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The use of testing to assess the contribution of Interactive Radio Instruction to
the quality of education in government schools

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from the evaluation reports prepared between 2005 and 2008

1. Background

Education Development Center (EDC) is a non-profit organisation based in the USA that works in many countries in Asia, Africa, America and Europe to advance solutions to some of the world's most urgent challenges in education, health and economic development.

EDC started working in Zambia in 1999 to assist the Ministry of Education in reducing the number of children who were unable to access education, which at that time stood at over 800,000. Trained and supported by EDC staff, producers from Educational Broadcasting Services produced a series of interactive radio instruction (IRI) programmes for Grade 1 learners, which were piloted in communities in Lusaka and Southern provinces. The communities found a venue for learning and a facilitator or mentor to run the class, while the project provided a radio, a mentor's guide and training for the mentor.

The pilot was successful in demonstrating that children learning through the radio attained considerable learning gains in language and mathematics, and the Ministry decided to take the programme to scale in all nine provinces in 2001. At the same time EBS was producing programmes for higher grades and in 2007 broadcast lessons for all grades from one to seven were broadcast. The programmes are called *Learning at Taonga Market* (LTM) and are broadcast each day on ZNBC 2 from 9.00 to 15.30 and also on ten community radio stations.

There are 50 programmes for each grade per term, so one 30-minute broadcast for each grade every day for ten weeks. The lessons cover all the objectives of the Ministry of Education basic education curriculum in the major subject areas. The Mentor's Guides give a plan for each lesson and activities to be done by the teacher before and after each broadcast. The lessons use active learning techniques and help the teachers to practise good teaching methods. The children hear a good model of spoken English from the radio teacher, but at the lower grades, the classroom teacher translates the lessons into the local language.

The demand for the program grew steadily from 2000. In 2001 there were 168 community run centres (IRI centres) reaching 7782 learners. In 2005 there were 814 centres with 54,859 learners listening to the programmes. About a third of these were community schools, which had realised the advantages of having professionally produced programmes to support their untrained teachers.

In 2008, according to the Ministry's data, there were 1,877 community schools with 360,253 learners, which were using the interactive radio instruction programmes.

As a result of the success of the programme in IRI centres and community schools, the Ministry agreed to test the effectiveness of the programmes in government basic schools with trained teachers.

2. 2005: Pilot in Grade 1 in 36 government basic schools

In March 2005, the Ministry of Education approved a pilot to use *Learning at Taonga Market* educational broadcasts in Zambian government schools. Members of In-service Teacher

Education determined that the pilot should take place at Grade 1 in schools that are understaffed, have untrained teachers or in which teachers are teaching more than one grade. Seven districts were chosen for the case study: Chongwe and Luangwa in Lusaka Province, Masaiti and Lufwanyama in Copperbelt Province, Mkushi and Serenje in Central Province and Solwezi in North Western Province. District education officers identified five schools in each district that fit the criteria of the case study, and Grade 1 teachers from each of the schools were trained to use *Learning at Taonga Market* educational broadcasts in their Grade 1 classes as a supplement to their normal teaching. Thirty-nine Grade 1 teachers from 36 government schools were trained from 13th to 15th April 2005. Since 50 LTM lessons had already been broadcast before the pilot began, the teachers used cassette tapes to help Grade 1 learners catch up during the first school break and the early part of Term 2. Lessons 51 through 150 were delivered via daily radio broadcasts during the second and third terms.

The learning gains of pupils were assessed by comparing the gains of learners enrolled in the 36 GRZ schools that used the *Learning at Taonga Market* broadcasts with learners enrolled in 14 GRZ schools not using the radio broadcasts. The evaluation efforts involved an examination of academic performance on two tests. A pre-test administered late April and a post test administered in November.

2.1 Study Goals

The overall goal of this evaluation was to determine if the IRI methodology and *Learning at Taonga Market* radio programme is an effective resource for teaching Zambian language literacy, English language, numeracy and life skills to Grade 1 pupils in Zambian government schools.

The evaluation questions were:

1. Do the pilot schools receive the radio broadcasts?
2. Can teachers conduct lessons using the broadcast effectively?
3. Do teachers integrate the educational broadcasts into their daily schedules and do the programmes help them teach efficiently?
4. Are learning gains greater for learners who use the radio broadcasts than those who do not use them?

The first three questions are about the practicality of using the radio broadcasts in GRZ schools. Answers to these questions were sought by conducting field monitoring visits to each pilot school. Monitoring questionnaires were used to collect information during classroom observations and discussions with the teachers. The fourth evaluation question about learning gains was answered by administering learning achievement pre-tests and post-tests in both experimental schools and control schools.

2.2 Results

Radio reception

During the field monitoring it was found that almost 90 percent of the selected schools had radio reception that was either very clear or acceptable, but only 65 percent reported that the radio reception was either very clear or acceptable during all five days during the week. Luangwa and Solwezi districts had the most problems with radio reception. The field

monitors noted that some teachers did not make use of extension cables and other means that could be used to enhance reception.

Conducting lessons

Field monitors found that the teachers were able to teach the Learning at Taonga Market (LTM) radio programmes effectively. The classroom teachers followed the instructions of the radio teacher. The classroom teachers used all the listed materials for the lessons that were observed. Teachers were also able to engage the learners during the lesson.

Field monitors also found that learners were highly motivated during the lessons, liked songs and games, and enjoyed being taught with the radio broadcasts. The learners' enjoyment of the programme is reflected in the enrolment gains at the experimental schools. It was observed that the radio broadcasts promoted good class and time management among teachers and that learners were focused on the lessons.

Integration of the radio broadcasts into daily schedule

When asked how easy it had been to integrate the radio broadcasts into the daily teaching schedule, a little more than half of the teachers reported that it was either very easy or easy. Seventy percent of the teachers using the radio broadcasts found that they now spend less time preparing for the lessons than before. The teachers spent less time because the lesson plans in the mentor's guide describe the day's activities and needed materials. Having a prepared lesson plan for Grade 1 gave the teachers additional time to prepare lesson plans for the other grades they were teaching.

All but two of the 36 schools had a complete set of New Breakthrough to Literacy (NBTL) materials, and more than 75 percent of the teachers were trained in NBTL. Seventy percent of all the teachers used NBTL materials to teach literacy in addition to the LTM radio programme. Twenty two of those teachers continued to conduct lessons with four ability-level groups, indicating that they had been able to integrate the two teaching resources.

Some teachers reported that they were not clear about the purpose of introducing LTM into their class and that more information at the beginning of the pilot study would have helped. Some teachers also mentioned that they were confused about whether LTM programmes should replace or supplement NBTL lessons.

2.3 Overall Learning Gains

A pre-test/post-test design was used to measure learning gains. The same test was administered to a sample of learners at the beginning of the pilot in April and May and at the end of the school year in November. Learning gains were determined by subtracting the average performance on the pre-test from the average performance on the post-test. The learners who used IRI made learning gains of 21.3 percent, while learners in the control schools made gains of 18.5 percent. The overall gains of the IRI learners in GRZ schools using IRI were higher than the gains of learners in the control GRZ schools.

Learning Gains by Subjects

The first table depicts the gains from pre-test to post-test for IRI learners and learners in control schools in Zambian language literacy, numeracy and English. Learners using IRI and learners in the control schools made gains in all three subjects. The IRI learners made greater gains than the control group in the subjects of numeracy and English. In numeracy, the IRI learners gained 27.6 percentage points while the control group gained 21.6 percentage points,

giving the IRI learners a greater gain of 6 percentage points. In English, the IRI learners gained 19.1 percentage points against the control groups' gain of 12.3 percentage points, giving the IRI learners a greater gain of 7.8 percentage points. In the area of Zambian language literacy, the control group made slightly greater gains than the IRI group. The control group gained 19.0 percentage points, while the IRI group gained 17.7 percentage points, giving the control group a greater gain of 1.3 percentage points.

Table 1: Learning gains by subject

	Zambian Language	Numeracy	English
IRI Learners in GRZ schools	17.7%	27.6%	19.1%
Non-IRI learners in GRZ schools	19.0%	21.6%	12.3%

Analyses of statistical significance show that IRI learners obtained statistically significantly greater gains than the learners in the control group in numeracy and English language. The difference in gains in the subject of Zambian language literacy is not statistically significant. In other words, the learners from both groups made similar gains in Zambian language literacy, while the pupils who used *Learning at Taonga Market* obtained significantly better command of English language and numeracy skills.

Assessment results indicate that *Learning at Taonga Market* did not have the same impact on learning gains in the area of Zambian language literacy. This could be because the teachers in the control schools might have put greater emphasis on Zambian language literacy activities due to recent training in NBTL teaching methods, and the fact that NBTL is an effective programme.

Learning Gains by Gender

In addition to analysing learning gains across subject areas, the evaluation also determined whether learning gains were equally attributed to boys and girls. The next table depicts the average score gain from pre-test to post-test for boys and girls in the IRI group and the control group. The table shows that the difference in learning gains between girls and boys in the IRI schools is 0.5 points, with girls achieving slightly higher gains than boys. On the other hand, the boys in the control schools obtained gains that were 8.6 points higher than the girls..

Table 2: Learning gains by gender

	IRI Learners in GRZ schools	Non-IRI learners in GRZ schools
Girls	18.9%	11.6%
Boys	18.4%	20.2%
Difference	0.5%	-8.6%

An analysis of this data indicates that the difference in learning gains between girls and boys in control schools was statistically significant, whereas there was no significant difference between the learning gains of boys and girls in IRI schools. The results seem to suggest that *Learning at Taonga Market* makes learning more accessible to girls.

Enrolment Gains

Enrolment data was collected twice during the year: once during the beginning of the pilot in April and May and once during the end of the term in November. The graph below shows the average class size in the 36 IRI schools and the 14 control schools.

Table 3: Average numbers of learners in IRI classes and control classes

	IRI Classes	Control Classes
Term 1	54.7	57.6
Term 3	57.7	47.5

While the enrolment in the IRI classes increased 5%, the average size of the classes in the control schools decreased by 17.5%. That is, control schools tended to experience attrition in their Grade 1 enrolment, while IRI schools tended to attract more Grade 1 pupils during the school year.

2.4 Overall Conclusion

The Learning at Taonga Market programme led to greater learning gains in the areas of numeracy and English language, gave girls equal access to learning gains and boosted enrolment and retention in the Grade 1 pilot schools. With proper training, teachers are able to conduct lessons effectively and integrate the programme with other elements of the curriculum. The overall conclusion of this report is that the *Learning at Taonga Market* programme is an effective tool for teaching first grade pupils in Zambian government schools.

3. Expansion to Grade 1 classes in all government schools

As a result of the positive findings in the 2005 pilot, the Ministry decided to make the IRI programme available to all GRZ schools which could receive the radio signal. Planning was done and preparations were made in 2006 and the programme was implemented in 2007 with funding from USAID. The process included the training of Ministry officials and teachers in the implementation and management of IRI. Over 4000 teachers and Ministry officials were trained, and 8000 radios and 13,500 mentor's guides distributed. At the end of the year learners were tested in Zambian language literacy and Numeracy to measure the impact of the radio programmes. The aim of the tests was to learn whether the significant results which had been found in the pilot programme would be replicated when the programme was expanded to a far greater number of schools

3.1 Sampling Design

It was decided to test 980 grade 1 learners in both IRI GRZ schools and control non-IRI GRZ schools. 660 learners were to be sampled from Grade 1 IRI GRZ classes and 320 learners

from non-IRI Grade 1 classes. The testing targeted learners in Central Province and Copperbelt Province. Chibombo and Serenje were selected from Central Province and Mufulira and Masaiti from Copperbelt Province.

A total of 928 learners from the 31 IRI GRZ Schools and 14 Control GRZ schools were tested.

Table 4: Number of schools in sample

Province	Total GRZ schools using IRI	Sampled GRZ schools using IRI	Control GRZ schools not using IRI
Central	54	17	11
Copperbelt	101	14	3
Total	155	31	14

Profile of learners in sampled GRZ schools

Table 5: Number of learners in sample by gender

Province	Total IRI Learners in GRZ schools		Total Learners in Sampled GRZ schools using IRI		Total learners in Control GRZ schools not using IRI	
	Male	Female	Male	Female	Male	Female
Central	4,895	4,703	181	177	92	90
Copperbelt	10,213	10,013	137	121	80	57
Total	15,108	14,716	318	298	172	147
Percentage	50.7%	49.3%	51.6%	48.4%	53.9%	46.1%

The difference in the average age of learners in IRI GRZ schools and Control GRZ schools was zero.

Table 6: Age distribution of learners in sample

	GRZ schools using IRI	Control GRZ schools not using IRI	Overall
Mean Age	7.7	7.7	7.7
Modal Age	7	7	7
Minimum Age	6	6	6
Maximum Age	8	7	7.5

3.2 FINDINGS

The response of the teachers

Results show that 100% of the teachers in IRI schools in both provinces found the broadcasts useful or very useful.

Table 7: Teachers' views on usefulness of LTM

Province		Frequency	Percent
Central	Very Useful	11	64.7%
	Useful	6	35.3%

	Total	17	100%
Copperbelt	Very Useful	12	85.7%
	Useful	2	14.3%
	Total	14	100%

Reception

All the 31 schools sampled in the evaluation had working radios. 55% of the schools on the Copperbelt and 45% of the Copperbelt schools had good reception.

Availability of Teaching and Learning materials

91% of the schools using IRI had the Grade 1 Mentor's Guide to aid in the delivery of quality teaching in schools.

Observations from lessons observed

LTM lessons were observed in 29 of the schools using the radio programmes. 73% of the schools used the language of play as language of classroom instruction. All except two of the teachers did pre- and post-broadcast activities as part of the LTM methodology. All except one of the teachers reported that LTM was useful in the delivery of lessons to the learners.

Table 8: Results of observation of lessons

Province		Central	Copperbelt	Total
Is language of play used in classroom instruction?	Yes	18 (64%)	15 (88%)	33 (73%)
	No	10 (36%)	2 (12%)	12 (27%)
Pre- and Post broadcast activities done	Yes	27 (93%)	16 (100%)	43 (96%)
	No	2 (7%)	0 (0%)	2 (4%)
Usefulness of LTM in class	Yes	27 (96%)	17 (100%)	44 (98%)
	No	1 (4%)	0 (0%)	1 (2%)

Do teachers integrate the educational broadcasts into their daily teaching schedule?

Only 3.3% of the schools reported that LTM lessons did not fit in the schedule every day. Teachers reported that they found it easy to integrate the broadcasts into their schedule because they found it easy to prepare radio lessons.

3.3 Performance of learners

Overall performance in Numeracy was good with learners scoring an average of 66.7% and learners from IRI GRZ schools performing better (71.7%) than those from Control schools (56.8%). Poor overall performance was recorded in Literacy with an average score of 23.2%. However, learners from IRI GRZ schools scored 28.0% in Literacy while learners from Control schools scored 13.7%. The findings are presented in the table below.

Table 9: Mean scores of learners by school type and sub-test

Type of school		Literacy (29 points)	Numeracy (26 points)	Total Overall (55 points)
Non-IRI GRZ schools [N=312]	Mean	4.0	14.8	18.8
	Percent	13.7%	56.8%	34.1%
IRI GRZ schools [N=616]	Mean	8.1	18.6	26.8
	Percent	28.0%	71.7%	48.6%

Total schools [N=928]	Mean	6.7	17.3	24.1
	Percent	23.2%	66.7%	43.7%

In both provinces learners using IRI performed significantly better than those who were not listening to the programmes.

Table 10: Performance by province, school type and sub-test

Province	Type of School		Literacy (29 points)	Numeracy (26 points)	Total Overall (55 points)
Central	Non-IRI GRZ schools [N=174]	Mean	3.2	15.8	19.1
		Percent	11.2%	60.8%	34.6%
	IRI GRZ schools [N=357]	Mean	5.1	17.2	22.3
		Percent	17.5%	66.2%	40.5%
	Total schools [N=531]	Mean	4.5	16.7	21.2
		Percent	15.4%	64.4%	38.6%
Copperbelt	Non-IRI GRZ schools [N=138]	Mean	4.9	13.5	18.4
		Percent	16.9%	51.8%	33.4%
	IRI GRZ schools [N=259]	Mean	12.3	20.6	32.9
		Percent	42.4%	79.3%	59.8%
	Total schools [N=397]	Mean	9.7	18.1	27.9
		Percent	33.5%	69.7%	50.6%
Total	Non-IRI GRZ schools [N=312]	Mean	4.0	14.8	18.8
		Percent	13.7%	56.8%	34.1%
	IRI GRZ schools [N=616]	Mean	8.1	18.6	26.8
		Percent	28.0%	71.7%	48.6%
	Total schools [N=928]	Mean	6.7	17.3	24.1
		Percent	23.2%	66.7%	43.7%

Influence of attendance on performance

During testing, the test administrators tested pupils with attendance rates ranging from Low to High. Administrators rated the attendance of pupils as High (attended 100-120 radio lessons), Medium (80-99 lessons) or Low (less than 80 lessons). Learners in IRI GRZ schools achieved higher scores in all categories than learners in non-IRI GRZ schools.

Table 11: Performance by attendance, school type and sub-test

Type of School	Attendance		Literacy (29 points)	Numeracy (26 points)	Total Overall (55 points)
Non-IRI GRZ schools	High [N=185]	Mean	5.1	15.3	20.4
		Percent	17.7%	58.8%	37.1%
	Medium [N=104]	Mean	2.4	14.2	16.6
		Percent	8.3%	54.4%	30.1%
	Low [N=3]	Mean	3.0	11.7	14.7
		Percent	10.3%	44.9%	26.7%
	Total [N=292]	Mean	4.1	14.8	19.0
		Percent	14.3%	57.1%	34.5%
IRI GRZ schools	High [N=395]	Mean	10.1	19.5	29.6
		Percent	34.9%	75.0%	53.8%
	Medium [N=208]	Mean	4.4	16.8	21.2
		Percent	15.3%	64.5%	38.6%

Type of School	Attendance		Literacy (29 points)	Numeracy (26 points)	Total Overall (55 points)
	Low [N=12]	Mean	6.5	22.6	29.1
		Percent	22.4%	86.9%	52.9%
	Total [N=615]	Mean	8.1	18.6	26.8
		Percent	28.0%	71.7%	48.6%

Total schools	High [N=580]	Mean	8.5	18.2	26.7
		Percent	29.4%	69.8%	48.5%
	Medium [N=312]	Mean	3.8	15.9	19.7
		Percent	13.0%	61.2%	35.7%
	Low [N=15]	Mean	5.8	20.4	26.2
		Percent	20.0%	78.5%	47.6%
	Total [N=907]	Mean	6.8	17.4	24.3
		Percent	23.6%	67.0%	44.1%

Performance by gender

Results show a very minimal difference in performance between female and male learners. Overall performance show that male learners scored 44.6% and female learners scored 42.8%. Male learners performed slightly better in both IRI and control GRZ schools than female learners.

Table 12: performance by gender, school type and sub-test

Type of School	Gender		Literacy (29 points)	Numeracy (26 points)	Total Overall (55 points)
Non-IRI GRZ schools	Male [N=170]	Mean	4.3	15.0	19.3
		Percent	14.7%	57.7%	35.0%
	Female [N=142]	Mean	3.6	14.5	18.1
		Percent	12.5%	55.8%	33.0%
	Total [N=312]	Mean	4.0	14.8	18.8
		Percent	13.7%	56.8%	34.1%
IRI GRZ schools	Male [N=318]	Mean	8.4	19.0	27.4
		Percent	28.8%	73.1%	49.8%
	Female [N=298]	Mean	7.9	18.2	26.1
		Percent	27.1%	70.1%	47.4%
	Total [N=616]	Mean	8.1	18.6	26.8
		Percent	28.0%	71.7%	48.6%
Total schools	Male [N=488]	Mean	6.9	17.6	24.5
		Percent	23.9%	67.8%	44.6%
	Female [N=440]	Mean	6.5	17.0	23.5
		Percent	22.4%	65.5%	42.8%
	Total [928]	Mean	6.7	17.3	24.1
		Percent	23.2%	66.7%	43.7%

Performance by Age

Results show that learners above the recommended grade age performed better than those in the recommended age category and below. There is minimal difference in performance between learners below and learners within the recommended age.

Learners in IRI GRZ schools performed better than those in non-IRI GRZ schools in both Numeracy and Literacy across all age categories.

Table 13: Performance by age, school type and sub-test

Age category	School type		Literacy (29 points)	Numeracy (26 points)	Total Overall (55 points)
Below recommended age (below 7 years)	Control schools [N=157]	Mean	3.3	14.2	17.5
		Percent	11.3%	54.6%	31.8%
	IRI schools [N=296]	Mean	8.2	18.1	26.3
		Percent	28.3%	69.7%	47.9%
Recommended age (7-8 years)	Control schools [N=92]	Mean	4.2	13.3	17.5
		Percent	14.3%	51.2%	31.8%
	IRI schools [N=179]	Mean	8.2	18.4	26.5
		Percent	28.1%	70.7%	48.2%
Above recommended age (above 8 years)	Control schools [N=63]	Mean	5.5	18.3	23.8
		Percent	18.8%	70.5%	43.3%
	IRI schools [N=141]	Mean	7.9	20	27.9
		Percent	27.1%	77.1%	50.7%

4. Results 2008 Grade 2

In 2008 *learning at Taonga Market* was rolled out to Grade 2 classes in GRZ basic schools. Demand for the programme was so great that the Zonal In-service Coordinators trained a total of 6775 teachers. Mentor's Guides for Grade 2 were printed and distributed but no additional radios were supplied since the Grade 2 classes could use the same radios as had been supplied for the Grade 1 classes.

4.1 Testing in Grade 2 in GRZ schools

Testing was conducted in Central, Copper belt, Southern and Western provinces in October 2008 and the results are still being analysed. The following is a brief account of the results processed so far.

A target of 1,160 Grade 2 learners in both IRI GRZ schools and control non-IRI GRZ schools were set to be tested during this period. 800 learners from Grade 2 IRI GRZ classes and 360 learners from control schools were to be tested. For various reasons, notably lack of time, the test administrators were only able to test 798 learners from IRI GRZ schools and 237 learners from Control GRZ schools.

4.2 Preliminary results of learner performance

In both IRI and non-IRI schools, learners performed relatively poorly in English and Zambian Language Literacy (below 40%) and better in Mathematics and Life Skills (above 40%). The total mean percent score stood at 42.3%. Even so, the IRI school learners performed slightly better than the non-IRI school learners. Performance in IRI GRZ schools was 43.2% while in non-IRI GRZ schools learners scored 39.4%, representing a 3.8% difference between IRI and Control learners.

The biggest differences can be seen in the English and Mathematics sub-tests (5.6% and 8.0% respectively).

The following results compare performance by school type and sub test:

Table 14: Results by school type and sub-test

School type		English [29 points]	Mathematics [13points]	Zambian Language [36 points]	Life Skills [8 points]	Overall total [76 points]
Non-IRI GRZ schools [N=237]	Mean	9.4	6.4	11.6	3.3	29.9
	Percent	32.5%	49.1%	32.2%	41.4%	39.4%
IRI GRZ schools [N=798]	Mean	11.1	7.4	10.7	3.4	32.8
	Percent	38.1%	57.1%	29.8%	42.0%	43.2%
Total [N=1,035]	Mean	10.7	7.2	10.9	3.3	32.1
	Percent	36.8%	55.3%	30.4%	41.9%	42.3%

The preliminary results seem to follow the same pattern as the findings from the Grade 1 study. That is, the IRI learners performed better than their counterparts who were not using the IRI programmes, except in the area of Zambian Language Literacy.