also relatively inexpensive.

Most legacy IAI series recorded in the recent past choose to print at least a Teacher's Guide that contains a summary of each IAI episode, so the teacher can read ahead and prepare for the lesson.

Materials and equipment:

The particulars of the support materials and equipment vary according to the design of the series. Some projects donate radios or MP3 players with speakers and solar panels, while others rely on the personal radios that many people already own. Some projects produce a variety of books for students, ranging from stories for reading practice to individual workbooks.

When designing programmes, it is best to keep sustainability in mind and limit the number of material expectations that will drive up recurring costs. This of course must be considered against the large instructional advantages that additional support materials can provide.

Most legacy IAI series recorded in the recent past are accompanied by at least a Teacher's Guide. This book contains a summary of each episode, so the teacher can read ahead and prepare for the lesson. The guide can also include reference materials for professional development, stories and pictures for the teacher to reproduce by hand for student consumption, and translations of common vocabulary words and sentences for use with lingua franca broadcasts that rely on localized mother-tongue translations.

Sustainability considerations

When considering the sustainability of IAI, it is important to map out the various costs it incurs, as well as those it offsets.

Protecting the salary investment in teachers:

IAI supports the work of formally trained teachers. The cost of paying these teachers is a significant proportion of most Ministry of Education budgets and of the national budget for government employees. There are further costs invested in each teacher's training.

Sustainability calculations must also factor in the return on investment for costs spent on teacher salaries in the long term. IAI consistently results in an increase in student achievement of between 10 and 15 per cent.

Part of the sustainability equation must include considerations of effectiveness. It is not sufficient to be satisfied that a government can afford to pay its teachers if those teachers are not doing an effective job**.** In the long term, national growth will falter as students enter the workforce with an inadequate education; the tax revenues will fall, and government budgets will be cut so that teacher salaries are no longer affordable.

A more insightful view of sustainability must also factor in the return on investment for money spent on teacher salaries across the long term. IAI consistently results in an increase in student achievement of between 10 and 15 per cent.[11] It significantly amplifies the sizeable investment in teacher salaries yet involves a relatively small recurring cost.

11 Ho, Tuned in to Student Success, 2009

All sustainability decisions should be considered with the above expenditure realities in mind. Instead of asking 'Are recurring IAI costs sustainable?' the more useful question is 'Are sustained teacher salary costs adequately effective without IAI?'

Identifying invisible resources:

There are resources to support IAI that might not be immediately visible or obvious, such as local civic partners and parental commitment to children's learning.

> ***One thing that remains unchanging and inexhaustible is parents' willingness to sacrifice for the long-term betterment of their children.***

Parents are not normally considered a resource, especially when they are economically disadvantaged. However, when it comes to sustainability, parents are perhaps one of the greatest resources because of their commitment to their children's education. Government funding is often the stalwart of sustainable programming, but budgets rise and fall with changes in policies and economies. One thing that remains unchanging and inexhaustible, though, is parents' willingness to sacrifice for the long-term success of their children.

IAI facilitates more meaningful parental contributions to educational initiatives and makes it possible for parents to deliver full educational services to their children without leaving their homes. It also lifts the veil on what is happening in a formal classroom, providing parents with insight into how to help their children with homework and how to better support their school. Harnessing parents' commitments requires a thoughtful outreach/SBCC campaign that helps them to see ways they can contribute, and challenges the notion that education is something that only happens in a school, and that parents' only job is to pay fees. If this is done effectively, parents can even be motivated to open a community school which is supplemented by IAI. They can be recruited to help children continue learning at home by creating post-broadcast activities, or they can be called directly into service to lead the use of IAI at home to teach their children.

> ***Harnessing parents' commitment requires a thoughtful outreach/SBCC campaign to challenge the notion that education is something that only happens in a school, and that parents' only job is to pay fees.***

Local civic partners can include local NGOs, church groups, community radio stations and other volunteer organizations. While the details of each partnership will vary according the organization's capacity**,** the following examples illustrate the potential of finding local, like-minded partners. A **local NGO** may have a network of community-based volunteers who can act as outreach staff, encouraging uptake of the IAI broadcasts or acting as trainers to implement the programme. A **church or religious organization** may have a network of schools that they support, and they can assist by promoting the adoption of the programming

or by donating supplementary materials. A **community radio station** may be able to provide airtime at minimal cost, which could be used for broadcasting the IAI and/or sensitization programming which explains IAI to parents and encourages uptake.

Opportunity cost of maintaining the status quo:

Poor educational practices are particularly hard to overcome, and this represents a missed opportunity for society. By their first day of employment, teachers may have received several semesters' worth of training on pedagogical theory as learned experience, but they also have many years of lived experience as school learners themselves, starting at an impressionable age. This often leads them to teach not how they have been trained, but rather how they have been taught. Moreover, because teaching is considered a stable form of employment, this naturally attracts more conservatively minded people into the profession, which leads to teaching practices being deeply entrenched and difficult to transform.

IAI offers a powerful tool to break the trend of 'teach as you were taught'. Because IAI shares lessons produced by master teachers, a new, higher standard of teaching is experienced by the learners. This standard becomes the baseline for the learners and a long-term fix for the educational system. Those students who graduate and come back to the classroom as teachers themselves will now teach as they have been taught—at the new, higher standard.

A short-term fix for the system occurs when IAI helps transform the practice of teachers who are using it for the first time. Research has shown how the presence of the radio teacher in the classroom, modelling ideal practices day in and day out, acts as a virtual coach to the live teacher. Over time the live teacher's skills improve as they engage in more child-centred methods, ask more questions of the students, provide more meaningful feedback, and counter their biases.

IAI offers a powerful tool to break the trend of 'teach as you were taught'.

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Appendix A: Video Summary

A short video has been produced to summarise the contents of this report.

WHAT IS IAI?

WHAT SHOULD BE CONSIDERED WHEN PRODUCING AN IAI SERIES?

Appendix B: A Selection of IAI Implementation Examples

Bolivia: RLP

Bolivia's IAI programme was initiated as part of the multinational RLP (Radio Learning Project) in 1988 and was locally administered by the Catholic organization Fe y Alegria. It produced IAI for grade 2-4 mathematics, which were adapted from the original Nicaraguan series. They also developed their own original mathematics programming for grade 5, and a short series of health programmes targeting 10-13 year olds. The language of broadcast was Spanish, and the target beneficiaries were children in formal schools.

- Mid-Term Evaluation Report 1991
- Bolivia Implementation Final Report 1993
- Multinational Project Final Report 1990

DRC: PAQUED

The Democratic Republic of the Congo's IAI project was called PAQUED (*Project d'Amélioration de la Qualité de l'Education*) and ran from 2009-2014. It produced French and mathematics lessons for grades 1-6, as well as programmes on teacher training and community school organization and management. The language of broadcast was French. The target beneficiaries were children and their teachers in grades 1-6 as well as community members involved in managing schools.

- Project Overview Video
- Global Digital Library Downloads

Guinea: FQEL

The Guinea IAI project was called FQEL (Fundamental Quality and Equity Levels). It produced IAI for grades 1-6 in language, mathematics and science. The language of broadcast was French. The target beneficiaries were children and their teachers in grades 1-6, and the project ran from 1997 to 2005.

- Programme Evaluation Report 2006
- Global Digital Library Downloads

Haiti: EDA

The Haiti IAI project was called EDA (*Edikasyon a Distans pou Ayiti*). It produced IAI for literacy and mathematics in grades 2-4, in addition to civic education, health, and the discussion of environmental issues. The language of broadcast was Haitian Creole. The project reached an estimated 352 schools and 45,000 students, 48 per cent of whom were girls. A separate project named Edikayson Kle Lavni (EKLA) was also created to deliver accelerated education programming to out-of-school youth.

- Project Overview Video (English)
- Project Overview Video (French)
- Final Student Assessment Report 2004
- Global Digital Library Downloads

Honduras: RLP

The original Honduras IAI project was initiated as part of the multinational RLP (Radio Learning Project) in 1988 and was locally administered by a private agency called ADVANCE. It began producing IAI for grades 1-3 in mathematics after a summative evaluation showed remarkable learning gains. IAI learners had almost double the achievement scores of those in schools without IAI. The language of broadcast was Spanish. The project was the first to sell its IAI materials commercially to offset production costs and to ensure sustainability after the donor funding ended.

- Project Annual Report 1988
- Multinational Project Final Report 1990

Honduras: Juego y Aprendo

A more recent programme was called *Juego y Aprendo* ('Play and Learn'). It produced IAI for preschool children aged 3-5 in early childhood centres as well as their caregivers in 2004. The language of broadcast was Spanish.

- Project Overview Video
- Summative Evaluation Report 2005
- Global Digital Library Downloads

India: T4

India's project was called Technology Tools for Teaching and Training. It produced an IAI programme called *English is Fun* for the early levels of English language speaking and comprehension. The language of broadcast was English and the target beneficiaries were primary learners, with a particular emphasis on girls. The project ran from 2004-2010 and its IAI reached 200,000 schools and 13 million students.

- Project Overview Video

Indonesia: DBE2

The Indonesia IAI programme was called Decentralized Basic Education. It produced school-readiness IAI for kindergarteners and their teachers. The language of broadcast was Bahasa Indonesia.

- Annual Report Summary 2009
- Global Digital Library Downloads

Kenya: RLAP

The original Kenyan programme was the first IAI project in Africa. It was called the Radio Language Arts Project (RLAP), and was produced for grades 1-3. The subject and language of broadcast was English. The project ran from 1979 to 1984 and is credited with evolving the IAI format with new innovations, including being the first to call on students to demonstrate an action for their classmates.

- Research Conference Paper Presentation 1983
- Project Summary Report 1986

Kenya: G-Youth

A more recent Kenyan programme was 2009's Garissa Youth project, which produced IAI for the upper primary grades in civics education called *Learning for Living*. The language of broadcast was English. This youth-empowerment project enabled learners to design and lead initiatives to improve opportunities for themselves and their communities. This gave Garissan young people greater access to the world of work and kept them in school for secondary and higher education. Civic activities promoted peace and tolerance among their diverse communities.

- Project Assessment and Design 2009
- Project Final Report 2016
- Global Digital Library Downloads

Lesotho: Let's Learn English

The Lesotho IAI programme, *Let's Learn English*, was initially adapted from Kenya's RLAP materials and produced IAI for grade 1. The subject and language of broadcast was English. It was first piloted in 1987 and then rolled out to classrooms nationwide a year later.

- Cost Effectiveness Study 1991
- Case Study, Technical Notes Series p. 15

Liberia: AYP

Liberia's IAI was called the Advancing Youth Programme (2012-2017), and its target beneficiaries were out-of-school youth aged 15-35 as well as their instructors in accelerated learning centres. The language of broadcast was English. This was the first project in the world to broadcast IAI directly to learners at home, as necessitated by the social distancing regulations of the Liberian Ebola crisis.

- AYP Assessment Report 2013
- Performance Evaluation 2016
- Global Digital Library Downloads

Madagascar: ATEC/STEP

Madagascar's IAI project ATEC/STEP (*Appui Technologique aux* Éducateurs *et Communautés* [Supporting Technology for Educators and Parents]) produced a radio series called *Izaho koa mba te hahay!* (I want to learn too!). The show was for grades 1-2 and covered mathematics and the French and Malagasy languages, which were also the languages of broadcast.

- Project Overview Video
- New Pathways Report 2008

Malawi: Tikwere

The Malawi programme was called *Tikwere!* (Climb Up!). It produced IAI for grades 1-4 nationwide in Chichewa, mathematics and English. The language of broadcast was Chichwea. The programme ran from 2007 to 2012, and the broadcast has been sustained by the government continuously since then. It was introduced to support the rollout of the Ministry of Education's PCAR (Primary Curriculum and Assessment Reform) initiative.

- Project Final Report
- Global Digital Library Downloads

Mali: PHARE

Mali has had a number of different IAI projects. The PHARE project (*Programme Harmonisé d'Appui au Renforcement de l'Education,* 2008-2013) created IAI to teach literacy to learners in grades 1 to 3. The language of broadcast was French.

- Global Digital Library Downloads
- Project Overview Video

Mali: SIRA

A second Malian IAI project called SIRA (Selected Integrated Reading Activity, 2016-present) focused on grade 1 pupils in the regions of Segou, Sikasso and Koulikoro. The language of the programming was Bamanankan.

- Annual Report 2017
- Annual Report 2018
- Annual Report 2019
- Global Digital Library Downloads

Nicaragua: Radio Mathematics

The Nicaraguan IAI programme Radio Mathematics ran from 1974 to 1979 with USAID funding and implementation support from Stanford University. It is widely credited with being the first production of IAI, and introduced the expectation that students talk out loud to answer questions posed by the radio teacher. It was focused on mathematics in formal classrooms after preliminary research showed that this was a subject that most teachers found difficult. Radio Mathematics led to a 26 per cent improvement in test scores.

- LearnTech Case Study 1994
- World Bank Report 1977

Nigeria: LEAP

The Nigerian IAI was called LEAP (Literacy Enhancement Assistance Programme, 2001-2003), and was produced for grades 5 and 6. The subject and language of broadcast was English. The project used an integrated approach to improve English language literacy and numeracy in primary schools through an innovative combination of IAI, policy support, teacher training and community participation.

- Project Final Report 2002
- Global Digital Library Downloads

Pakistan: ESRA

Pakistan's IAI programme, ESRA (Education Sector Reform Assistance), was embedded within a larger education project with more generalized support to the sector. The IAI component produced content to teach English as a second language using a show called *Time for English*. The languages of broadcast were English and Urdu, and the target beneficiaries were children in grade 1. The project designed followed a whole-school improvement model and used ICT to: increase participation, awareness, and ownership on the part of all stakeholders; enhance the efficiency of educational administration; improve the classroom environment to positively impact enrolment and retention; and build community and parental support for local schools.

- Project Final Report 2008
- Global Digital Library Downloads

Papua New Guinea: RSP

In Papua New Guinea, the IAI was called RSP (Radio Science Project). Starting in 1986 it produced programmes for grades 4-6 in science, which included information on health, agriculture and community life. The lessons were used semi-weekly to set up science experiments that the teachers then helped learners perform after the broadcast. RSP was so popular among teachers that they successfully advocated for its institutionalization.

- LearnTech Case Study Series 1994
- Project Final Report 1990
- Project Evaluation 1989

Rwanda: L3

The Rwanda IAI programme was called L3 (Literacy, Language and Learning Initiative, 2011-2016). It produced IAI for the subjects of literacy, numeracy and English as a second language and was broadcast in Kinyarwanda and English. The target beneficiaries were children in grades 1 to 4. It was part of a wider materials package consisting of teacher guides, read-aloud stories, and books for pupils.

- Project Executive Summary 2017
- Global Digital Library Downloads

Sierra Leone, Liberia & Guinea: Radio in a Box

In an adaptation of IAI involving the concept of audience interaction, the IFRC deployed 'Talkback radio' in an initiative called Radio in a Box. In this format a pickup truck is loaded with the equipment needed to run a mobile radio station and is driven to rural locations to then broadcast live programming. In 2015 this approach was deployed to combat Ebola when, after donating 'crank' radios to local populations, the Red Cross used 'Radio in a Box' to broadcast highly localized programmes. This allowed the broadcasters to provide reliable health messages to populations who were outside the reach of conventional radio broadcasts, and who sometimes had shown distrust of outside messaging. It fostered new forms of trust through creating the broadcast programming live in front of each community. This trust was consolidated by sharing community voices on the air, engaging them with Forum Theatre performances, and generally facilitating live interaction with the community to create the programming.

- Sierra Leone project summary Interview
- Liberian National Red Cross article
- Guinea Radio in a Box footage

Somalia: SIRIP

Somalia's IAI was called SIRIP (Somalia Interactive Radio Instruction Project, 2005-2011), and produced programmes for grades 1-5 in Somali literacy, and grades 1-4 in mathematics. The language of broadcast was Somali. The programmes were distributed via both radio and digital media players. SIRIP reached over 330 thousand children in formal, non-governmental, Quranic, and community schools, as well as disadvantaged, out-of-school children most in need of education.

- Project Overview Video
- Teacher Training Video
- Global Digital Library Downloads

South Sudan: SSIRI

The South Sudan initiative, SSIRI (South Sudan Interactive Radio Instruction, 2004-2012), produced IAI for two separate age groups. *Learning Village* was designed for grades 1-4 and covered all primary subjects, and RABEA (Radio-Based Education for All) was an English language and civic education programme for youth and adults. The language of broadcast was English for both programmes. Finally, a third series provided IAI for a 12-week accelerated in-service teacher training course.

- Performance Evaluation Report 2012
- Global Digital Library Downloads

Tanzania: Timebound

Tanzania's IAI was called the Timebound Programme and it began in 2002. It produced IAI for grades 1-4 in literacy and numeracy, and life skills related to health, hygiene, nutrition, and HIV/AIDS prevention. The series *Mambo Elimu* (Education Matters) was broadcast was Kiswahili and targeted out-of-school child labourers, who gathered in community learning centres in 10 districts of Tanzania in the afternoons. Upon their completion of grade 4 they were assisted in transitioning back into the formal schooling sector.

- African Bureau Education Division Case Study 2005
- Global Digital Library Downloads

Zambia: Learning at Taonga Market

The Zambian IAI programme, *Learning at Taonga Market*, taught grades 1-7 in the full primary curriculum of subjects. The language of broadcast was English, though translation time was built into the programme so the live teacher supporting each classroom could translate instructions into the learner's mother tongue. The target beneficiaries began as out-of-school children in community learning centres but as uptake grew it spread to community schools and finally formal schools as well. The programme is noted as the first to pilot the use of an MP3 player (the video iPod) which was loaded with both the IAI content and professional development videos for the teachers. The project ran from 1999 to 2009 though the programmes remained on air until 2012.

- Project Overview Video
- Global Digital Library Downloads

Zanzibar: RISE

Zanzibar's programme was called RISE (Radio Instruction to Strengthen Education, 2006-2010), and produced IAI for preschoolers and students in grades 1 and 2 in mathematics and in Kiswahili and English, which were also the languages of broadcast. The target beneficiaries were children in non-formal, community-led preschools (of which the project helped establish 180) and Standard One centres. RISE also assisted with the continuation of mainland Tanzania's *Mambo Elimu* programmes.

- Project Overview Video
- Project Final Report 2010
- Global Digital Library Downloads

Appendix C: Worldwide IAI Catalogue

Click on title to open link

Country	Project	Technical Assistance	Subject	Language	Grade Level
Bangladesh	BRAC		English	English	Secondary school
Bolivia	PER	Education Development Center	Mathematics	Spanish	Grades 1–5
	PER	Education Development Center	Health	Spanish	Grades 3–4
	PER	Education Development Center	ECD	Spanish	Kindergarten
Burkina Faso		Education Development Center	ECD	Moore and Gourmachema	Preschool
Comoros		Education Development Center	ESL	English	Grades 1–2
Costa Rica		Education Development Center	Environmental education	Spanish	Grades 4–5
		Education Development Center	Mathematics	Spanish	Grades 1–6
Dominican Republic			Integrated programming	Spanish	
DRC	ECD IAI	Education Development Center	Kindergarten	Lingala	Kindergarten
	PAQUED	Education Development Center	French, mathematics, reading	French	Grades 1–6
El Salvador			Mathematics	Spanish	Grades 1–2
Ethiopia	BESO	Academy for Educational Development	English	English	Grade 1
	IRIS	Education Development Center	Reading and mathematics	Somali	Grades 1–2

Guatemala		Academy for Educational Development	Spanish, mathematics	Spanish	Grades 1–3
Guinea	FQEL/ABEL	Education Development Center	French, mathematics	French	Grades 1–6
Guyana	BEAMS	Education Development Center	Mathematics	English	Grades 1–2
Haiti	EKLA	Education Development Center	Youth literacy and mathematics	Creole	Levels 1–2
	FAD/EDA	Education Development Center	Primary literacy	Creole	Grades 2–4
			Primary mathematics	Creole	Grades 2–4
Honduras	ADVANCE		Mathematics	Spanish	Grades 1–3
	ADVANCE		Adult basic education	Spanish	Grades 1–6
	EDUCATODOS	Education Development Center	Middle school	Spanish	Grades 7–9
	Juego y Aprendo	Education Development Center	ECD	Spanish	Kindergarten
India	T4	Education Development Center	Language and mathematics	Multiple	Grades 1–4
Indonesia	DBE2	Education Development Center	Kindergarten	Bahasa Indonesia	Preschool
Kenya		Academy for Educational Development	English	English	Grades 1–3
Latin America and Caribbean	English for Latin America (ELA)	Education Development Center	Literacy	English and Spanish	Grades 4–12, Levels A1 and A2
Liberia	AYP	Education Development Center	English, mathematics, life skills for youth	English	AEP Levels 1–3
Lesotho	English in Action	Academy for Educational Development	English	English	Grades 1–3

Madagascar	STEP/ATEC	Education Development Center	French	French	Grades 1–6
			Malagasy	Malagasy	Grades 1–6
			Mathematics	French	Grades 1–6
			English	English	Grades 1–6
Malawi	Tiyende	Education Development Center	English	English	Preschool
	Tikwere	Education Development Center	In-service teacher training	English	Standard 1
			English and mathematics	Chichewa	Standards 2 and 3
	Tikwere Extension	Education Development Center	English and mathematics	Chichewa	Standards 1 and 4
Mali	Paje-NIETA	Education Development Center	Songhai literacy	Songhai	mlearning[12] for youth
			Mathematics	Bamanankan and Songhai	mlearning for youth
			Functional French	Bamanakan and Songhai	mlearning for youth
			Bamanakan literacy	Bamanankan	Year 2
			Entrepreneurship	French and Songhai	mlearning for youth
			Bamanakan literacy	Bamanankan	mlearning for youth
	PHARE, SIRA, ERSA, FFE3	Education Development Center	Bamanankan literacy	Bamanankan	Grade 1
			French literacy	French	Grades 1–3
	AEEQ (Accelerated Basic Education)	Education Development Center	Tamashek literacy	Tamashek	Levels 1 and 2 (Equivalent to grades 1 and 2)
			Mathematics	Tamashek	Levels 1 and 2 (Equivalent to grades 1 and 2)
			Songhai literacy	Songhai	Levels 1 and 2 (Equivalent to grades 1 and 2)
			Mathematics	Songhai	Levels 1 and 2 (Equivalent to grades 1 and 2)

12 Mlearning means 'mobile learning' or learning outside a classroom using a mobile device

Nepal	Radio Nepal	Education Development Center	ECD	Nepali	Kindergarten
	Distance Education Center	Education Development Center	English, mathematics	English	Grades 3 and 5
Nicaragua		Stanford	Mathematics	Spanish	Grades 1–4
Nigeria	LEAP	Education Development Center	Mathematics, literacy	English	Grades 4–6
Pakistan		Academy for Educational Development	English	English	Grades 3–5
	ESRA	Education Development Center	English literacy	English	Grades 1–2
Papua New Guinea		Education Development Center	Sciences	English	Grades 4–6
Paraguay	Tikichuela	Education Development Center	Mathematics	Spanish and Guaraní	Preschool
Portuguese-speaking countries in Africa		UNESCO and the Netherlands	Mathematics, Portuguese	Portuguese	Grades 1–4
Rwanda	L3	Education Development Center	English	English	Grades 1–4
			Kinyarwanda	Kinyarwanda	Grades 1–4
			Mathematics	Kinyarwanda	Grades 1–4
Somalia	SIRIP	Education Development Center	Literacy	Somali	Grades 1–5
			Mathematics	Somali	Grades 1–5
			Training of Trainers	Somali	Adult
South Africa	English in Action	Open Learning Systems Ed Trust	English	English	Grades 1–3
South Sudan	SSIRI Learning Village	Education Development Center	Integrated primary subjects	English	Grades 1–4
	SSIRI RABEA	Education Development Center	English	English	Youth Level 1 (Beginner) through 4 (Advanced)

Tanzania	Mambo Elimu	Education Development Center	English, Kiswahili, mathematics and science for youth	Kiswahili and English	Levels 1–4
Thailand	Center for Education Technology	Short-term consultant	Mathematics	Thai	Grades 1–2
Venezuela		none	Mathematics	Spanish	Grades 1–3
Zambia	QUESTT	Education Development Center	Local language literacy, English, mathematics, social studies, science, life skills	English and Local Languages	Grades 1–3
			English, mathematics, social studies, science, life skills	English	Grades 4–7
			In-service teacher training	English	Grades 1–7
Zanzibar	RISE Tu Tu	Education Development Center	Kiswahili and English	Kiswahili and English	Preschool and Grade 1

Appendix D: Examples of IAI practices in selected countries in the SADC region

Examples of IAI practices in selected countries in the SADC region

CASE STUDY: ZAMBIA

In 2000, when Zambia had lost many teachers and parents to HIV/AIDS, the pilot programme Interactive Radio Instruction for Out-of-School Children reached orphans and out-of-school children in community learning centres led by volunteer facilitators with 100 half-hour broadcasts that enabled them to master the grade 1 curriculum. Based on the positive results of the initial pilot, Zambia's USAID-funded Quality Education Services Through Technology (QUESTT) project partnered with the Ministry of Education's Educational Broadcast Services (EBS) division and community radio stations to develop a more refined, center-based model for grades 1-7 to reach the most vulnerable children. Over the next 10 years, the *Learning at Taonga Market* IRI programmes were delivered to 3,000 community learning centres and 1.2 million students, laying the foundation for a dramatic increase in access to education for the most marginalized children.

The programmes included an integrated basic education curriculum along with life skills and HIV/AIDS segments aimed at primary school students. A separate but complementary series provided community mentors with in-service professional development that not only strengthened their teaching skills but also prepared many of them for obtaining positions in formal schools. *Taonga Market* students consistently outperformed their peers in formal government schools – an impressive outcome given that the *Taonga Market* students were primarily orphans meeting for only 40 minutes per day with mentors who were not trained teachers. The average grade 2 *Taonga Market* student scored at the 70th percentile in mathematics while their formal school counterpart scored at the 50th. Similar positive gains were seen at each grade level and in English language, which most students did not speak at home. Because of these positive results, the Permanent Secretary of Education decided that the programmes should also be used in formal schools.

To see *Taonga Market* in action, please click through to the following video

CASE STUDY: MADAGASCAR AND COMOROS

In the late 1990s, enrolment in primary schools in Madagascar nearly doubled. The majority of teachers were community-based and many had no training. Most schools were situated in rural areas, often with little or no access to electricity, and were resource-constrained. Nearby Comoros faced many of the same challenges. The Ministry of Education needed assistance to improve its capacity to reach and train these teachers in a cost-effective, sustainable manner. From 2005 to 2011, the USAID-funded STEP/ATEC project provided this support.

In Madagascar, ATEC collaborated with the Ministry of National Education and Scientific Research to help it design, develop and implement IRI programmes that could offer high quality professional development to teachers. These programmes provided training in active, hands-on, student-centred instruction with lessons focusing on topics such as group work, open-ended questioning techniques and the construction of knowledge. They also provided training in the teaching of English as a second language. For students, the IRI series *Izaho koa mba te hahay!* (I want to know too!) provided instruction in mathematics, French and Malagasy three times per week for grades 1 and 2. By grade 6, some subjects were delivered with French as the language of instruction. Initially the programmes were designed to reach 600 schools but ultimately the broadcast range included 20,000. As a result, the Ministry decided to incorporate the programmes into their certification for community teachers. This gave those teachers, who had had little or no training, an alternative way to prove their proficiency in a designated list of competencies. Parents and community members also tuned in to programmes specifically designed to inform them about PTAs and their role in the education of their children.

In the Comoros islands Mohéli and Anjouan, STEP worked with local Ministries of Education to improve the quality of education through IRI-based preservice and in-service professional development. At the beginning of the project, 62 per cent of first grade teachers and 55 per cent of second grade teachers incorporated the evidence-based teaching practices modelled by the programmes into daily instruction. By the end of the project these percentages had increased to 96 and 93 respectively. Parents' awareness of their roles and responsibilities also increased: 86 per cent said they had been involved in efforts to improve the quality of their schools as a result of listening to the programmes. Their subsequent actions included classroom construction, multi-year action planning to improve educational quality and a plan to provide fresh drinking water at school. Local school administrators in Comoros received kits with pre-recorded audio programmes which enabled them to strengthen the in-service training of 89 per cent of primary school teachers. By the end of the programme, the project included 70 community listening groups. Eighty-six per cent of Comorian high school English teachers demonstrated improved practices in the classroom.

To see the project in action, please click through to the following video

CASE STUDY: MALAWI

In 2007, the *Tikwere* project in Malawi used the power of interactive radio to improve learning outcomes in basic education for grades 1 to 3 while also disseminating a new primary curriculum throughout the country. In a context of often large, overcrowded classrooms with teachers often using lecture or rote memorization, these IRI programmes provided guidance. Daily 30-minute IRI lessons produced in collaboration with the Ministry of Education gave instructional support to teachers in literacy, numeracy, English and life skills. The programmes were able to bring to life the new curriculum, developed under the Ministry's Primary Curriculum Assessment Reform, by modelling the new lessons and incorporating active, learner-centred techniques. One hundred and fifty lessons were produced for each of the three grades. As a result, enrolment increased, learning gains were made, and there was a reduction in the achievement gap between boys and girls as well as between urban and rural students.

Following the primary school programmes, the project generated pre-school, grade 4, out-of-school youth and pre-service teachers' programmes. The pre-school *Tiyende!* programmes were used in community-based childcare centres which had previously been where meals and caregiving took place. The arrival of *Tiyende*! transformed the centres into spaces of early childhood development including education in pre-literacy and pre-numeracy skills. As was the case with *Tikwere*, the lessons were engaging and included not only embedded professional development for teachers and caregivers but also songs, games, activities and stories that kept the young learners engaged. A peer-to-peer (P2P) model was implemented whereby the IRI-trained teachers were able to train others over the course of two weekends with the support of audio instruction.

By the end of the project, 25,000 teachers and 2.7 million students had participated. Evaluation data demonstrated that caregivers' skills in providing effective early childhood instruction significantly improved. Moreover, the children attending the *Tiyende*! centres scored significantly higher than control school peers in the knowledge and skills that prepared them for an easy transition into primary school. Primary school students participating in the programmes showed significantly better scores in mathematics, English and Chichewa compared to their control-school peers, including a 10 per cent outcome advantage in mathematics at grade 1.

CASE STUDY: DEMOCRATIC REPUBLIC OF THE CONGO

In 2009, the Democratic Republic of the Congo faced severe educational challenges: enrolment was only 60 per cent, absenteeism was high, and 20 per cent of learners dropped out after their first year. The *Project d'Amélioration de la Qualité de l'Education* (PAQUED) addressed the need to improve the quality of instruction to encourage greater enrolment and retention. IRI programmes were developed for grades 1 to 6 in French and mathematics. They reached 30,000 teachers and 1.2 million students in 3,000 schools and served as a key element of an intensive effort to support the Ministry of Education's new reading approach. The grade 1 PAQUED students significantly outperformed their control-school peers in reading, while 21 per cent of the grade 2 students reached or surpassed the Ministry's French fluency benchmarks for grade 3. These gains were sustained and carried over into their Lingala language performance in the following year. An evaluation of teaching practice also demonstrated that 14.2 per cent of the observed changes in independent instructional practices were attributable to the IRI programmes.

PAQUED served as a springboard for a range of other IRI and distance education efforts. The tablet-based digital professional development resources provided to PAQUED teachers were so well received that the World Bank later supported the development of ten digital training packages in general pedagogy for all teachers. Demand for more programming led to a World Bank-funded Lingala pilot of early childhood IRI. The higher-grade programmes from PAQUED have been remobilized to serve out-of-school learners in the USAID-funded Integrated Youth Development Programme. PAQUED has also been used in Tanzania by the United Nations High Commissioner to serve refugees from the Democratic Republic of the Congo.

To see this project in action, please click through to the following videos:

English video

French video

United Nations
Educational, Scientific and
Cultural Organization

Education
Sector

Handbook for Interactive Audio Instruction

Planning and implementing radio lessons in sub-Saharan Africa

IAI has experienced a resurgence of interest in Sub- Saharan Africa, as recent pandemics caused by Ebola and COVID-19 led to widespread school closure. In areas without easy and affordable access to the internet, radio remains the only cost effective means of reaching large numbers of out-of-school children. Even where broadband is available, it is a challenge to find educational solutions that work for the youngest learners who struggle to sit still through a webinar-style class. For these reasons, policy-makers are increasingly looking at IAI as a promising avenue for ensuring the continuity of learning, thus prompting the development of this handbook. This handbook is designed for education policy-makers, curriculum developers, and those charged with the professional training of teachers and facilitators. It is also written for members of the education development community interested in learning about IAI's myriad uses as a solution to the challenges they face in programme design and delivery.

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4 QUALITY EDUCATION

Sustainable
Development
Goals