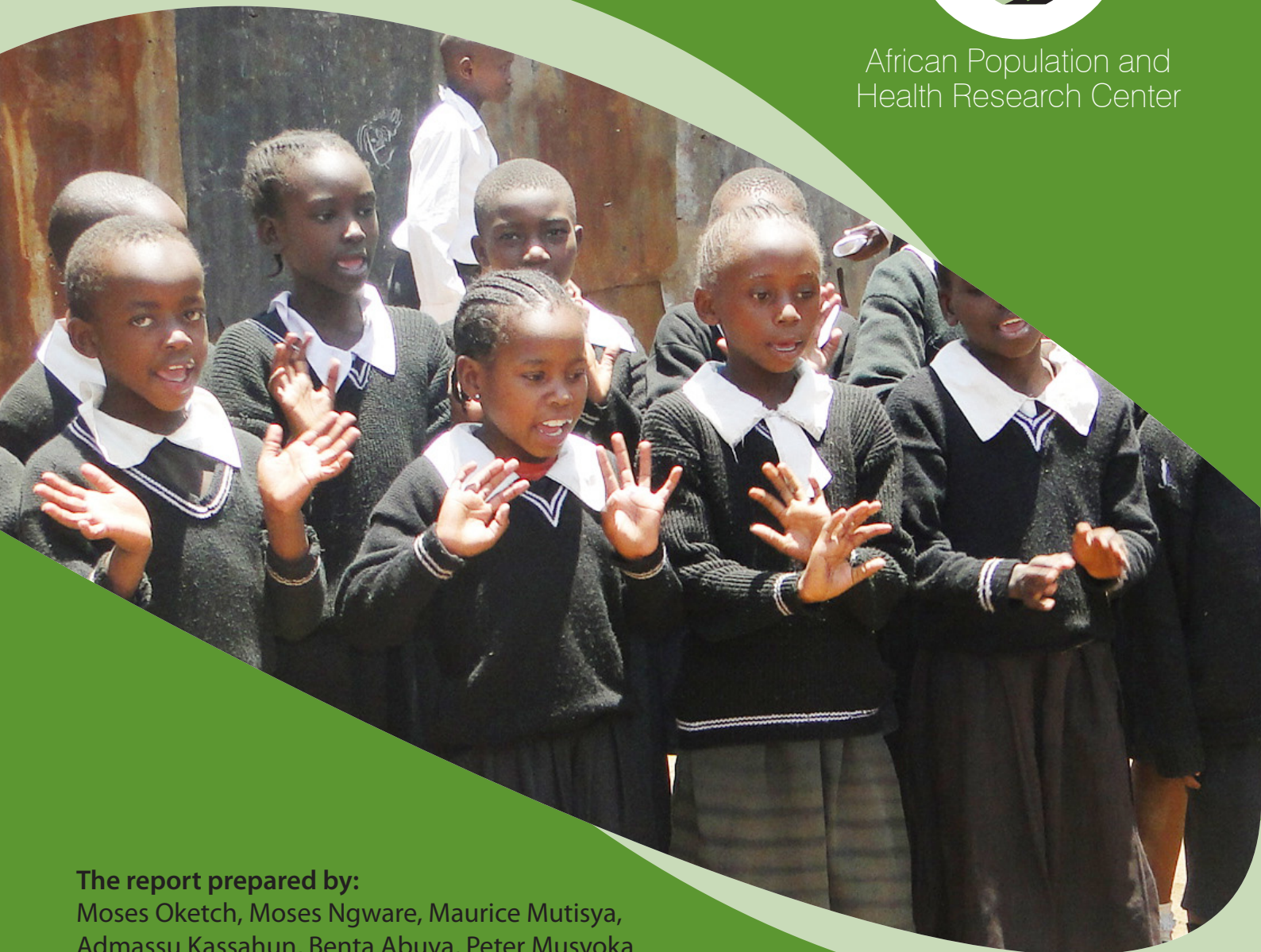


East African Quality in Early Learning (EAQEL) **IMPACT EVALUATION REPORT**



African Population and
Health Research Center



The report prepared by:
Moses Oketch, Moses Ngware, Maurice Mutisya,
Admassu Kassahun, Benta Abuya, Peter Musyoka

APHRC, February 2012

Table of Contents

Acknowledgement	iv
List of Figures.....	v
List of Tables	vi
List of Acronyms	vii
1 Executive Summary	1
1.1 The Study.....	1
1.2 Results.....	4
1.2.1 Numeracy Assessment Findings	4
1.2.2 Oral literacy assessment findings	4
1.2.3 Written literacy assessment findings	4
1.2.4 Lessons emerging from the focus group discussions (FGD)	5
1.2.5 Cost-effectiveness analysis results.....	6
2 Introduction.....	7
2.1 The context.....	8
2.2 Profiles of study Districts-Kenya	8
2.3 Profiles of study Districts-Uganda	9
2.4 Education impact evaluation studies in Africa	9
3 Methods	13
3.1 Design	13
3.2 Sampling Procedures.....	14
3.2.1 Selection of schools	14
3.2.2 Selection of pupils.....	14
3.2.3 Selection of parents	15
3.3 Study tools	16
3.3.1 Pupil Assessment Tools	16
3.3.2 School and Household characteristics questionnaire.....	17
3.3.3 Scoring	17

3.4 Description of the Sample.....	18
3.4.1 Baseline sample	19
3.4.2 Endline sample	19
3.5 Attrition.....	21
3.6 Baseline Balance Across treatment and Control groups	22
4 Results of the RCT Impact Evaluation	24
4.1 Treatment Effects on Numeracy.....	24
4.1.1 Pupil abilities at the baseline	25
4.1.2 Summary of the Numeracy Assessment Results	27
4.2 Treatment effects on Oral Literacy.....	28
4.2.1 Pupil abilities at the baseline	29
4.2.2 Summary of oral literacy assessment results	30
4.3 Written Literacy Treatment Effects	31
4.3.1 Pupil abilities at the baseline	32
4.3.2 Summary written literacy assessment results	33
4.4 The Role of Program Implementation.....	35
5 Conclusions and Discussion.....	37
6 Appendices.....	39
References.....	71

Acknowledgement

We acknowledge the important contribution of APHRC staff who participated at various stages of the development of this report including the study design, data collection and processing, and report writing. We cannot name them all but we particularly would like to mention Alex Ezeh, Charles Epari, Evangeline Nderu, Catherine Macharia, and Nkatha Karichu. We are also grateful to our partners including the Aga Khan Foundation, Kenya and Uganda Ministries of Education and the local education and provincial/county administrations for providing useful information, local and international assessment experts who worked with both AKF and APHRC to develop the impact assessment tools, head teachers, teachers, parents, and pupils who participated in the study. We are also grateful for the contributions made by Adrienne Lucas and Patrick McEwan who did further analysis using regression method as well as testing for Baseline balance and attrition. Their input is incorporated in various sections of this report. Funding for this study was provided by The William and Flora Hewlett Foundation through the Education Research Programme at APHRC.

List of Figures

Figure 3.1: Sampling frame for Kenya and Uganda	15
---	----

List of Tables

Table 3.1: Number of test items and total score per grade	18
Table 3.2: Distribution of schools by district.....	18
Table 3.3: Endline sample by grade and test	20
Table 3.4: Distribution of teachers interviewed.....	21
Table 3.5: Attrition.....	22
Table 3.6: Baseline test scores	23
Table 4.1: Difference in difference (DID) in the numeracy assessment both countries	24
Table 4.2: Difference in difference (DID) in the numeracy assessment by country.....	24
Table 4.3: The difference in difference based on numeracy in Kenya	25
Table 4.4: Learning outcomes of low and high performing pupils based on the	25
Table 4.5: Difference-in-Difference (DID) in the Oral Literacy assessment both countries.....	28
Table 4.6: DID between treatment and control in oral literacy by country	28
Table 4.7: The difference in difference based on Oral Literacy.....	29
Table 4.8: Learning outcomes of low and high performing pupils basedon the.....	30
Table 4.9: Difference-in-Difference (DID) in the Written Literacy assessment both countries...	31
Table 4.10: DID between treatment and control in written literacy by country.....	31
Table 4.11: The difference in difference based on written literacy by district, Kenya	32
Table 4.12: Learning outcomes of low and high performing pupils based on the	33
Table 4.13: Treatment effects in high, medium, and low implementing schools	35

List of Acronyms

AKF	Aga-Khan Foundation
APHRC	African Population and Health Research Center
DID	Difference-In-Difference
EA	East Africa
EAQEL	East African Quality in Early Learning
ERP	Education Research Program
FGD	Focus Group Discussion
FPE	Free Primary Education
ICER	Incremental Cost Effectiveness Ratio
JPAL	Jameel Poverty Action Lab
KENSIP	Kenya School Improvement Program
KNBS	Kenya National Bureau of Statistics
LRA	Lord's Resistance Army
MoE	Ministry of Education
NAPE	National Assessment of Primary Education
PTA	Parent Teachers Association
RCT	Randomized Controlled Trial
RfC	Reading for Children
RtL	Reading to Learn
SMC	School Management Committee
UPE	Universal Primary Education
USD	United States Dollar

1 Executive Summary

1.1 The Study

This is an impact assessment report of an independent evaluation of the Aga Khan Foundation's (AKF) East African Quality in Early Learning (EAQEL) initiative to determine whether the initiative improves learning outcomes in the early grades (1-3) in two districts in Kenya and two districts in Uganda as was intended. The initiative is also referred to as the Reading to Learn (RtL) approach. The districts covered by the study are Kwale and Kinango in Kenya and Amolatar and Dokolo in Uganda. The four districts were selected by AKF because they were consistently performing poorly in the national examinations in both countries. The EAQEL initiative has two components: Core model and Core model plus. The Core model involved a 'new' instructional model implemented by teachers in selected schools and the Core model plus is a combination of Core model activities and parental component. The parental component includes story telling for children, community mini-libraries and asking parents to regularly read for their children among others. Baseline survey was undertaken between the months of July and August 2009 for grades 1 and 2 of 2009 and in the months of February and March for grade 1 of 2010. The endline survey was undertaken from the end of June to July 2011 in all the grades for which baseline data had been collected.

The impact evaluation was designed to answer the following research questions: Are children in lower primary grades (1, 2 and 3) able to read and do mathematics calculations more proficiently as a result of the Reading to Learn/scaffolding approach?; what are the differences in proficiency for children who have been exposed to parental involvement in the Reading to Learn Approach (core model plus) compared to those exposed to the Reading to Learn Approach with no parental involvement (core model), and compared to control schools?; and what are the key contributing factors to these improvements in numeracy and literacy in grades 1, 2 and 3? The evaluation also aimed to find out the cost-effectiveness of the core model and core model plus.

To assess the impact of EAQEL on numeracy and literacy in early grades, a randomized controlled trial (RCT) design was adapted. The adoption of this design followed extensive consultation between APHRC as impact evaluators and AKF as intervention implementers. It was agreed that the benefit of an RCT design, particularly its simplicity in interpreting the results

and ability to clearly isolate the impact of the intervention through the control group counterfactual, while at the same time avoiding selection bias problems that can exist in other evaluation designs, was powerful. The superiority of RCTs over other evaluation method also include clear results, elimination of lengthy caveats, and the possibility of future meta-analysis (Hutchinson and Styles, 2010, p7). In addition to this quantitative approach of an RCT, focus group discussions were conducted with parents to provide insights to the intervention and its implementation experiences.

To minimize contamination, randomization was done at cluster level. These were pre-existing clusters of schools determined by AKF's administrative units, in both Kenya and Uganda. The experimental sample consisted of 41 "clusters" of schools. In Kenya, the clusters were groups of schools determined by AKF that contained 1 to 8 geographically proximate schools. In Uganda, the clusters were administratively determined sub-counties that contained 2 to 16 schools each. Figure 3.1 shows that 41 clusters across both countries (the first number in the parentheses) contained 229 schools in total (the second number in the parentheses).

Figure 3.1 further shows that, of the 41 clusters, 31 were in Kenya and 10 in Uganda. Kenya's clusters are divided between two districts, Kwale and Kinango. The district of Kinango was further subdivided into clusters that did, or did not, participate in the Kenya School Improvement Program (KENSIP) intervention. KENSIP was an earlier intervention undertaken by AKF whose effect needed to be isolated from the effect of EAQEL. Uganda's clusters were also divided between two districts, Amolatar and Dokolo. The final randomization occurred within 5 strata (defined by 3 districts, plus one district divided between KENSIP and non KENSIP). Of the 41 clusters, 16 received the treatment (either Core or Core Plus, depending on the district) and 22 were in the control group. In general, all schools residing within treatment clusters received the treatment, while control schools did not. However, one school in Amolatar and one in Dokolo were randomly assigned to a control cluster, but were later selected to be "model treatment schools" by AKF (a classic instance of experimental crossover between treatment and control conditions).

A total of 120 and 109 schools participated in Kenya and Uganda, respectively. In each grade, a random sample of 20 pupils was selected taking into account the proportion of girls and boys in

the class. The sample of pupils was increased to 25 for the 2010 grade 1 in order to cater for any possible attrition due to absenteeism and school transfers. The same pupils were followed at the endline survey that took place between June and July 2011. To address the attrition problem at endline, the pupils who couldn't be traced were randomly replaced taking sex into consideration. At endline survey, 13,944 pupils participated in the evaluation, with 67.4% being the follow-up group traced from the baseline. In total 445 teachers were interviewed, and 12 FGD's were conducted in both control and treatment schools in the districts where core model plus was implemented. To undertake the impact evaluation, several tools were developed including pupil assessment tools – two for literacy and one for numeracy, teacher characteristics questionnaire, classroom observation checklist, school characteristics questionnaire, household characteristics questionnaire and the focus group discussion (FGD) guide.

1.2 Results

1.2.1 Numeracy Assessment Findings

The Difference-in-Difference (DID) results indicate that EAQEL did not have an effect on numeracy in both countries combined (pooled data) nor in each country separately. This is a true reflection of absence of treatment effect in numeracy achievement as the DID takes in to account any difference between treatment and control groups at the baseline. The district level results also indicate lack of treatment effect in numeracy.

1.2.2 Oral literacy assessment findings

The results on oral literacy show a clear effect of treatment on Oral Literacy throughout all the cohorts in Uganda. This indicates that EAQEL had positive impact in Uganda, whereas in Kenya, the treatment is not statistically different from zero. Comparison at district level reveals that the treatment effect is higher in Amolatar, the core plus model district, than in Dokolo, core model district. Both the country and district level point estimates are equally unbiased but because of a lack of statistical power, the statistical significance of the difference cannot be determined at district level as a result of inappropriately small standard errors generated by fewer clusters.

1.2.3 Written literacy assessment findings

The results in written literacy indicate that there is treatment effect in Uganda, which is statistically significant across all the three cohorts. This suggests that EAQEL improved written literacy levels in Uganda whereas in Kenya the evidence shows there is no treatment effect. The positive treatment effects found overall in Uganda is maintained at the district level but with the same caveat that analysis at district level has lower statistical power to be resoundingly convincing as the country and pooled data treatment effects.

Disaggregated analysis by pupil's level of competency at baseline indicates that the average performing pupils tend to have benefited from the EAQEL intervention more than the low and high competent pupils.

1.2.4 Lessons emerging from the focus group discussions (FGD)

Focus group discussions were held with parents at the same time that the endline data was being collected. The focus group analysis is to be interpreted differently from the clear treatment effect results obtained through DID because they are views of participants. What was observed from the coding and analysis of the interviews with parents is that in Uganda parents were explicitly more receptive of the intervention and the implementer, and were more open to speak about it during the FGD than their Kenyan counterparts. Parents in Uganda were particularly pleased to see learning materials for their children in the local language and were generally very positive about EAQEL.

Discussions with parents in Uganda further demonstrate that there was ownership of EAQEL intervention with a very clear understanding of their roles and involvement. For instance parents used a powerful phrase “AKF brought schools to our children” to describe EAQEL. At the same time parents from the control schools were remotely involved in what was happening in schools indicating that there was no cross-over during the implementation.

In Kenya, this receptive description of EAQEL did not emerge with clarity. For example, parents in control schools seemed to be involved in their children’s schooling just as those who were participating in treatment schools. Furthermore, parents in both treatment and control schools were aware of the need for them to consult, follow-up on their children’s homework and collaborate with teachers. These are country context differences which are explained in detail in the appendices pertaining to the qualitative aspects that were part of the endline. The comparison here need not be interpreted beyond the simple fact that the two countries were different- Kenya was starting from a base where parental involvement seemed to have existed whereas in Uganda, there seems to have been greater enthusiasm attached to EAQEL by parents, perhaps because they had not been supplied with text books before and having been a region that had experienced conflict not many years ago, such enthusiasm in education would have been expected.

1.2.5 Cost-effectiveness analysis results

The cost-effectiveness presented in this report is simply indicative. APHRC was aware that this was a developmental phase of EAQEL and therefore the initial costs are likely to be high and biased. Nonetheless, they are presented to give indication of the costs, but interpretation has to bear the implementation phase cost bulge.

Given the results that have been presented on the treatment effect, it can be said that the program is relatively more effective in Uganda than in Kenya, specifically on literacy for all the three cohorts. There is no consistent pattern in cost-effectiveness ratio estimates across treatment groups, classes and subjects. Comparing Core model plus (Amolatar) and Core model (Dokolo) in Uganda, suggests that the former is potentially more effective than the latter, but not more cost-effective because of the additional costs in the Core model plus approach.

Among those cohorts and subjects with a treatment effect, the lowest ratio (the most cost-effective) is 1.62 USD per percentage point increase/gain in numeracy test score among grade 1, 2010 cohort pupils in Dokolo district, while the highest (the least cost-effective) cost of about 7 USD for each percentage point increase/gain in literacy test is grade 1, 2010 cohort in Amolatar district. Because of the inherent imprecision of the benefit estimates at the district level, the cost-effectiveness analysis and results presented here are simply indicative as should be only interpreted as such.

Further, cost benefit analysis using Uganda country level results on literacy which are more precise show an average ratio of 3.65 USD per percentage point increase/gain and nearly similar cost benefit ratio across the three cohorts.

2 Introduction

This is the report of an independent impact evaluation conducted by the African Population and Health Research Centre (APHRC) of the East African Quality in Early Learning (EAQEL) initiative. EAQEL is a research and development initiative of the Aga Khan Foundation which aims to demonstrate a model for improved learning outcomes in reading and numeracy of early primary grades (1-3) in two districts (Kwale and Kinango) in Kenya and two (Amolatar and Dokolo) in Uganda. The initiative was implemented over a period of 16 months. The project tested an instructional approach based on David Rose's scaffolding model (Reading to Learn). Reading to Learn (RtL) is a systematic approach to the teaching of reading with subsequent impact on numeracy.*

The project design includes three components: teacher preparedness and practice, school leadership, and classroom learning environments. These components were embedded into two separate but mutually inclusive modules- the "core model" and "core model plus". The core model involved early grade teachers being trained on the instructional approach (EAQEL), which is child-centered, systematic and focuses on social interaction. In addition, schools were supported to improve teachers' and pupils' access to and use of appropriate teaching and learning materials. Project technical staff worked with head teachers, key teachers and district education staff from decentralized teacher support resource institutions to train teachers and provide in-class mentoring support. The core model plus included all of the aspects of the core model and had a parental involvement component. The aim was to encourage literacy by establishing mini-libraries and encouraging parents to borrow books, read and tell stories to their children.

The goal of the impact evaluation was to assess the effectiveness of the EAQEL intervention. The objectives in undertaking this impact evaluation of EAQEL were as follows: (i) to determine whether the intervention leads to improved learning outcomes in numeracy and reading among children enrolled in primary grades 1, 2 and 3; (ii) to determine if there is a critical difference in the learning outcomes of children enrolled in grades 1, 2 and 3 attributable to the two different treatment models (Core model and Core model plus) as was proposed by AKF; (iii) to determine

* Aga Khan Foundation (AKF).

the key contributing factors that lead to improvements, if any, in numeracy and literacy in grades (1, 2, and 3). These factors may include but are not limited to the following: teachers' effective implementation of the Reading to Learn Approach; availability and use of instructional materials; in-classroom functioning libraries; head teacher active support; the presence and effectiveness (how engaged/involved and influential) of School Management Committees (SMC); the level of priority given to lower grades in the allocation of school resources (there may not be an effective SMC but the school head prioritizes early grade and vice versa); uptake in parents borrowing books and using them with their children; proximity of functioning library; parental support for attendance; class size; family literacy and education levels, among others.

2.1 The context

Uganda and Kenya are two East African (EA) countries where political goodwill and international support has led to the Universal Primary Education (UPE) and Free Primary Education (FPE) policies in 1997 and 2003 respectively. These policies have led to remarkable growth in enrolment because they removed the direct tuition fee that had been a major barrier to access for many children. However, this increase in access has potential negative effects on the quality of learning. Specifically, there is growing concern that millions of children spend many days in school but learn very little. For example, in Uganda learners in grade 3 could only score 16.81% on a written literacy test and those in Kenya scored 48.35% in a similar test (Oketch et al., EAQEL baseline, 2010).

2.2 Profiles of study Districts-Kenya

Kwale District is an administrative district in the Coast Province of Kenya. In 2007, the larger Kwale district was split into two to form the current Kwale and Kinango districts. According to the 2009 population census, the population sizes of the Kwale and Kinango districts were 151,978 and 209,560 respectively. Kinango and Kwale together were the worst performing districts in the country in 2007 end of primary examinations. Kinango has among the highest levels of poverty in the country with half of the population living below the poverty line and two thirds considered food poor (KNBS, 2009). Among the challenges in the district is low

community participation among parents in their children's education due to poor attitudes toward education and also the misconception that with the FPE program parents have no responsibilities for their children's education.

2.3 Profiles of study Districts-Uganda

Amolatar and Dokolo are two districts in the northern region of Uganda which for about 20 years has experienced civil war due to the disgraced Lord's Resistance Army (LRA) of Kony. With the end of the civil war, there have been efforts by the government and a number of international partners to provide an effective education. AKF has been active in this regard. Literacy rates in Uganda, according to the National Assessment (NAPE, 2007) were 45.5% at Primary Grade 3, 49.6% at Primary Grade 6.-this means that students in grade 6 are only 4 percentage points more likely to be literate. So students learn effectively nothing between grades 3 and 6 if they are not literate by grade 3. Numeracy competencies were rated at 44.8% at Primary Grade 3 and 41.4% at Primary Grade 6. The NAPE report further noted that literacy and numeracy rates of these two districts were below the national average. The EAQEL baseline analysis undertaken by APHRC found written literacy to be appallingly low at 1.63% and 5.08% for grades 1 of 2010 and 2009 respectively for the two districts (Oketch et al., 2009).

2.4 Education impact evaluation studies in Africa

In the recent past, there has been growing interest in impact evaluation in education in the region in order to determine how best to improve educational outcomes. This has led to the prominence of randomized controlled trial studies in the region, although overall, they are still few. Further, some object to their application in education on the basis of ethical concerns and their cost in set-up and implementation. However, the proponents of RCTs note that they save money in the long run because they provide clear treatment effects, whether positive or zero, and in so doing result in more efficient future resource allocation. Furthermore, since it is never known whether the treatment is helpful, harmful or makes no difference the denial of treatment through randomization is considered an ethically neutral scenario (Hutchinson and Styles, 2010, p4). Generally, education impact evaluation studies in Africa are quite few and are mainly

concentrated in a handful of countries, Kenya included. Examples from Kenya include the flip chart study by Glewwe et al. (2000); merit scholarship program for adolescent girls by Kremer et al. (2005); Vermeersch and Kremer (2004) on the effects of subsidized school meals on school participation, educational achievement and school finance; the study on teacher incentives based on students' scores by Glewwe et al. (2003); Glewwe, et al. (2007) on the impact of text books on test scores; and, the study on the effect of deworming school children on school attendance (Miguel and Kremer, 2004). Most of these studies were concentrated in the districts of Busia and Teso in western Kenya where the Abdul Latiff Jameel Poverty Action Lab (JPAL) has one of its labs.

The study on flip charts by Glewwe et al. (2000) used retrospective and prospective analyses of flip chart provision to assess the effect of flip charts on student scores in rural schools. The retrospective analyses used data from 100 randomly selected schools involved in a separate project that provided textbooks and grants, prior to 1998. While the retrospective analysis showed an effect of up to 20 percent, after controlling for other learning inputs, the prospective analyses concluded that there was no effect. The study argues that the observed effect in the retrospective analysis could have been due to selection bias.

Another study on scholarship targeted adolescent girls who were in school and in grade 5 or 6 in January 2001 (Kremer et al. 2005). A total of 127 schools were randomly assigned, using random numbers, to either the scholarship or comparison group. End of year district mock exams were used to award scholarships to the top 15 percent of the girls in grade six. While there was no significant program impact in Teso district, girls in Busia district showed large gains (0.22 – 0.27 standard deviations) and the gains were sustained up to one year after qualifying for a scholarship. Program externalities were also observed with boys recording sizeable average test gains, and both teacher and student attendance increased in treatment schools. The estimation strategy involved the use of a non-parametric locally weighted regression technique following an education production framework. In addition, the study used regression discontinuity to explore within-school impacts of the program in 2002. That is, a comparison of the 2002 outcomes of girls who barely won the scholarship to girls who barely lost out - in order to estimate the impact of winning.

The Vermeersch and Kremer (2004) study on pre-primary school meals targeted 50 pre-primary schools that were randomly divided into treatment and comparison groups of 25 schools each. This followed the stratification of schools by geographic location and participation in other projects sponsored by the implementing NGO. The 50 schools were grouped into pairs with similar pre-program characteristics, and a coin was tossed to select the school to be in the treatment group. Baseline data was collected from children aged 4 – 6 years who were living within 4 kilometers of a pre-primary school. Using a probit model with random effects to estimate the probability of a child being present in school, the results showed that school participation was 30 percent higher in the treatment group than in the comparison group. The study also found that in treatment schools, class sizes increased despite a rise in school fees. The comparison schools reduced their fees.

Glewwe et al. (2003) examined teacher incentives and their effect on students' scores. In this teacher incentive study, 50 schools were selected from a group of 100 schools that were considered by the Ministry of Education to be in need of assistance. On average, these schools performed more poorly in examinations than other schools in the area (Busia and Teso districts). Schools were numbered alphabetically and the odd numbered schools were chosen to participate in the teacher incentive program. Teachers of grade 4 to 8 participated in the study – the incentive was a 21 – 43% of the monthly salary award at the end of the year based on the best performing school and/or best improved schools in grade 4-8 district mock exams. The study examined the differences in test scores between the treatment and comparison schools using a random effect regression framework that allowed for the possibility that scores of students in the same grade and same school might be correlated due to unobserved characteristics of teachers and headmasters. The baseline scores were based on the district examination scores of 1996 (as there were no district exams results available in 1997). The program years were 1998 and 1999, while the post-program year considered in the analysis was 2000. The Kenya Certificate of Primary Examination scores were also used to independently evaluate the impact of the incentive. The study utilized the difference in test scores between treatment and comparison schools, and the difference-in-difference estimator of the effect of the program. Students in the incentive schools had higher test scores during the program period – due to short-run test scores

effect. There was no teacher effort aimed at increasing long-run learning. The study also found that teacher attendance did not improve, homework assignment did not increase, and pedagogy did not change.

In the textbook study reported by Glewwe et al. (2007), 25 schools were randomly selected from a group of 100 schools that the Ministry of Education district office considered to be particularly in need of assistance. Schools were listed alphabetically based on their geographical location. Every fourth school beginning with the first one in a list was selected to be included in the schools to receive treatment/text books (group1) at the beginning of 1996. Every fourth school beginning with the second, third and fourth were assigned to groups 2, 3 and 4 respectively. Group 2 received educational improvement grants at the beginning of 1997, group three at the beginning of 1998 and group four at the beginning of 1999. The study used a random effects estimation procedure, then presented a levels estimator based on comparing post-test scores across treatment and comparison schools. Differences between pre- and post-test scores were also compared. The study assumed the effect of text books to be 0.20, 0.13, and 0.07 standard deviations for levels, difference and subject-based estimators. Results show that there was no increase in average test scores, except for the bright learners (the top two quintiles of initial academic achievement). The intervention also increased the probability of students transiting to secondary school.

These studies are useful in informing EAQEL impact evaluation in a number of ways. Firstly, there is no body of knowledge that has paid attention to early grades in doing evaluation in literacy and numeracy in Kenya and Uganda. Secondly, the design and interpretation of EAQEL is consistent with or superior to the prevailing practices in other RCT's that have been conducted in the region.

3 Methods

This study was designed to answer the following research questions:

1. Are children in lower primary grades (1, 2 and 3) able to read and do mathematics calculations more proficiently as a result of the Reading to Learn/scaffolding approach?
2. Are there differences in proficiency for children who have been exposed to parental involvement in the Reading to Learn Approach (core model plus) compared to those exposed to the Reading to Learn Approach with no parental involvement (core model), and compared to control schools?
3. What are the key contributing factors to these improvements in numeracy and literacy in grades 1, 2 and 3?

3.1 Design

Randomized Controlled Trial (RCT) impact evaluations attempt to answer the following question: what would have been the outcome if the participants did not receive treatment (Ravallion, 2001). In most impact evaluation studies, a comparison group is used as a counterfactual to establish what the outcome would have been. In randomization, the participants are randomly assigned to treatment and comparison groups. The underlying principle is that any observed average difference in outcome can only be as a result of the program or intervention (Duflo et al 2006). The impact evaluation reported in this report used an RCT methods. The benefit of an RCT design is the simplicity in result interpretation and the clear isolation of the impact of the intervention through the control group counterfactual, while at the same time avoiding selection bias problems that exist in other evaluation designs. In addition to the quantitative approach of RCT, focus group discussions (FGDs) were conducted with parents to provide explanations for the observed results. This was restricted to core model plus in order to highlight mechanisms by which parental involvement might influence the outcomes of the intervention.

3.2 Sampling Procedures

3.2.1 Selection of schools

Pre-existing AKF clusters of schools in the case of Kenya and sub-counties in the case of Uganda were randomly assigned to either the control or treatment group of the EAQEL intervention. The sub-counties in Uganda, then, are effectively equivalent to Kenyan clusters, and we will refer to both using the cluster terminology for the remainder of the study. By this design, all schools residing within treatment clusters received the treatment, and all schools within control clusters did not. Through clustering, contamination which may have resulted if both treatment and control schools were in the same cluster was minimized.

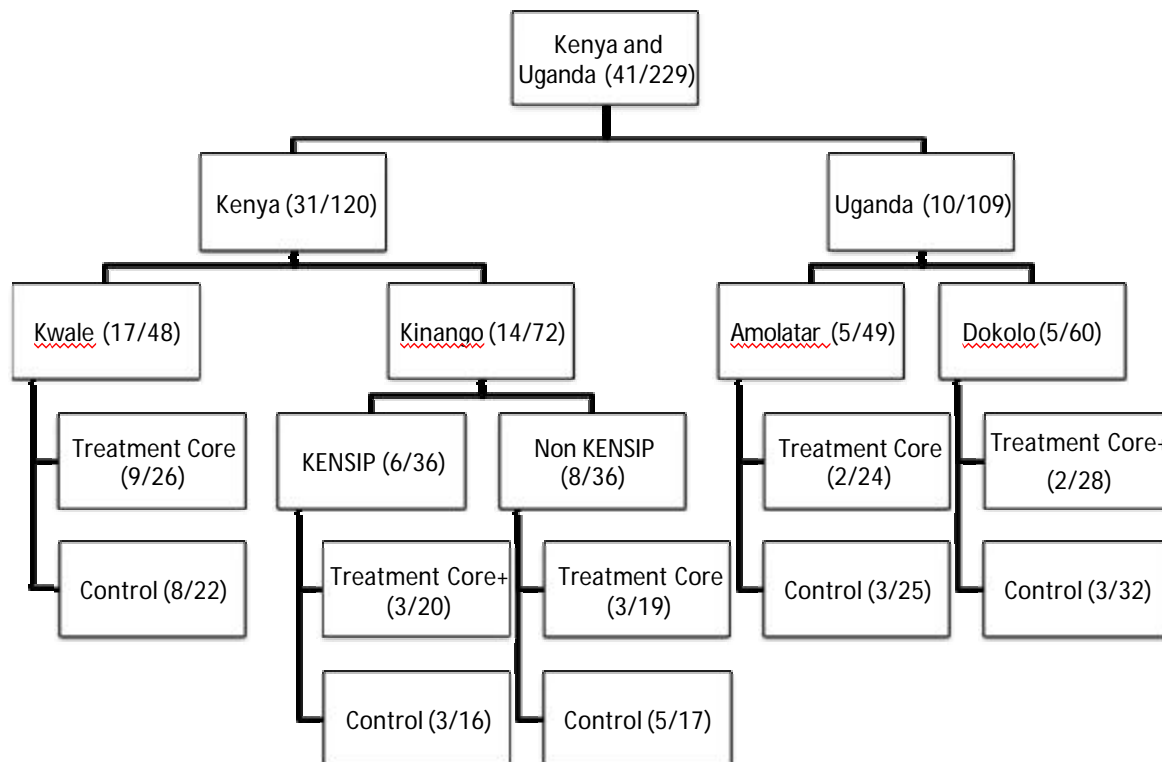
Figure 3.1 below shows how the study was designed. There were a total of 41 clusters in the study, with 31 in Kenya and 10 in Uganda. Kenya's clusters fall within two districts, Kwale and Kinango. The district of Kinango was further subdivided into clusters that did, or did not participate in the Kenya School Improvement Program (KENSIP) intervention. KENSIP was an earlier intervention undertaken by AKF whose effect needed to be isolated from the effect of EAQEL. Uganda's clusters also fall within two districts, Amolatar and Dokolo. The final randomization occurred within 5 strata (defined by 3 districts, plus one district divided between KENSIP and non KENSIP). Of the 41 clusters, 19 received the treatment (either Core or Core Plus, depending on the district) and 22 were in the control group. However, one school in Amolatar and one in Dokolo were randomly assigned to a control cluster, but were later selected to be "model treatment schools" by AKF (a classic instance of experimental crossover between treatment and control conditions).

3.2.2 Selection of pupils

The design of the study was such that it was not necessary (and financially feasible) to assess all pupils in each grade in the sampled schools. Therefore a random sample of 20 pupils was selected in each grade. The random sampling was done by first grouping pupils by sex; and then selecting each sex based on their proportion in the class. Based on the baseline I experience, the sample was increased to 25 pupils for the 2010 grade 1 in our baseline II in order to allow for

any possible attrition due to absenteeism and school transfers. The same pupils were followed at the endline survey that took place between June and July 2011. During the endline survey, pupil absenteeism presented a sample attrition problem. To address the attrition problem at endline, the pupils who were lost to follow-up were randomly replaced taking sex into consideration. This did not pose any methodological threat to the study because the intervention was administered at class level.

Figure 3.1: Sampling frame for Kenya and Uganda



Note: The first number in parentheses is the number of AKF clusters in Kenya, or sub-counties in Uganda (i.e., the unit of randomized assignment). The second number in parentheses is the number of schools in all clusters/sub-counties.

3.2.3 Selection of parents

Initial sample of 180 parents was targeted for the focus group discussion during the endline. A total of 106 parents turned up for the participation of the actual FGD. The selection of parents was first done by randomly selecting 10% of the schools in the core model plus districts. The selected schools were assigned to be either a male or female FGD. Then, 15 pupils in each of the

sampled schools were randomly selected and provided with letters inviting their parents to participate in the FGD. Among the details in the letter to the parents included the venue, time and whether it was the father or the mother who was invited.

In total, 12 FGD's were conducted, 5 in Amolatar (3 treatments and 2 controls) and 7 in Kinango (4 treatments and 3 controls). The FGD's were held separately for men and women, except, in one school in Kenya where both male and female parents participated in the same FGD.

3.3 Study tools[†]

To undertake the impact evaluation, several tools were developed. They included the following:

1. Pupil assessment tools: one for each measure of Literacy and one for Numeracy
2. Teacher characteristics questionnaire
3. Classroom observation checklist
4. School characteristics questionnaire
5. Household characteristics questionnaire
6. Focus group discussion study protocol

3.3.1 Pupil Assessment Tools

The EAQEL teaching approach focuses on literacy and numeracy in early grades 1, 2 and 3. In developing standardized assessment tests to assess the impact of EAQEL, several consultation meetings with key stakeholders and experts were held. The stakeholders included EAQEL implementing agency (AKF), APHRC, national assessment experts, national curriculum experts, academics, and practitioners in numeracy and literacy assessment. These experts came from Kenya and Uganda as well as internationally. Several stages were involved in developing the assessment tools. First, a pool of questions was developed drawing on curriculum from both countries. For instance, in numeracy, the team came up with a pool of 50 test items in each of the grades. The competencies and skills for grade 1 were examined and agreed upon by the team. In the case of grades 2 and 3 the competency and skills domains were repeated but the level of difficulty of test items required higher order thinking.

[†] Please write to info@aphrc.org if you would like more details on the tools.

Second, the pool was refined with the input of assessment experts and from this pool the final test items were selected. Third, the test items were translated into both Kiswahili and Lang'o, which are the languages of instruction in the Kenya and Uganda study sites respectively. These languages are also widely spoken in the catchments area of these schools.

There was one test tool for numeracy and another two test tools for each of written and oral literacy for all the three grades with students in higher grades taking all of the lower grade questions along with the questions appropriate for their grade. The rationale for having one assessment tool covering the three grades was to permit determination of how pupils in higher grades scored on items for lower grades (for instance to determine how competent grade 2 pupils would be on grade 1 items in both numeracy and literacy).

3.3.2 School and Household characteristics questionnaire

Other instruments that were developed by APHRC and agreed on by both partners included questionnaires to gather information on the schools, teacher's characteristics and household characteristics. These were adapted from ongoing APHRC research work that collects similar information.

3.3.3 Scoring

Scoring of the literacy and numeracy assessment test was done for each grade using the sum of the item scores which that grade was supposed to attempt as the denominator and expressing a student score as a percentage. For example, a grade 1 pupil who correctly answered all the 15 grade 1 numeracy items scored 100%, while a pupil in grade 2 who correctly answered all the 30 numeracy items for grade 2 (i.e. 15 items from grade 1 and another 15 at grade 2 level) scored 100% (see Table 3.1). For the purpose of computing the impact of EAQEL using DID, pupils' endline scores were computed based on the test items they were supposed to respond to at the baseline.

Table 3.1: Number of test items and total score per grade

<i>Assessment</i>	<i>Grade</i>	<i>Items[‡]</i>	<i>Total score</i>
Oral literacy	1	52	76
	2	83	120
	3	94	155
Written literacy	1	38	50
	2	53	71
	3	74	144
Numeracy	1	15	20
	2	30	48
	3	45	75

3.4 Description of the Sample

This study was undertaken in two districts in Kenya (Kinango and Kwale) and two in Uganda (Amolatar and Dokolo). As was mentioned earlier, these districts were chosen by AKF for EAQEL intervention because they have consistently performed poorly in national examinations. On the basis of our sample design described in the previous sections, this study included a total of 229 schools distributed as shown in Table 3.2.

Table 3.2: Distribution of schools by district

District	Control		Treatment	
	No	%	No	%
Kinango	33	45.83	39	54.17
Kwale	22	45.83	26	54.17
Amolatar	24	48.98	25	51.02
Dokolo	31	51.67	29	48.33
Total	110	48.03	119	51.97

[‡] For example if the pupil was asked to read 5 letters then these are five separate items.

3.4.1 Baseline sample

Baseline was carried out in two phases. The first phase was conducted in July and August 2009 and targeted 9,160 pupils in both grades 1 and 2. The second phase was carried out in February and March 2010 for incoming grade 1 and targeted 5,725 pupils. This was in line with the intervention period and aimed to capture all the three grades (1, 2 and 3) in the impact evaluation. However, in the actual baseline test, the number (14,404) of pupils who were assessed was less than the target (14,885). The reasons for the difference between the target and actual were: 1) some classes had fewer pupils below the target sample size of 20 pupils in 2009 and 25 in 2010; 2) during the testing time, a few pupils disappeared from the test venues and some were also absent during call backs.

3.4.2 Endline sample

During the endline (follow- up), a total of 13944 pupils were captured. This consisted of 9397 pupils followed from the baseline (67.4% of the baseline sample). The rest were new pupils resampled to replace those lost mainly due to absenteeism. Table 3.3 shows the proportion of pupils who were assessed for each of the assessment tests, both at baseline and endline. The Table also show the follow-up group and the number of pupils who could not be traced.

Table 3.3: Endline sample by grade and test

COHORT	Numeracy				Written Literacy				Oral Literacy			
Grade 1, 2010	Initial sample	New	Traced	Not traced	Initial sample	New	Traced	Not traced	Initial sample	New	Traced	Not traced
Overall (Both KE & UG)	5251	1,551	3,442	1,809	5239	1,554	3,432	1,807	5234	1,545	3,431	1,803
Kenya	2727	303	2,122	605	2727	303	2,119	608	2716	303	2,116	600
Uganda	2524	1,248	1,320	1,204	2512	1,251	1,313	1,199	2518	1,242	1,315	1,203
Treatment	2753	777	1,837	916	2754	777	1,837	917	2758	774	1,834	924
Control	2498	774	1,605	893	2485	777	1,595	890	2476	771	1,597	879
Boys	2610	803	1,701	909	2607	804	1,692	915	2598	797	1,691	907
Girls	2641	748	1,741	900	2632	750	1,740	892	2636	748	1,740	896
Grade 1, 2009												
Overall (Both KE & UG)	4590	1,488	2,982	1,608	4573	1,494	2,975	1,598	4507	1,485	2,977	1,530
Kenya	2424	453	1,859	565	2414	454	1,856	558	2418	449	1,858	560
Uganda	2166	1,035	1,123	1,043	2159	1,040	1,119	1,040	2089	1,036	1,119	970
Treatment	2401	721	1,636	765	2395	724	1,634	761	2356	722	1,635	721
Control	2189	767	1,346	843	2178	770	1,341	837	2151	763	1,342	809
Boys	2259	758	1,453	806	2251	764	1,449	802	2209	757	1,448	761
Girls	2331	730	1,529	802	2322	730	1,526	796	2298	728	1,529	769
Grade 2, 2009												
Overall (Both KE & UG)	4560	1,490	2,973	1,587	4563	1,491	2,959	1,604	4508	1,499	2,934	1,574
Kenya	2407	482	1,806	601	2409	479	1,789	620	2403	485	1,787	616
Uganda	2153	1,008	1,167	986	2154	1,012	1,170	984	2105	1,014	1,147	958
Treatment	2389	777	1,593	796	2394	777	1,580	814	2366	786	1,562	804
Control	2171	713	1,380	791	2169	714	1,379	790	2142	713	1,372	770
Boys	2268	752	1,458	810	2270	751	1,449	821	2236	755	1,430	806
Girls	2292	738	1,515	777	2293	740	1,510	783	2272	744	1,504	768

During the endline survey, we targeted teachers in treatment schools who were captured at the baseline irrespective of the grade they were teaching in 2011 as well as those currently teaching grades 1 to 3. In total 445 teachers were interviewed, the distribution of the number of teachers who were interviewed is as shown in Table 3.4.

Table 3.4: Distribution of teachers interviewed

<i>District</i>	Teachers(n)	%
Kinango	135	30.34
Kwale	104	23.37
Amolatar	84	18.88
Dokolo	122	27.42
Total	445	100.00

3.5 Attrition

Even when baseline attributes are balanced across treatment and control groups, some students cannot be located at the endline. The main concern is that attrition is non-random (i.e. lower-achieving students leave the sample), and that patterns of attrition differ across treatment and control groups. For example, one could imagine that a treatment could prevent student drop-out (or attrition), thus altering the relative composition of students in treated schools vs. control schools at the follow-up. These differences in endline achievement, introduced by attrition, could be mistaken for the impact of the treatment.

Table 3.5 examines treatment and control group attrition. Panel A shows that, overall, about 34% of the baseline students in the treatment group could not be located at the endline. However, about 38% of the control group could not be located. The difference between the likelihood of attrition across the two groups is not statistically significant. This provides a measure of confidence that differential attrition did not create further imbalance in the treatment and control groups.

Table 3.5: Attrition

	Treatment	Control	Difference
<i>Panel A: Proportions</i>			
Proportion of Baseline Cohort not in Endline	0.342	0.376	-0.035
<i>Panel B: Scores of Those in Baseline Cohort not in Endline</i>			
Numeracy Score	-0.161	-0.023	-0.137
Written Literacy Score	-0.141	-0.002	-0.139
Oral Literacy Score	-0.113	0.014	-0.127

Notes: Treatment and control group as originally defined by APHRC; * significant at 10%, ** significant at 5%, *** significant at 1% based on standard errors clustered at the unit of randomization (cluster in Kenya, sub-county in Uganda).

Panel B in Table 3.5 compares the baseline scores of “attritors” from the treatment group, and those from the control group. Note that, on average, treatment group attritors are lower achieving than those in control groups (though not statistically significant). But, also note that the difference is very similar to the difference in baseline test scores among all students. Thus, the attrition does not appear to have introduced further imbalance in baseline test scores across treatment and control groups. In conclusion, while levels of attrition are high—and not surprisingly so, given the context—differential attrition does not seem to be an important threat to the internal validity of the estimated treatment effects.

3.6 Baseline Balance Across treatment and Control groups

At the baseline, there was small difference in test scores (Oketch et al., EAQEL baseline, 2010) in favour of the control group in Kenya, particularly in numeracy. This has implication for the analysis of the end results because ideally randomization assignment implies that baseline test-scores should be similar, on average, across treatment and control groups. Overall, Table 3.6 indicates that students attending treated schools at baseline have modestly lower baseline test scores, although the differences are only statistically significant in the case of the overall numeracy test (pooling Kenyan and Uganda samples), and in the numeracy test only in the Kenyan sample. In oral literacy, for example, the differences are approximately 12% of a standard deviation and statistically insignificant.

Table 3.6: Baseline test scores

	Treatment	Control	Difference	
Numeracy Score	-0.078	0.076	-0.153	*
Kenya	-0.122	0.126	-0.248	**
Uganda	-0.030	0.027	-0.057	
Written Literacy Score	-0.076	0.075	-0.151	
Kenya	-0.089	0.093	-0.182	
Uganda	-0.062	0.057	-0.120	
Oral Literacy Score	-0.061	0.060	-0.121	
Kenya	-0.060	0.062	-0.123	
Uganda	-0.063	0.058	-0.120	

Notes: Mean of standardized test scores. Treatment and control group as originally assigned by APHRC. * significant at 10%, ** significant at 5%, *** significant at 1% based on standard errors clustered at the unit of randomization (cluster in Kenya, sub-county in Uganda).

To address the baseline imbalance in test scores, the analysis at the endline used Difference in Difference (DID) technique which is a straight forward and clear way of assessing the treatment effect of the intervention.

4 Results of the RCT Impact Evaluation

4.1 Treatment Effects on Numeracy

The impact evaluation results are based on the Difference-in-Difference (DID) technique which is a straight forward and clear way of assessing the treatment effect of the intervention Table 4.1 shows the pooled DID data for Kenya and Uganda. The results indicate that there is no treatment effect on numeracy. At the country level results shown in Table 4.2, one of the key highlights is that grade 1, 2010 shows a DID of -3.92 percentage points, which shows that schools in the control group performed better in the case of Kenya. In Uganda, grade 1 of 2010 shows a positive DID of 6.45 percentage points in favour of the treatment group. The statistical significance shown in the two cohorts is possibly noise introduced by the low number of clusters and therefore, the pooled data indicating no treatment effect on numeracy in both countries is more reliable.

Table 4.1: Difference in difference (DID) in the numeracy assessment both countries

Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
Treatment (t_1-t_0)	9.44	18.81	22.37
Control (t_1-t_0)	9.39	17.63	19.70
DID	0.04	1.18	2.68

* $p<0.1$, ** $p<0.05$, *** $p<0.01$, t_1 is Endline, t_0 is Baseline

Table 4.2: Difference in difference (DID) in the numeracy assessment by country

Country	Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
Kenya	Treatment (t_1-t_0)	7.33	16.12	28.16
	Control (t_1-t_0)	11.25	14.75	25.38
	DID	-3.92**	1.37	2.78
Uganda	Treatment (t_1-t_0)	13.08	23.35	12.75
	Control (t_1-t_0)	6.63	22.31	11.50
	DID	6.45**	1.04	1.25

* $p<0.1$, ** $p<0.05$, *** $p<0.01$, t_1 is Endline, t_0 is Baseline

Tables 4.3 present the impact of EAQEL at district level. These results are more or less suggestive that these effects are similar across the two districts in Kenya but due to the fewer

number of clusters in each district, we cannot more precisely assess their statistical significance. The point estimates for Dokolo is particularly positive for the grade 1, 2010 cohort, and similarly that of Kinango is large compared to the others but due to the small number of clusters in each district, it is not possible to attach statistical significance to these estimates. Therefore, the differences in the DID point estimates between the districts or differences of the point estimates from 0 should not be taken as necessarily statistically significant, but this evidence is being provided as informational.

Table 4.3: The difference in difference based on numeracy in Kenya

District	Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
Kinango	Treatment (t_1-t_0)	7.32	16.89	30.42
	Control (t_1-t_0)	10.80	13.92	23.19
	DID	-3.48	2.97	7.23
Kwale	Treatment (t_1-t_0)	7.34	15.02	25.06
	Control (t_1-t_0)	11.86	15.99	28.69
	DID	-4.52	-0.96	-3.62
Amolatar	Treatment (t_1-t_0)	18.58	27.03	18.83
	Control (t_1-t_0)	13.63	21.33	16.17
	DID	4.95	5.69	2.66
Dokolo	Treatment (t_1-t_0)	9.56	20.80	8.44
	Control (t_1-t_0)	1.27	23.00	8.21
	DID	8.29	-2.20	0.23

Note: Due to fewer numbers of clusters at district level of analysis, statistical significance cannot be determined for the point estimate differences shown in the table.

4.1.1 Pupil abilities at the baseline

The EAQEL intervention was designed to have a greater impact among those pupils who were not able to do numeracy and literacy on their own. In order to examine the impact of EAQEL on the learning outcomes of low and high performing pupils within each district we placed pupils into three categories according to their performance at baseline: those who scored below 1 standard deviation (s.d.) from the mean (the lowest scoring students), those who scored within 1 s.d. below and above the mean (the middle scoring students), and those who scored more than 1 s.d. above the mean (the highest scoring students)

Table 4.4: Learning outcomes of low and high performing pupils based on the

numeracy scores

Grade/District	Group	< -1 s.d.	Within -1 & 1 s.d	> +1 s.d.
Grade 1, 2010				
Kenya	Treatment (t_1-t_0)	23.70	5.75	-4.81
	Control (t_1-t_0)	29.94	9.71	-4.57
	DID	-6.25**	-3.97**	-0.24
Uganda	Treatment (t_1-t_0)	29.07	14.86	-15.41
	Control (t_1-t_0)	32.90	10.19	-20.30
	DID	-3.84	4.67	4.88
Grade 1, 2009				
Kenya	Treatment (t_1-t_0)	32.68	14.40	-0.27
	Control (t_1-t_0)	37.65	14.19	-0.10
	DID	-4.98	0.21	-0.18
Uganda	Treatment (t_1-t_0)	43.22	25.73	1.61
	Control (t_1-t_0)	41.85	25.44	-1.38
	DID	1.37	0.30	2.98
Grade 2, 2009				
Kenya	Treatment (t_1-t_0)	45.32	27.92	9.85
	Control (t_1-t_0)	46.22	26.73	10.05
	DID	-0.90	1.19	-0.20
Uganda	Treatment (t_1-t_0)	25.11	13.65	-0.40
	Control (t_1-t_0)	18.63	13.42	-1.21
	DID	6.48**	0.23	0.81

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Tables 4.4 present the results based on s.d. categorization for Kenya and Uganda. It is notable that there was no treatment effect on numeracy across the cohorts among pupils who scored higher marks at the baseline. In Kenya, grade 1, 2010 cohort pupils scoring one s.d. below the mean gained statistically significantly less than the control group. In Uganda, grade 2, 2009 cohort, a differential positive impact was seen among those ranked one standard deviation below the mean.

4.1.2 Summary of the Numeracy Assessment Results

The DID presented in Table 4.3 and 4.4 indicate that EAQEL did not have any overall effect in improving numeracy when the countries are combined nor in each country separately. As was noted earlier, this is a true reflection of absence of treatment effect in numeracy achievement as the DID takes in to account any differences that may exists between treatment and control groups at the baseline.

Although the district level results show an unbiased point estimate differences, their significance cannot be determined due to fewer number of clusters.

4.2 Treatment effects on Oral Literacy

Tables 4.5 and 4.6 presents country specific treatment effects of the EAQEL intervention based on the oral literacy scores. In the table, the treatment and control row entries show the mean difference between endline and baseline (score increases) for each of the groups, while the DID row presents the percentage point difference in difference between the treatment and control groups (i.e. the treatment effect).

Table 4.5: Difference-in-Difference (DID) in the Oral Literacy assessment both countries

Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
Treatment (t_1-t_0)	17.51	21.19	18.51
Control (t_1-t_0)	15.69	19.53	16.02
DID	1.81	1.66	2.49

* $p<0.1$, ** $p<0.05$, *** $p<0.01$, t_1 is Endline, t_0 is Baseline

Table 4.6: DID between treatment and control in oral literacy by country

Country	Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
<i>Kenya</i>	Treatment (t_1-t_0)	18.60	21.88	19.03
	Control (t_1-t_0)	18.69	21.81	18.64
	DID	-0.09	0.07	0.39
<i>Uganda</i>	Treatment (t_1-t_0)	15.64	20.16	17.65
	Control (t_1-t_0)	11.19	15.62	12.20
	DID	4.45**	4.54**	5.45**

$p<0.1$, ** $p<0.05$, *** $p<0.01$; t_1 is Endline, t_0 is Baseline

The DID results in Uganda are positive and significant across all the three cohorts, whereas none is significant in Kenya's case. These results indicate that EAQEL/RtL had a positive treatment effect in Uganda and not in Kenya on oral literacy.

Table 4.7 presents a comparison of the treatment and control schools by district, in Kenya and Uganda respectively – although as noted earlier district level analysis in terms of significance levels has to be interpreted cautiously due to fewer numbers of clusters. Consistent with country level results, there is no treatment effect in both districts in Kenya.

In Uganda, the core model plus was implemented in Amolatar district and the core model was in Dokolo. There is positive impact of EAQEL on oral literacy across the three grades in both Amolatar and Dokolo. In Amolatar, an impact of 5 percentage points for the cohorts of both grades 1 of 2010 and 2009 is observed. The most striking DID results is the 9 percentage points for cohort of grade 2 2009 in oral literacy. In Dokolo, the highest DID was observed in the cohort of grade 1, 2010 (4.6 percentage points) and the least with cohort of grade 2, 2009 (about 3 percentage points). This suggests that in Uganda based on point estimates alone, the core model plus had a greater impact than the core model.

Table 4.7: The difference in difference based on Oral Literacy

District	Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
Kinango	Treatment ($t_1 - t_0$)	17.86	24.02	23.02
	Control ($t_1 - t_0$)	17.62	23.32	21.19
	DID	0.24	0.70	1.83
Kwale	Treatment ($t_1 - t_0$)	19.63	18.55	13.53
	Control ($t_1 - t_0$)	20.19	19.58	14.87
	DID	-0.57	-1.02	-1.33
Amolatar	Treatment ($t_1 - t_0$)	20.40	25.14	21.49
	Control ($t_1 - t_0$)	15.19	20.08	12.08
	DID	5.21	5.06	9.41
Dokolo	Treatment ($t_1 - t_0$)	12.65	16.74	14.90
	Control ($t_1 - t_0$)	8.06	12.50	12.28
	DID	4.59	4.23	2.63

Note: Due to fewer numbers of clusters at district level of analysis, statistical significance cannot be determined for the point estimate differences shown in the table.

4.2.1 Pupil abilities at the baseline

Table 4.8 presents results by categorization of pupil's performance at baseline by how far their score was from the mean score below 1s.d., within 1 s.d., and above 1 s.d. of the mean. In Kenya, the gains are large but there is no EAQEL treatment effect on oral literacy across the initial performance categories. In Uganda, an average performing pupil (within 1 s.d.) consistently benefited more from the intervention. Contrary to the expectations of the intervention, high achievers in Uganda also show a rather impressive treatment effect across all grades. Nonetheless in Amolatar there is impressive treatment effect of about 7 percentage point among the low performing pupils in grade 2 of 2009 (results not presented).

Table 4.8: Learning outcomes of low and high performing pupils based on the oral literacy scores

Grade/District	Group	< -1 s.d.	Within -1 & 1 s.d.	> +1 s.d.
Grade 1, 2010				
Kenya	Treatment (t_1-t_0)	29.10	17.97	10.68
	Control (t_1-t_0)	29.22	18.13	10.20
	DID	-0.13	-0.16	0.48
Uganda	Treatment (t_1-t_0)	31.72	15.30	1.99
	Control (t_1-t_0)	28.12	11.10	-2.39
	DID	3.61	4.20	4.39
Grade 1, 2009				
Kenya	Treatment (t_1-t_0)	36.55	22.39	7.40
	Control (t_1-t_0)	35.89	22.69	8.86
	DID	0.67	-0.30	-1.46
Uganda	Treatment (t_1-t_0)	41.50	17.71	7.35
	Control (t_1-t_0)	38.02	14.39	2.95
	DID	3.47	3.32	4.40
Grade 2, 2009				
Kenya	Treatment (t_1-t_0)	30.12	21.24	3.26
	Control (t_1-t_0)	33.33	20.41	3.46
	DID	-3.21	0.84	-0.21
Uganda	Treatment (t_1-t_0)	34.72	16.34	3.87
	Control (t_1-t_0)	26.11	12.91	0.00
	DID	8.61	3.43**	3.87

** p<0.05

4.2.2 Summary of oral literacy assessment results

The results presented in Tables 4.5 – 4.8 show clear effects of the treatment on Oral Literacy scores throughout all the cohorts in Uganda. This indicates that EAQEL had a positive impact in Uganda, whereas in Kenya, the treatment is not statistically different from zero. Comparison at district level show that the treatment effect is higher in Amolatar – the core plus model district than in Dokolo, core model district, but this has to be interpreted cautiously. What is clear is the overall positive treatment effect seen for Uganda at the country level.

4.3 Written Literacy Treatment Effects

Table 4.9 and 4.10 presents country specific treatment effects (DID) of the EAQEL intervention based on the Written Literacy. The Written Literacy results show a positive treatment effect in Uganda across the three cohorts, whereas in Kenya, there is none.

Table 4.9: Difference-in-Difference (DID) in the Written Literacy assessment both countries

Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
Treatment (t_1-t_0)	22.15	29.43	27.79
Control (t_1-t_0)	19.74	28.84	24.69
DID	2.40	0.59	3.10

* $p<0.1$, ** $p<0.05$, *** $p<0.01$, t_1 is Endline, t_0 is Baseline

Table 4.10: DID between treatment and control in written literacy by country

Country	Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
Kenya	Treatment (t_1-t_0)	27.29	31.95	27.89
	Control (t_1-t_0)	27.49	34.70	25.69
	DID	-0.20	-2.75	2.21
Uganda	Treatment (t_1-t_0)	12.83	25.48	27.90
	Control (t_1-t_0)	8.10	19.24	23.27
	DID	4.73**	6.24**	4.63**

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 4.11 present a comparison of the treatment and control schools by district, in Kenya and Uganda respectively. The gain scores (t_1-t_0) for both the treatment and control groups are highly significant. Larger DID were observed among pupils in Uganda compared to those in Kenya, though pupils in Uganda had much lower baseline mean scores.

In Kinango, where the core model plus was implemented, results show positive DID point difference for the grade 2, 2009 cohort. In Kwale, where the core model was implemented, the control grade 1 of 2009 cohort which is control group show positive DID point difference of 4 percentage points. In Uganda the DID point differences are larger than those observed in Kenya but the statistical significance cannot be determined due to fewer cluster numbers at district level.

Table 4.11: The difference in difference based on written literacy by district, Kenya

District	Group	Grade 1, 2010	Grade 1, 2009	Grade 2, 2009
Kinango	Treatment (t_1-t_0)	24.52	33.32	30.60
	Control (t_1-t_0)	24.57	34.98	28.01
	DID	-0.05	-1.66	2.60
Kwale	Treatment (t_1-t_0)	31.27	29.88	23.75
	Control (t_1-t_0)	31.57	34.28	22.23
	DID	-0.30	-4.41	1.52
Amolatar	Treatment (t_1-t_0)	14.51	24.86	32.97
	Control (t_1-t_0)	12.19	19.14	22.68
	DID	2.32	5.72	10.29
Dokolo	Treatment (t_1-t_0)	11.78	25.91	24.29
	Control (t_1-t_0)	4.91	19.31	23.69
	DID	6.87	6.60	0.60

Note: Due to fewer numbers of clusters at district level of analysis, statistical significance cannot be determined for the point estimate differences shown in the table.

4.3.1 Pupil abilities at the baseline

Table 4.12 present the results based on s.d. categorisation for districts in Kenya and Uganda, respectively. In Kenya, there is no treatment effect on oral literacy across pupil ability levels in all the cohorts.

In Uganda, the mean scores for Written Literacy at the baseline were very low for grades 1 2010 and 2009 such that few pupils fall below 1 s.d. from the mean. EAQEL had positive effect for the pupils ranked within one standard deviation of the mean at their baseline score. For the pupils who at baseline were 1 s.d. above the mean, the EAQEL intervention had positive and large DID benefit of about 15 percentage points among the grade 2010 cohort in Uganda.

Table 4.12: Learning outcomes of low and high performing pupils based on the written literacy scores

Grade/District	Group	< -1 s.d.	Within -1 & 1 s.d	> +1 s.d.
Grade 1, 2010				
Kenya	Treatment (t_1-t_0)	18.57	29.37	20.07
	Control (t_1-t_0)	22.36	29.00	22.76
	DID	-3.79	0.38	-2.69
Uganda	Treatment (t_1-t_0)	-	11.57	23.69
	Control (t_1-t_0)	-	8.01	9.14
	DID	-	3.56**	14.55***
Grade 1, 2009				
Kenya	Treatment (t_1-t_0)	29.73	36.27	16.72
	Control (t_1-t_0)	35.08	39.86	18.59
	DID	-5.35	-3.59	-1.86
Uganda	Treatment (t_1-t_0)	-	24.77	34.16
	Control (t_1-t_0)	-	18.32	26.05
	DID	-	6.44***	8.11
Grade 2, 2009				
Kenya	Treatment (t_1-t_0)	37.98	30.83	7.43
	Control (t_1-t_0)	34.05	30.27	10.40
	DID	3.93	0.56	-2.97
Uganda	Treatment (t_1-t_0)	27.37	28.67	22.67
	Control (t_1-t_0)	22.52	22.85	25.53
	DID	4.85	5.82**	-2.86

Note: The missing (-) mean scores for Uganda is a result of very low mean scores for Written Literacy at the baseline for grades 1 2010 and 2009 cohorts such that few pupils fell below 1 s.d. from the mean.

4.3.2 Summary written literacy assessment results

The results in Table 4.10 indicate positive treatment effect in Uganda, which is statistically different from 0 across all the three cohorts. This suggests that EAQEL improved written literacy levels in Uganda whereas in Kenya the evidence shows there was no treatment effect. The positive treatment effects observed in Uganda districts combined is maintained at district level in the case of Uganda, but this is merely informational evidence.

Disaggregated analysis by pupil's level of competency at baseline indicates that the average performing pupils tend to have benefited from the EAQEL intervention more than the low and high competent pupils.

4.4 The Role of Program Implementation

After implementation but without knowing the endline test scores, AKF created a simple categorization of the treated schools based on the fidelity of program implementation (or uptake). The three categories—high, medium, or low—are based on 11 separate indicators of implementation observed by AKF personnel.

Table 4.13 examines whether the treatment effects are sensitive to the degree of program implementation. In the first column, three separate coefficients indicate treatment effects among schools with high, medium, or low implementation. Note that implementation does not matter for numeracy effects, since all are small and statistically indistinguishable from zero. For both literacy assessments, the full-sample effects are highest among the high implementation category (19-22% of a standard deviation). In contrast, they are zero among the low category of schools.

Table 4.13: Treatment effects in high, medium, and low implementing schools

	Global Mean			Heterogeneous Effects		
	Numeracy	Written Literacy	Oral Literacy	Numeracy	Written Literacy	Oral Literacy
Intention to Treat X High Uptake	0.033	0.191***	0.219***			
Intention to Treat X Medium Uptake	0.012	0.087	0.165**			
Intention to Treat X Low Uptake	-0.064	-0.018	0.036			
Intention to Treat X High Uptake X Kenya				0.029	0.097*	0.165**
Intention to Treat X Medium Uptake X Kenya				-0.099	-0.030	0.020
Intention to Treat X Low Uptake X Kenya				-0.200**	-0.111*	-0.060
Intention to Treat X High Uptake X Uganda				0.013	0.358***	0.300**
Intention to Treat X Medium Uptake X Uganda				0.147	0.233**	0.340**
Intention to Treat X Low Uptake X Uganda				0.138	0.118	0.179*
N	8,920	8,850	8,819	8,920	8,850	8,819
R-Squared	0.28	0.34	0.29	0.28	0.35	0.29

Notes: Sample of students who completed specified endline test and at least one baseline test. Endline test scores standardized based on cohort, country, and grade at endline. Intention to treat defined through original APHRC randomization. All regressions include controls for all three baseline tests (students who did not take a particular test are given a score of 0), a dummy variable for each missing baseline test score, interactions between cohort and country, a dummy variable for sex, and district fixed effects separately by Kensip status for all but one district in each country. Standard errors clustered at the unit of randomization (cluster for Kenya, sub-county for Uganda). * significant at 10%, ** significant at 5%, *** significant at 1%.

It is also instructive to assess treatment effects by implementation status in each country. The final columns of Table 4.13 confirm once again that in Uganda the treatment effects are uniformly positive for all levels of implementation. However, note that effects are relatively lower in low-implementing schools. In Kenya, the results are particularly striking because they now show small and statistically significant treatment effects (10-17% of a standard deviation), but only in high-implementing schools.

In conclusion, the results suggest that implementation quality, as judged by the criteria and observation of AKF, is an important mediator of program effects. It even suggests that, among a subset of Kenyan schools, there were small positive effects.

5 Conclusions and Discussion

The following broad conclusions can be drawn from the results presented on the various tables on the impact evaluation of EAQEL. (1) On average, the EAQEL intervention was effective at raising Ugandan literacy, both written and oral; (2) it was not effective at raising Kenyan literacy; and (3) it was not effective at raising numeracy in either country.

The results present an important puzzle. What can explain the generally positive findings in Uganda, and the much weaker findings in Kenya? The first potential explanation is that the baseline achievement and resource levels were lower in Ugandan schools. In this regard, the two districts included in the study had suffered greatly in the recent Uganda conflict and had a more limited supply of instructional materials than the districts in Kenya. The provision of any instructional materials or libraries could more easily have an immediate effect on students who would have had very few materials in the absence of treatment. Additionally in Uganda the EAQEL-provided instructional materials were the first materials available to these schools in the local language. In Kenya, with better-resourced classrooms and higher levels of initial achievement, the intervention's effect might have been weaker.

A second explanation is that the assessment tools showed some evidence of ceiling effects. The scores of Kenyan students—who had higher initial levels of achievement—were at the top of the measurement scale. That is, some students answered all items correctly. In this case, the growth of treated Kenyan students' test scores is attenuated relative to control students. Even so, this explanation bears a more careful examination of the item-level test score, and the use of alternative statistical techniques to analyze the data.

A third explanation comes from the potentially differential implementation in the two countries. This explanation was somewhat explored in Table 4, but important differences could still remain. Different individuals, with potentially varied ideas on adequate implementation, rated school level implementation in the two countries. Also, teachers were trained in their respective countries. Other differences include an emphasis on including all the steps of the RtL framework in a single lesson in Kenya, whereas the thematic baseline curriculum in Uganda lent itself to splitting the steps across multiple lessons; and the differential model of funding “support tutors”

resulted in more follow-up with the treatment schools in Uganda than in Kenya. While these explanations are speculative, they can serve as the basis for additional analysis of quantitative and qualitative data, as well as discussion with AKF.

6 Appendices

Appendix I: Further analysis of Treatment Effects: Regression approach

In addition to the DID results presented in the report, further analysis was undertaken using an alternative regression approach. Appendix 6.1 presents results from the regression analyses that estimate the impact on test scores of the EAQEL treatment. Each column reports results from a separate regression. In the first column, for example, the numeracy test score is regressed on an “intention to treat” dummy variable, equal to 1 if the students is in a cluster that was originally assigned to the treatment, and zero otherwise. The regression includes controls for all three *baseline* test scores (i.e. numeracy and both literacy scores). It further includes controls for dummy variables indicating the strata within which the randomized occurred (see table note). The standard errors are clustered at the level of the unit of randomization (AKF cluster in Kenya, or sub-county in Uganda).

To provide a global (pooled data for both countries) assessment of the treatment, the first three columns pool across students in two countries and three entering student cohorts within each country. The results show that the treatment has a zero average effect on numeracy, and a small average effect of 10-15% of a standard deviation on either literacy test.[§] The final three columns report regressions that interact the main dummy variable with country and cohort. In numeracy, there are no positive and statistically significant effects in any group. This is perhaps consistent with nature of the EAQEL intervention, which emphasized reading and literacy (although improved literacy might eventually improve students’ ability to learn or be tested on numeracy). There is a negative and significant effect for a single Kenyan cohort. However, recall from Table 4.2 that baseline test score imbalance was greatest on the numeracy assessment in the Kenyan sample. This implies that “negative” effects in this cohort could partly be reflecting imbalance on other, unobserved variables that would be causing differential trends even in the absence of treatment

[§] The effect size, or percent of a standard deviation, is a common metric in which to report the mean difference in a test score between a treatment and control group. It makes the effects more comparable across different tests within an evaluation (or even across evaluations), because it adjusts for the fact that some assessments may have a narrower or wider distribution.

In written literacy, there are uniformly positive and statistically significant effects of the treatment on the three Ugandan cohorts (18-27% of a standard deviation). The same pattern is evident for Ugandan cohorts on oral literacy (21-34% of a standard deviation). In contrast, the effects are small and statistically insignificant for Kenya.

These results are most comparable to the difference-in-difference (DID) pooled and country level estimates presented in the main report. Despite the use of slightly different samples and specification, similar broad conclusion emerge: (1) on average, the EAQEL intervention was effective at raising Ugandan literacy; (2) it was not effective at raising Kenyan literacy; and (3) it was not effective at raising numeracy in either country.

Appendix 6.1: Treatment effects using regression approach

	Global Mean			Heterogeneous Effects		
	Numeracy	Written Literacy	Oral Literacy	Numeracy	Written Literacy	Oral Literacy
Intention to Treat	0.004	0.102**	0.148***			
Intention to Treat X Kenya X Grade 1 2009				-0.175**	-0.017	0.017
Intention to Treat X Kenya X Grade 2 2009				-0.051	-0.007	0.067
Intention to Treat X Kenya X Grade 1 2010				0.062	0.076	0.105
Intention to Treat X Uganda X Grade 1 2009				0.089	0.265***	0.339***
Intention to Treat X Uganda X Grade 2 2009				0.140	0.246***	0.213***
Intention to Treat X Uganda X Grade 1 2010				0.079	0.177**	0.268**
N	8,920	8,850	8,819	8,920	8,850	8,819
R-Squared	0.28	0.34	0.28	0.28	0.34	0.29

Notes: Sample of students who completed specified endline test and at least one baseline test. Endline test scores standardized based on cohort, country, and grade at endline. Intention to treat defined through original APHRC randomization. All regressions include controls for all three baseline tests (students who did not take a particular test are given a score of 0), a dummy variable for each missing baseline test score, interactions between cohort and country, a dummy variable for sex, and district fixed effects separately by Kensip status for all but one district in each country. Standard errors clustered at the unit of randomization (cluster for Kenya, sub-county for Uganda). * significant at 10%, ** significant at 5%, *** significant at 1%.

Appendix 2: Parental and Teacher Perceptions and Experiences with EAQEL

The design of EAQEL had a key parental component which has been referred to as the core model plus. The involvement of parents in EAQEL is in recognition of the role of parents in improving learning outcomes. Therefore, the exploration of parental perceptions and experiences in the process of the implementation of EAQEL is important. This section offers a qualitative assessment of ways in which parents were involved in the education of their children in the early grades with respect to EAQEL intervention.

The Context

Following the implementation of free primary education in East Africa there was a phenomenal increase in school enrolment. In Uganda, school enrolment increased from 3,068,625 in 1996 to 8,193,267 in 1997 while in Kenya enrolment increased from 5.9 in 2002 to 7.2 million in 2004. This put a strain on education systems and schools with already limited access to human and material resources. Interaction between school and communities remained low on issues of children's learning. It is for this reason that AKF embarked on the implementation of the EAQEL approach in collaboration with the Education Research Program (ERP) at the African Population and Health Research Center (APHRC) who were the impact evaluators. This section highlights: the experiences of parents with EAQEL within the different communities; and mechanisms by which the intervention took root in the communities. We obtained data from the qualitative component of the evaluation study conducted in June- July 2011, using focus group discussions in core plus schools in Kinango, Kenya and Amolatar, Uganda.

Reform initiatives and especially those involving parents have better chances of becoming institutionalized when participation by the community is evident (Arriaza, 2004). Within communities, meanings are defined by circumstances that are particular to people's interactions, and true representations of the reality emerge from the ground (Mishler, 1986; Goffman, 1974; Charmaz, 1983). Parents operate within communities, and indeed the implementer of the project—the AKF had realized that parental involvement is key to learning outcomes. This is the reason why one of the key objectives of the EAQEL project was to enhance parental involvement and support for children's early learning in selected schools in Kenya and Uganda.

As members of their respective communities, parents are bound by socialization processes, the geographic locations that they occupy, and social control measures present (Willie, 2000). Above and beyond this, parents as community members bond due to relationship dynamics created and sustained by organizations—in this case schools that were part and parcel of this project and the overall implementing agency (AKF).

Consequently, bonding acts as social glue that enables individuals to develop their interdependence while being able to control issues affecting their lives, one of them being resources. According to Willie, (2000) social control is what gives a community a sense of purpose and in turn be able to focus on solving issues and problems. In this case the communities (school and the local communities around the schools) interacted with AKF in the process of the implementation of the EAQEL had a shared vision of improved learning outcomes for the children in early grades.

The interaction between communities in the process of project implementation is enhanced by the presence of social capital. Putnam (2000) argues that social capital that exists between individuals can be extended to include communities as social networks. He argues that parental involvement in schools is enhanced when individuals citizens (in this case parents), have very closely knit connections through formal institutions (school PTA's, and school meetings). This is exhibited by AKF using "lead parents" who were to keep textbooks, which were to be borrowed by other parents on behalf of their children. Research evidence shows that the presence of social capital makes the interactions between individual community members stronger, while facilitating the exchange of services (Putnam, 2000). Putnam further posits that the presence of social capital "greases the wheels that allow communities to advance smoothly; where people are trusting and trustworthy, where they are subject to repeated interactions with fellow citizens, everyday business and social transactions are less costly" (Putnam 2000, p. 288).

Results of Focus Group Discussion

Process of implementation and reception of intervention

The intervention was well received by the communities in which it was implemented, particularly in Uganda. This was also as a result of the strong presence of the implementer (AKF) on the ground, and the process with which the implementer used to implement the core module plus. AKF provided books both in English and Lang'o at the community level that parents borrowed on behalf of their children. This was in addition to the books that had been supplied at school level. The enthusiasm was evident among the parents in Uganda who felt that the implementer had gone an extra step by providing the books in the local language, which is Lang'o. Parents whose children attended Burkwoyo School in Uganda said this about the provision of books:

Assistant Moderator: *Do you work as a coordinator for AKF?* R2: her husband is the one who is a coordinator. R4 affirms this... they are at the home of Mr. Ogwang. R4: These books are there at village level, and it is not the children who borrow; it is their parents. A parent signs for the number of books they need, and takes the book, and when they bring it back, I acknowledge... Am from Abwoc Col village. It is the parent that takes... What the children keep are the books that they get from school (Female FGD, July 6th 2011).

The implementer (AKF) used the parents in the whole process of implementation of the intervention. According to the parents, their names were registered by AKF, and they were assembled in the various schools once contacted by the respective head teachers of the schools. This corroborates the key component of the process of implementation of the EAQEL that included the training of parents in the approach. According to the AKF Grant Report for the period April 2009-June "the project staff then trained 1,101 parents (469 male and 632 female) from 20 schools in Kinango district and 759 parents (668 male and 358 female) from 23 schools in Amolatar on how to use the Reading for Children (RfC) training guide developed by the project." Parents from Agwenonywal primary school attending an FGD reported the following on the process of the implementation of EAQEL:

Assistant Moderator: *Someone said something very interesting, and I feel I need clarification; (to R7), you said that a lot of visitors come to your home, and also*

that you have books at your place; where did you get these books from?

Respondent 7: AKF called parents here for a meeting, some came and others did not. They registered our names in their books. Later the Head teacher of the school called us; three people in three villages; I from Agwenonywal village, Olengo Jimmy from Owiri Village, and Francis Olum for Nyanglit village. The people down south (of this place) did not get any books because none of them came for the meeting. So these books were given by AKF and those of us that keep them are called *lead parents*. The children come and borrow...that is why am saying visitors come to my house from time to time. Even the head teacher came to my home the other day. There were so many people...so they sat under the mango tree and read books (Female FGD, 19th July 2011).

One parent from Burkwoyo in Amolatar in Uganda says this in relation to the EAQEL, “I have seen its goodness...” This typifies the positive attitude among several parents across the FGD’s discussions in Uganda. This positive attitude translated into a positive reception by parents of the intervention. Parents from Agwenonywal had this contribution in relation to the contribution of AKF to the reading and numeracy in Amolatar:

Moderator: *But that means that they are able to read and write. Do you know what AKF has done to improve the education of your children in this school?* R2: they sent books to the school and others were sent to the community. Some of these books are borrowed by the children and then returned after reading... the children have access to good books with very interesting stories. And they read and understand. R9: I also know only about those books. R5: it’s true the books were given...my child got a copy when he was in P.1 at the time. The person who was keeping those books at the community came to me and told me about them. R7: the organization has done a [good thing] to teach our children to read and write because I know it will give them a brighter future. For us who are not educated we find hardship in the community, but we hope that our children should not be like that. But I’d request the organization to also bring other books in simple English so that they also learn English... (Female FGD, 19th July 2011).

Ways of parental involvement

To a larger extent, parents were involved in their children learning process by helping them with *home work, reading, and revising* with their children at home. In addition, *older siblings* of the children in P.1 and P.2 were available to read with their sisters and brothers in the lower classes. In addition, parents were also advised to help children *prepare those materials* that are required for teaching and learning of numeracy, like counting materials. This is what the parents of children from Burkwoyo observed:

Moderator: *Do you know what AKF has done to improve the education of your children in this school?* R5: we were taught that when a child comes home from school, you should get their books and revise school work with them. So for me that was the greatest [advantage of this program]. It helped my child perform very well at the end of the term... teach them hygiene. Many times, we use the pictures in the books to emphasize a point. You can look at a picture of child brushing his teeth and tell the child to do the same, or washing hands, or washing fruits before eating them or even bathing... so those are the things I tell my child, and he also confirmed that was the same thing they were told at school; for example washing hands after using the latrine, brushing teeth every morning. Sweeping the compound, among other things. R4: those books are very good, and they are also available in English and **Lang'o**. I have them at my home; that is where they are kept. The children ahead can always help the younger ones with their reading, and they learn faster together. R8: those books are very good. They help the children to read in Lang'o they help each other, and they understand. R9: they are good books, but of course a child cannot read everything, they read some, and are defeated to read others, even in English it's the same thing; they read some and fail to read others (Female FGD, July 6th 2011).

Moreover, parents *attended meetings* wherever they were called upon to share the ideas on what was working for them as parents charged with the responsibility of ensuring that their children have the necessary books, borrow the books to read. Parents from Etam School in Amolatar had to say:

Moderator: *Did you also help to make these materials that help children in reading and writing?* R2: Yes, we come every time they call us for meetings. We come, share ideas with them. R1: Those of us who are given the books to keep, we gather children on Saturdays, and we encourage them to tell stories to one another. This happens even in the communities. I make sure I have checked the books for mathematics or a work book where they do their rough...Moderator: *What did you do as a way of sharing ideas with the school regarding your children's learning during all this time?* R5: We've been helping them with their homework following from what we can see from their books...(Male FGD, 6th July 2011).

In Kenya, parents shared the same sentiments as their counterparts in Uganda. These parents took the initiative to check the children's work when they came home from school, and subsequently interact with respective teachers of the pupils. Parents of children from Kideri School had the following to say about their involvement in their children's literacy and numeracy campaigns by AKF:

Moderator: *What did you do as a way of sharing of encouraging your child to improve in school?* Participant 2: when he arrives home, I must look at the work he has done...I mean at school and when you see he is not progressing well, instead of continuing going on the way he is...I seek advice from teacher. Participant 5: yes, and then he gives me his books and I look at them. I look at the ones that have been marked by his teacher and I will know whether he has problems, and, then I tell him what is supposed to be done...(Both Male and Female FGD, 28th June 2011).

AKF as a partner and motivator for parents

AKF has been a partner and motivator for parents and in the process of the literacy and numeracy intervention. They told parents how to use pupils' time and value their children's education. This role was complimentary to the trust that has been built between the community in Uganda and AKF over a period of time. These parents associated the implementer with positive educational outcomes. This was very instrumental in the enhancing the positive attitude that parents had on the ability of AKF to effect change in their community.

Moderator: *Any other ideas?* R3: AKF is also giving the parents good ideas for the future of their children. Moderator: *What kinds of advice/ideas?* R3: telling parents that the future of this country lies in education of children and their participation in their children's education... encouraging parents and children from time to time. Some parents and even children fear to come and borrow books from the schools, but with what AKF has done, it is easier at community levels, parents come because we are parents like them, and they don't fear us...(Female FGD, 19th July 2011).

Empowered parents acting as "teachers" outside the classroom

In Uganda, the implementer worked closely with parents and in the process empowered them to be "teachers outside the classroom" Parents took the initiative to encourage community learning through borrowing books on behalf of their children. Parents whose children attended Burkwoyo Primary School had this to say about parents being teachers outside the classroom.

Moderator: *Where are the books found?* R4: These books are there at village level, and it not the children who borrow; it is their parents. A parent signs for the number of books they need, and takes the book, and when they bring it back, I acknowledge. Moderator: *Which village is that?* R4: Am from Abwoc Col village. In this village, it is the parent that takes... What the children keep are the books that they get from school (Female FGD, July 6th 2011).

Parents who attended an FGD on behalf of the children in Agwenonywal concurred with the sentiments of their fellow parents in Burkwoyo that parents have to play their part as “teachers outside the classroom” in order to facilitate the improvement of reading and math among their children. This is what they said, Moderator: *What are you doing as parents to improve their level of literacy?* R6: *I go through the books together with the child and make corrections where the child has gone wrong. I help with spellings, and every time he fails he comes to me and reports and I keep encouraging him to be close to the teacher. And I keep correcting him...*

However, there was a difference between the role of parents as empowered teachers outside the classroom between the control and treatment schools in Uganda. For instance, in the control school in Uganda the sample of parents who attended the FGD painted a picture of parents who were remotely involved with their children schooling. Either the parent or any significant other could check the books. It was clear that parents were more or less concerned with whether the teacher had “marked” and if the books need replacement. Parents representing Acengreny primary school, a control school said:

Moderator: *What are you doing as parents to improve their level of literacy?*
R4: after class, there is a[girl] who checks to see what the child has done, [for me I only see if it's marked]. Moderator: *How often is this done?* R2: I check but not often. But when I have to, I check to see if it is marked, if I find that it is not, then I ask why. R1: I check the book. If my child comes and asks for a new book, I check to see if it's actually full. I urge parents to help provide for their children all the materials they need and those who can read should also try, however busy they are to look into their children's books and guide them (Female FGD, 15th July 2011).

In Kenya, parents were aware of the importance of complimenting the teachers' effort for improved literacy and numeracy. For instance, it was important to read with the child, the importance of homework and to the fact that he understands the context of the work that he [she] has been assigned. Parents whose children were attending Mtulu Primary School in Kenya observed:

Moderator: *What are you doing so far to improve the level of literacy and numeracy for your child?*
Participant 7: I also feel that it is very important to read those books with the child.

When he gets home it is important to know that he has been given homework, and even books to read as well, I feel it is good to explain to him and to help him do mathematics problems ... (Female FGD, 1st July 2011).

Parents perception of the role of teachers in EAQEL

Like parents, teachers were crucial to the success of EAQEL. Therefore, teachers were trained in the methods of teaching literacy and numeracy by the implementer (AKF). They attended seminars that took them through the stages of EAQEL intervention and how to utilize them in the classroom with pupils. The design of the intervention was such that teachers and parents were to continuously interact.

Parents in Kenya recounted their understanding of the processes of teacher involvement before the implementation of the intervention.

Moderator: *What do you know about the process that was used before your children began reading and doing maths?* Participant 2: This program I feel it has some benefits and I don't know whether my colleagues have different views...In the year 2009, there are some teachers here who were being chosen. I hear to go for seminars by the Aga khan group. Aga khan group is the one that takes these teachers to go for the seminars. ..Ah! Did you not allow the Aga Khan people to do research? Now those teachers who are responsible for your children are the ones who are going for seminars...When the teachers come back they bring the same education to our children... Now I see that there are benefits in this training (Male FGD, 30th June 2011).

AKF “brought schools to our children”

Parents in Uganda strongly felt that the implementing agency decentralized the classroom interaction, as one participant strongly put it “AKF brought schools to our children” The implementer connected the schools to the communities and encouraged parents to be the intermediaries between the school, the community and their children. Parents supported their children learning within the community on agreed dates. In addition, *peer learning* was also

encouraged from the older siblings who were in the upper grades. This is what parents attending FGD at Etam Primary School, one of the treatment schools in Uganda said:

Moderator: *Now we are going to begin our questions... Does anyone know about AKF or their activities?* R8: The good thing they have done here is encouraging the teaching children to read well. In the past they could not read, but now because of AKF programs, they understand Lang'o well... Moderator: *Is there anyone who knows anything else?* R9: What AKF has done here for us is enabling our children to read well and also bringing the parents together with children. [They have brought schools to our children...].

Moderator: *Brought schools for your children?* R9: They have brought community libraries at village level where the children go to read... Moderator: *How do these "classes" work?* R9: On arranged days, children, teachers and the parents come together and learn using the books borrowed... Moderator: *Could you please shed more light on how these community libraries work? I'd like to understand better.* R9: What happens is that they call children, especially P.1 to P.3 on the agreed dates, and the children go with their parents; they are taught while their parents are also present to give support. Also older pupils of, say, P.6 also come to help these young ones.

Moderator: *How often do these happen?* R9: In my area it is about twice a week.

Moderator: *How about for the rest of you?* R7: AKF has supplied books that have enabled our children to read better and has greatly improved their spellings... It has also supplied other teaching materials to the schools, like, manila cards, among other training materials for the children. Moderator: *Were these training/learning materials for the children also sent to the communities?* R7: At community level they only sent story books for the children to read (Male FGD, 6th July 2011).

Why there is no impact in Kenya?

In the case of Kenya, some of the control schools exhibited similarities in parent-school relationships that were characteristic of the treatment schools. Parents were equally concerned that their children level of reading and math performance improved. Parents in the control schools in Kenya also consulted the teachers about their children's performance. They appeared to realize that good performance in school was important to the children, and they wanted it. The difference is that they left the burden of ensuring that the children read and do math to the teachers. They saw their role as empowering the teachers to do what they do best. Parents whose children attended Mazeras Primary School, a control school had this to say:

Moderator: *What is your role in your child's education?* When I read those reports I was not happy. I was forced to come to school. I took that responsibility and came to school, I saw his teacher who explained to me where the problem was. Aah... I felt that I should take another step because a teacher alone cannot help the child. Aah, when we sat down with the teacher and talked, he told me that tuition...this private helps... now he goes home and eats and then takes his books and comes back and is kept busy by this teacher. Now I don't know how this term the results will be but I felt that this also helps. Most of the time I also pass by school and look at the progress of the child instead of sitting at home until the child does the exam and you are brought the report...whether the child has done badly or has done well it is not in order that the parent is not concerned. That also makes the child not to have that motivation... (Female FGD, 27th June 2011).

In addition, parents in the control schools in Kenya reported that in addition to consulting the teachers, as reported above, they helped the children to navigate the difficulties they encountered in the process of doing homework. Moreover, the parents sought advice from the teachers how to improve their children's performance in Math and English. Parents attending the FGD from Ndauni Primary School reported:

Moderator: *Is there anyone who has a different thought apart from those which have come up?* Participant 3 [Woman]: ...I look at his books and if I find out that he is not doing well, I go to his class teacher and I ask him, 'How is this child doing?' then I am made to understand and another time we will go with him [child] and he is given homework to do... slowly-by-slowly he goes through the work until he gets those things he is supposed to, and then I can know whether I have a problem or not ...Even during the closing day one would like to know how his/her child is doing in school, whether he gets to play or if he gets to read. So, at that time I go to school and get to his teacher. If it is Math he doesn't understand, I am advised, if it is English, I am advised if there is a topic he doesn't understand, he tells me and he is given homework little by little... Participant 2[woman]: ...I never got educated but when my child studies for like three or four days, I go to the teacher and tell the teacher, 'How is my child progressing?...I am informed about my child, then I look at their books whether it has been taken to the teacher...(Female FGD, 29th June 2011).

Lessons that can be drawn from the FGD

In Uganda, parents were explicitly more receptive of the intervention and the implementer, and were more open to speak about it during the FGD. Parents in Uganda were particularly pleased to see learning materials for their children in local language. This reinforced positive perception for them in terms of the intervention. Discussions with parents in Uganda demonstrate that there was ownership of EAQEL intervention with a very clear understanding of their roles and

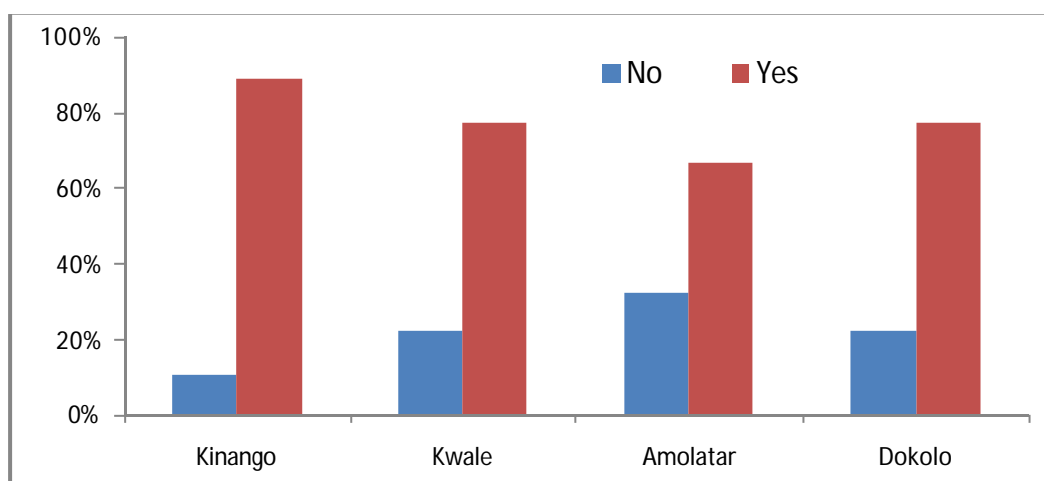
involvement. For instance parents used a powerful phrase “AKF brought schools to our children” to describe EAQEL.

In Uganda, parents from the control schools were remotely involved in what was happening in schools. In Kenya, this receptive description of EAQEL does not emerge with clarity. For example, parents in control schools seemed to be involved in their children schooling just like might have been expected of those in treatment schools. Parents in Kenya both in treatment and control schools were aware of the need for them to consult, follow-up on their children homework and collaborate with teachers.

Uptake of EAQEL by teachers

In addition to the qualitative data collected from the parents, 429** teachers in the treatment school were interviewed on the EAQEL intervention. The purpose for interviewing teachers in the treatment school was 1) to understand their uptake of the intervention; 2) to understand their effective use of the intervention and 3) document the support they receive from the school head teachers.

Appendix 6.2: Proportion of teachers in the treatment schools trained on EAQEL intervention (n=429)

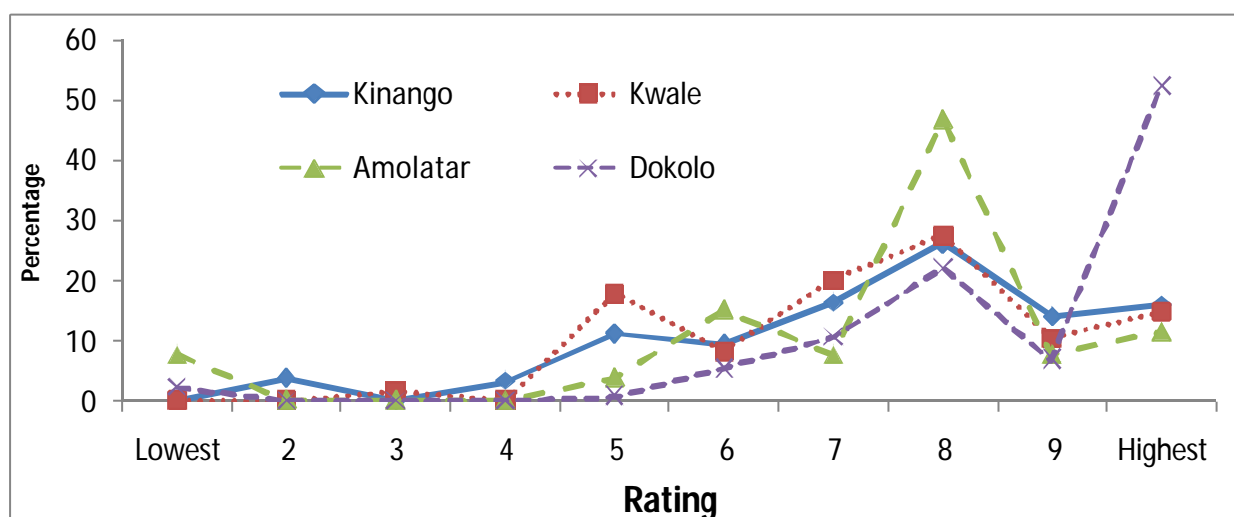


** At the endline, a total of 445 teachers were interviewed and this number included 16 teachers captured in the baseline, who at the endline were not teaching grades 1, 2, and 3. The 16 teachers are excluded in the analysis.

Results presented in Appendix 6.2 shows that a higher proportion of numeracy and literacy teachers in Kenya were trained on the EAQEL intervention than Uganda. Amolatar district had about 40% of the teachers reporting not to have been trained on the EAQEL intervention.

Teachers who had undergone EAQEL training, were asked to rate themselves in terms of their understanding of the EAQEL intervention in a scale of 1 to 10 (Appendix 6.3). Teachers in Uganda rated themselves highly compared to their Kenyan counterparts. The highest rating was among teachers in Dokolo, with 52% rating themselves highest and this was closely followed by teachers in Amolatar who rated themselves at level 8.

Appendix 6.3: Teacher rating on their understanding of EAQEL intervention (n=318)



The knowledge of the steps of the EAQEL intervention for both numeracy and literacy is key to the success of the project. Teachers were therefore asked to state the steps of EAQEL intervention for both numeracy and literacy and in the right sequence (Appendix 6.4). The results show that literacy skills steps were mastered better than numeracy across the districts. The correct sequencing of the numeracy in Uganda was low compared to that of Kenya. For literacy, more teachers in Uganda were able to correctly sequence the literacy EAQEL intervention steps than Kenya.

Appendix 6.4: Correct mentioning of EAQEL intervention steps (n=318)

District	Literacy (%)	Numeracy (%)
Kinango	78.5	39.25
Kwale	73.13	42.65
Amolatar	62.5	43.59
Dokolo	64.29	58.06

Classroom Observations

Teacher preparedness

Appendix 6.5 shows teacher preparedness to teach assessed by availability of lesson plans. Those teachers who reported to have the lesson plan but could not produce it in order to be recorded as seen by the field interviewer, as well as those who simply reported to have had none, their lesson plan were coded as not available. Comparing baseline and endline teacher preparedness to teach in both treatment and control schools, there is an increase in the use of lesson plans. At endline, more teachers in Uganda treatment schools were consistently better prepared to teach than those in the control schools.

Appendix 6.5: Availability of lesson plan (n= 229 schools; 665 classes)

	Baseline (%)			Endline (%)		
	Treat	Control	Diff	Treat	Control	Diff
Grade 1, 2010						
Kinango	70.59	85.29	-14.70	94.59	97.14	-2.55
Kwale	89.66	90.00	-0.34	83.33	86.36	-3.03
Amolatar	88.89	74.07	14.82	100.00	88.00	12.00
Dokolo	87.18	90.48	-3.30	94.87	94.87	0.00
Grade 1, 2009						
Kinango	76.32	75.00	1.32	94.87	90.32	4.55
Kwale	84.21	82.61	1.60	96.30	92.00	4.30
Amolatar	72.22	81.25	-9.03	93.55	88.24	5.31
Dokolo	92.11	94.29	-2.18	100.00	95.56	4.44
Grade 2, 2009						
Kinango	90.70	93.33	-2.63	94.23	79.07	15.16
Kwale	92.31	90.91	1.40	82.05	87.88	-5.83
Amolatar	65.63	83.78	-18.15	92.50	83.78	8.72
Dokolo	88.89	94.59	-5.70	94.12	90.74	3.38

Non-basic teaching and learning materials

Non-basic teaching and learning materials were captured by collecting data on different items that included use and presence of visual teaching aids in classrooms. Information on visual aids was collected separately for numeracy and literacy using an observation checklist. Appendix 6.6 and 6.7 show the presence of visual aids in all the classrooms observed.

Appendix 6.6: Availability of Visual Teaching Aids in Numeracy (n= 229 schools; 665 classes)

	Baseline (%)			Endline (%)		
	Treat	Control	Diff	Treat	Control	Diff
Grade 1 - 2010						
Kinango	66.67	48.48	18.19	89.19	39.39	49.8
Kwale	92.86	73.68	19.18	87.5	71.43	16.07
Amolatar	72.73	42.86	29.87	90.91	52.17	38.74
Dokolo	45.83	40.63	5.20	88.46	50.00	38.46
Grade 1 - 2009						
Kinango	55.26	43.33	11.93	86.84	51.61	35.23
Kwale	73.68	76.19	-2.51	81.48	65.22	16.26
Amolatar	45.45	70.59	-25.14	68.00	30.43	37.57
Dokolo	29.17	66.67	-37.5	79.31	41.94	37.37
Grade 2 - 2009						
Kinango	75.00	51.72	23.28	41.67	7.14	34.53
Kwale	84.00	72.73	11.27	36.00	38.1	-2.10
Amolatar	45.00	45.45	-0.45	20.83	26.92	-6.09
Dokolo	32.00	43.48	-11.48	36.67	29.03	7.64

The numeracy results shows variation between treatment and control schools in the use and presence of teaching visual aids at both baseline and endline. At endline, there is heavy use and presence of visual aids in numeracy lessons in treatment schools, with the exception of grades 2, 2009. Grade 2, 2009 had progressed to grade 4 during endline data collection in 2011 and this grade (4) was not targeted for the EAQEL intervention. This could partly explain why the proportion of classes using visual aids in this grade was low.

A similar pattern is also seen in the use and presence of visual aids in literacy classes. At the endline, a higher proportion of the treatment schools had higher proportions of visual aids than the control schools.

Appendix 6.7: Availability of Visual Teaching Aids in Literacy (n= 229 schools; 665 classes)

	Baseline (%)			Endline (%)		
	Treat	Control	diff	Treat	Control	Diff
Grade 1 - 2010						
Kinango	69.7	59.38	10.32	88.89	42.42	46.47
Kwale	92.86	85.00	7.86	91.67	75.00	16.67
Amolatar	85.00	42.86	42.14	95.00	50.00	45.00
Dokolo	32.14	38.71	-6.57	96.15	63.33	32.82
Grade 1 - 2009						
Kinango	56.76	40.63	16.13	86.84	54.84	32.00
Kwale	76.47	82.61	-6.14	80.00	65.22	14.78
Amolatar	45.83	65.22	-19.39	71.43	40.91	30.52
Dokolo	30.77	60.71	-29.94	89.66	43.33	46.33
Grade 2 - 2009						
Kinango	73.17	53.33	19.84	32.35	11.54	20.81
Kwale	84.00	85.00	-1.00	40.00	30.00	10.00
Amolatar	36.36	52.63	-16.27	18.18	30.43	-12.25
Dokolo	36.36	41.67	-5.31	23.33	29.03	-5.7

Pupil attendance

Appendix 6.8 shows the proportion of pupils present on the interview day by district and class for both baseline and endline. The results show the following:

1. The mean attendance rate is high in Kenya than in Uganda at both baseline and endline. That is, while Kenya districts recorded close to 90% attendance, Uganda districts recorded about 80% or less.
2. The difference in pupil attendance between the treatment and control schools at both baseline and endline is small across the grades in Kenya districts and slightly large for Uganda districts in favour of the treatment schools.

3. Comparing the differences in pupil attendance at the endline between the treatment and control schools, the EAQEL intervention may have contributed to the small difference in pupil attendance in favour of the treatment schools.

**Appendix 6.8: Proportion of pupils present on the interview date by grade and district
(n=229 schools; 687 classes)**

	Baseline (%)			Endline (%)		
	Treat	Control	diff	Treat	Control	Diff
Grade 1 - 2010						
Kinango	89.75	89.96	-0.21	86.87	85.12	1.75
Kwale	87.28	91.85	-4.57	89.40	88.59	0.81
Amolatar	78.34	69.66	8.68	72.20	70.64	1.56
Dokolo	74.10	83.29	-9.19	74.09	74.51	-0.42
Grade 1 - 2009						
Kinango	87.66	89.04	-1.38	87.06	85.06	2.00
Kwale	92.00	90.21	1.80	92.81	86.17	6.64
Amolatar	80.21	68.08	12.12	71.98	73.52	-1.54
Dokolo	71.56	74.42	-2.87	77.05	71.75	5.31
Grade 2 - 2009						
Kinango	90.16	88.41	1.75	86.42	84.12	2.30
Kwale	87.39	87.62	-0.22	89.47	87.67	1.80
Amolatar	81.11	69.69	11.43	75.93	70.05	5.88
Dokolo	74.95	70.79	4.16	78.87	72.72	6.16

Appendix 3: Cost-Effectiveness Analysis

Background

In sub-Saharan Africa, large sums of money have been invested by national governments and international development partners to improve access to education and learning outcomes. Impact evaluation studies help to estimate whether education interventions have had significant impacts on education outcomes of interest, but provides only a third of the answer as to whether the interventions are good policy choices. The remaining concerns whether the benefits exceed the costs of interventions, and whether a particular intervention has the largest benefit per unit cost as compared to other alternatives (Evans & Ghosh, 2008). Cost-effectiveness analysis addresses these concerns by comparing impacts of an intervention with the cost of the intervention.

Cost-effectiveness analysis of education intervention helps to inform policy makers and partners whether a program or combination of programs lead to higher learning achievement at the lowest cost (Levin, 1995). This is particularly important in low-resource environments to provide research evidence to policy makers such as Ministry of Education (MoE) in their decision making to scaling-up an intervention deemed to be cost-effective. However, very few of impact evaluation studies, if any, have assessed the cost-effectiveness of different education interventions in the region. In the EAQEL intervention therefore cost-effectiveness analysis was included in the design of impact evaluation study.

In a randomised control trial intervention, cost-effectiveness analysis compares two quantities: additional cost of a new intervention compared with no-intervention (control group) and additional gain in learning outcomes, typically measured by gain scores in tests (Levin, 1995; O'Neill, 2009). In this particular case the purpose of this cost-effectiveness analysis is to examine whether the two approaches (Core model and Core model plus) implemented in treatment schools result in higher pupils' literacy and numeracy achievements at a minimum cost compared to the traditional approach in the control schools. The cost-effectiveness ratio provides the cost of obtaining one percentage point increase in mean test scores of pupils in treatment schools as compared to mean test scores of pupils in control schools.

Before estimating the cost-effective ratio, it is important to describe how the two key inputs (costs and impacts of the intervention) were estimated. The following sections present brief descriptions on cost estimation procedure and highlights measures of impacts of the intervention on literacy and numeracy by districts and grade levels. The cost data are obtained from AKF, implementing organization of the intervention. Estimates of impacts of the intervention are taken from the impact evaluation results discussed in section 3 of this report.

Cost Estimation

The direct costs of the intervention are estimated based on values of all resources/activities (teachers/head teachers training, textbooks & teaching materials, parental involvements, and school & community libraries) employed in EAQEL intervention. In order to ensure that all costs related to the intervention are included in the estimation procedure, all cost items were identified systematically and the cost of each item is provided by the AKF (See appendix A and B). Indirect costs associated with program administration and monitoring and evaluation by the implementing organization are excluded to reduce inflated costs external to the education system. In general, about 43% of the total cost was spent to purchase textbooks, teaching materials and books for school libraries. Close to 36% of the total cost to provide training for teachers, head teachers and school management committee. The remaining (about 21%) of the total cost is used for community libraries equipments and books and to sensitize parental involvement in reading to learn.

Although cost data was requested disaggregated by district level to estimate costs associated with the two approaches, the cost data for Kenya is not available disaggregated for the two districts. In this analysis, costs other than costs associated with EAQEL intervention in treatment schools are assumed to be the same across treatment and control schools during the implementation period of the intervention. It is also important to mention that initial cost of the intervention is higher than the cost of running the program in subsequent years. Capital improvement costs charged at the beginning of the program, such as setting-up libraries, and purchasing books and equipments inflate the cost in the first year of the intervention.

In addition, for both countries, separate cost estimates are not available for numeracy and literacy and by grade levels whereas impact estimates are disaggregated by grades and subjects. Theoretically, cost-effectiveness could be estimated separately for numeracy and literacy and by grade levels if disaggregated cost data were available. However, since the EAQEL intervention was designed and implemented as a package to improve literacy and numeracy in early grades, it would be practical to use the overall per-pupil cost in the cost-effectiveness estimation. Therefore, per-pupil cost is estimated simply by dividing the total cost of the intervention to the number of pupils who have benefited from the intervention. Finally, cost-effectiveness ratio is estimated by dividing the per-pupil cost by the gain in test scores in percentage points in literacy and numeracy for each grade. The ICER estimates give the per-pupil cost of improving literacy and numeracy test scores by 1 percentage point for each grade level.

Impact Estimates

For this particular study, the primary outcome of the intervention is pupils' learning outcomes measured in literacy and numeracy test scores. Impact of the intervention is estimated by taking differences in gain scores (DID) in numeracy and literacy tests between treatment and control groups. As presented in the impact evaluation results under section 4, the intervention was effective in improving literacy achievement in Uganda across the three grade cohorts. However, the results show no treatment effects on numeracy in both Kenya and Uganda, and on literacy in Kenya. Cost-effectiveness ratios are estimated only for results on literacy in Uganda where the intervention had positive impact in raising literacy achievement. That is, no need to assess cost effectiveness when there is no positive treatment effect in the first place. For the purpose of cost effectiveness analysis, oral and written literacy are combined together under literacy. Appendix 6.9 presents the DID results on numeracy and literacy by subject and grade cohorts.

Appendix 6.9: Impact of EAQEL/RtL intervention on Literacy and Numeracy test scores

Subject /Cohort	Uganda			Kenya		
	Country	Amolatar	Dokolo	Country	Kinango	Kwale
Numeracy						
Grade 1 in 2010	6.45*	4.95	8.29**	-3.92**	-3.48	-4.52*
Grade 1 in 2009	1.04	5.96	-2.20	1.37	2.97	-0.96
Grade 2 in 2009	1.25	2.66	0.23	2.68	7.23**	-3.62
Literacy						
Grade 1 in 2010	4.59**	3.77**	5.73**	-0.04	0.25	-0.18
Grade 1 in 2009	5.39**	5.17**	5.42**	-1.42	-0.38	-2.99
Grade 2 in 2009	5.04**	9.85**	1.62	1.29	2.21	0.15

** significant at P<0.01, * significant at P<0.05

Index of Cost-effectiveness

The cost effectiveness ratio is constructed by dividing the intervention cost per pupil by gains in test scores. Thus, index of cost-effectiveness ratio defined in terms of incremental cost effectiveness ratio (ICER) of the treatment relative to control groups (O'Neill, 2009; Petrou & Gray, 2011). In this case, ICER is calculated by dividing the difference in additional cost per-pupil between treatment and control schools to the corresponding difference in average gains in test scores. The lower the ratio, the higher would be the cost-effectiveness. The formula is given as follow.

$$\frac{C_T - C_C}{E_T - E_C}$$

Where C_T & C_C are incremental per-pupil costs for treatment and control schools respectively, but it is assumed that except the additional cost of EAQEL for treatment schools all other cost increases are the same for both groups.

Where E_T & E_C are mean gain scores in tests for treatment and control group, and the difference between the two gives the difference in difference (DID) in mean test scores. ICER can be interpreted as the additional investment of resources required for each percentage point gain in test score among treatment schools as a result of the intervention compared to control schools in the absence of the intervention.

Results

The cost-effectiveness ratios are estimated based on the ICER formula shown above and using per-pupil cost and average impact of the intervention for each grade cohort (Appendix 6.10). In the table, when there is no treatment effect the cells are marked with ('-') since cost-effectiveness ratio is not estimated in the absence of treatment effect. As mentioned earlier, the impact evaluation results show no treatment effect in Kenya both on literacy and numeracy. Thus, cost-effectiveness analysis was done only for Uganda and the results are presented in the table below.

Appendix 6.10: Cost-effectiveness Ratios			
Subject /Cohort	Uganda		
	Country	Amolatar	Dokolo
Numeracy			
Grade 1 in 2010	2.84	-	1.62
Grade 1 in 2009	-	-	-
Grade 2 in 2009	-	-	-
Literacy			
Grade 1 in 2010	3.99	7.16	2.36
Grade 1 in 2009	3.31	5.22	2.49
Grade 2 in 2009	3.65	2.74	-

Note: '-' No positive significant treatment effect

In Uganda, the cost-effectiveness ratios on literacy show that, on average, it costs from 3 to 4 USD per pupil to bring one percentage point increase in literacy test score. There is a slight difference across grade cohorts. The highest ratio (the lowest cost-effectiveness) is about 4 USD per pupil for each percentage point increase among Grade 1 2010 cohort, while the lowest ratio (the highest cost-effectiveness) is about 3 USD for Grade 1 2009 cohort. The lowest cost-effective ratio implies that, assuming that in the absence of the intervention an average score of 50 %, it would cost at least USD 75 (25×3) per pupil to bring the average test score to 75%, an increase of 25 percentage points. Although this looks very expensive, it is important to note that naturally it is costly to bring such a significant improvement in literacy achievement in a short period of time. The costs estimated based on a research and development (R&D) program are likely to overestimate the direct cost of the intervention. In addition, initial costs associated with establishing libraries, teachers' trainings, purchasing books and teaching materials spread over multiple years. Discounted annual costs may substantially reduce after the first year of the program while the intervention continues to have positive impacts in subsequent years.

District level comparison shows that, in general, the intervention resulted in more positive impacts in Amolatar than in Dokolo. However, the cost-effectiveness ratios shows that the intervention is more cost-effective (lower ratios) in Dokolo/the Core Model approach than Amolatar/ the Core Model Plus approach. This suggests that while the Core Model Plus leads to more positive impacts than the Core Model approach, it may be less cost-effective as the additional costs of parental involvement component raises the cost-effectiveness ratio.

Appendix 6.11: Costs of EAQEL intervention in Kenya (in USD)

List of Cost Items	2009/10		2010/11	
	Core Model	Core Plus	Core Model	Core Plus
Teachers' training	22,192	-	54,253	-
Head teachers' training	1,517	-		-
School management committee training	11,071	-	4,129	-
Support for parents reading for children	-	-		4,306
Teachers' guide books	-	-	5,718	-
Literacy text books	-	-		-
Maths text books	-	-	6,756	-
Storytelling books	-	-		-
Instructional materials & stationeries	13,238	-	8,504	-
Books for classroom libraries	-	-	58,645	-
Books for community mini-libraries	-	4,423	-	19,452
	-		-	
Other costs related to EAQEL (Cost of reflection meetings and government engagement)	-	162	-	13,655
Total Cost	48,018	4,585	138,005	37,413
Number of Pupils	11,138	11,138	11,783	11,783

Appendix 6.12: Costs of EAQEL intervention in Uganda (in USD)

List of Cost Items	2009/10		2010/11	
	Core Model	Core Plus	Core Model	Core Plus
Teachers' training	36,235	29,764	24,604	20,210
Head teachers' training	243	200	2,211	1,816
School management committee training	4,474	3,675	3,,630	2,982
Support for parents reading for children	-	2,184	-	11,679
Teachers' guide books	-	-	-	-
Literacy text books	-	-	-	-
Maths text books	14,879	12,222	3,114	2,558
Storytelling books	-	-	-	-
Instructional materials & stationeries	19,703	16,185	8,110	6,662
Books for classroom libraries	52,259	42,927		
Books for community mini-libraries	-	32,415	-	12,906
Other costs related to EAQEL	-	-	-	-
Storage facilities (Shelves) for classroom libraries	6,291	5,167	6,291	5,167
Technical expertise	341	280	248	204
Total Cost	134,425	145,019	48,208	64,184
Number of Pupils	13,042	7,627	13,845	7,855

Appendix 4: Full Sample Analysis

Students who were sampled in the baseline but were unavailable at the endline were “replaced” with students of the same sex from the grade in which that cohort should have been. The previous analysis was based on the sample of students who were present in both the baseline and endline samples. For the subsequent analysis we treat the baseline and endline surveys as repeated cross sections not necessarily containing the same students, and include all students, whether they are observed only at the baseline, only at the endline, or at both the baseline and the endline. The pupils randomly selected at the endline to replace the lost to follow-up pupils from the baseline are assumed, on average, to have similar ability level with the ones they have replaced. In addition and as earlier shown attrition rates from treatment and control schools are more or less similar.

The results show no treatment effects on numeracy both in Kenya and Uganda for all cohorts (Appendix 6.13). In Kenya, the intervention had no effect in both oral and written literacy tests. In Uganda, there are consistent treatment effects on both literacy tests across the three cohorts. This result is similar to what is observed when the estimation of treatment effect based only those pupils have test scores at both the baseline and endline surveys in the DID results presented earlier.

Appendix 6.13: School level DID Estimates on Treatment Effects

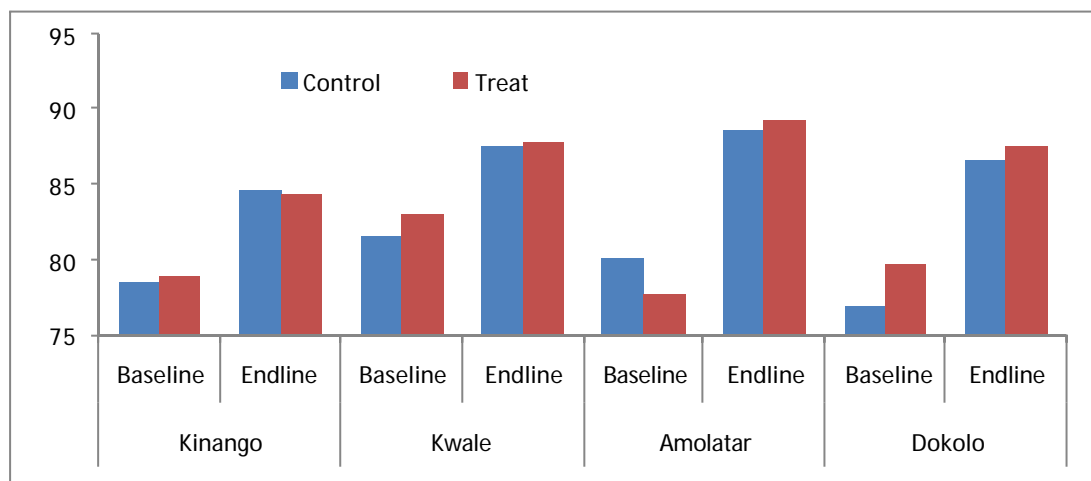
Country/ Cohort	Tests		
	Numeracy	Oral Literacy	Written Literacy
Kenya			
Grade1, 2010	-3.49*	0.56	1.38
Grade1, 2009	2.17	0.50	-1.55
Grade2, 2009	3.94	1.80	3.39*
Uganda			
Grade1, 2010	5.04	3.88**	3.43**
Grade1, 2009	0.13	5.53***	6.04***
Grade2, 2009	1.00	4.68**	5.78***

Appendix 5: Literacy Oral Competencies

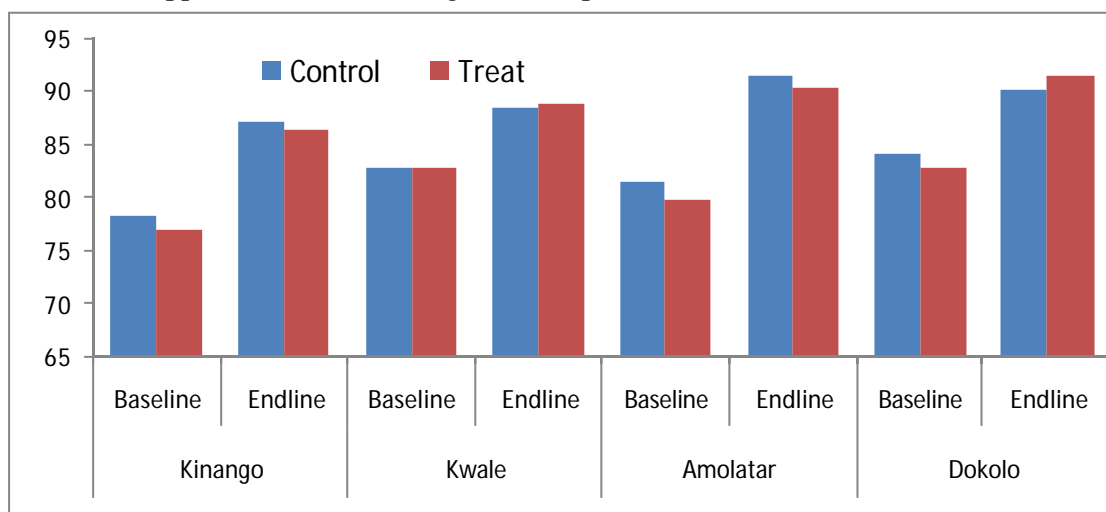
There were different domains of the literacy- both oral and written. These are presented in the figures and tables below. As was noted earlier, no meaningful effect can be presented as analysis of treatment effect at the domain level due to the fewer clusters at the district level. The evidence provided in these figures are therefore simply informational point differences between treatment mean scores and the control means scores at baseline and endline. These should not be interpreted as representing treatment effects.

Listening and comprehension Skills

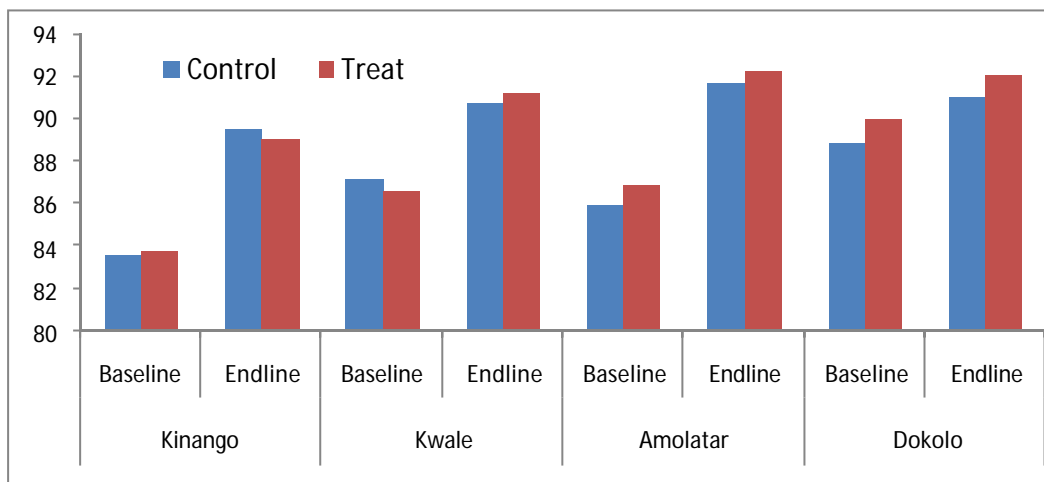
Appendix 6.14: Listening and Comprehension skills: Grade 1, 2010



Appendix 6.15: Listening and Comprehension skills: Grade 1, 2009



Appendix 6.16: Listening and Comprehension skills: Grade 2, 2009

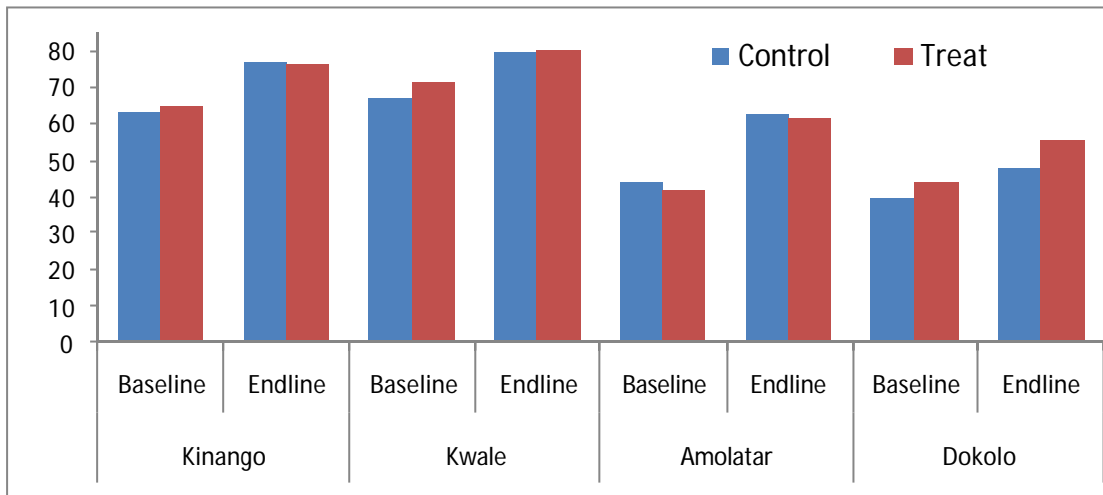


Appendix 6.17: Listening and Comprehension skills: Summary

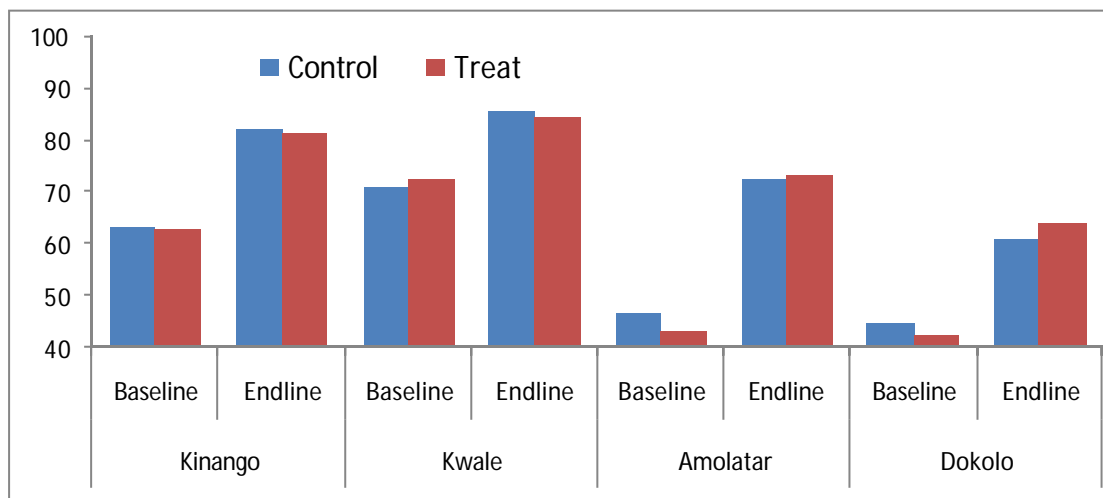
District/ Cohort	Endline						Baseline					
	Control			Treatment			Control			Treatment		
Kinango	n	Mean	Std. dev	n	Mean	Std. dev	n	Mean	Std. dev	n	Mean	Std. dev
Grade 1, 2010	647	84.61	11.05	779	84.37	10.69	724	78.44	16.42	882	78.92	15.32
Grade 1, 2009	604	87.22	8.48	762	86.48	9.42	656	78.29	15.20	767	76.98	15.66
Grade 2, 2009	591	89.52	6.70	760	89.04	6.78	651	83.61	12.33	762	83.76	12.95
Kwale	435	87.56	10.17	558	87.81	7.87	529	81.59	15.20	627	83.01	12.51
Grade 1, 2010	411	88.52	7.78	530	88.92	6.60	441	82.78	11.14	554	82.67	12.40
Grade 1, 2009	393	90.72	4.81	528	91.25	4.38	438	87.12	8.39	552	86.59	9.20
Grade 2, 2009	520	88.54	10.86	553	89.29	10.29	514	80.14	17.64	531	77.69	18.70
Amolatar	465	91.58	5.34	484	90.47	9.62	465	81.38	16.76	473	79.90	18.38
Grade 1, 2010	483	91.65	5.54	487	92.24	3.46	458	85.88	15.46	487	86.83	11.89
Grade 1, 2009	766	86.57	13.24	718	87.61	12.71	757	76.86	22.41	718	79.60	19.77
Grade 2, 2009	625	90.20	7.32	581	91.46	5.84	589	84.21	15.07	562	82.76	18.50
Dokolo	618	91.01	8.17	573	92.09	5.24	595	88.85	10.38	565	89.97	7.99
Grade 1, 2010	647	84.61	11.05	779	84.37	10.69	724	78.44	16.42	882	78.92	15.32
Grade 1, 2009	604	87.22	8.48	762	86.48	9.42	656	78.29	15.20	767	76.98	15.66
Grade 2, 2009	591	89.52	6.70	760	89.04	6.78	651	83.61	12.33	762	83.76	12.95

Speaking Skills

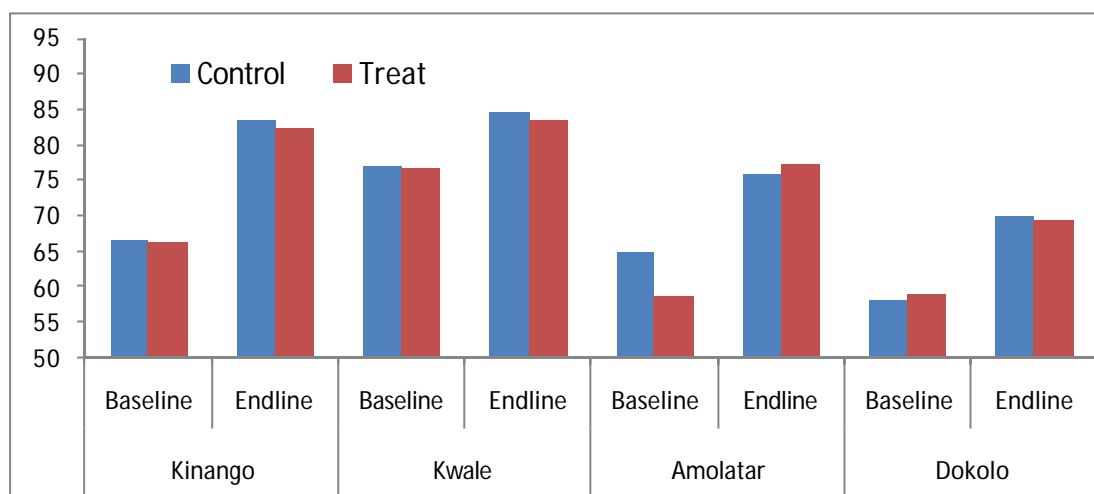
Appendix 6.18: Speaking skills: Grade 1, 2010



Appendix 6.19: Speaking skills: Grade 1, 2009



Appendix 6.20: Speaking skills: Grade 2, 2009

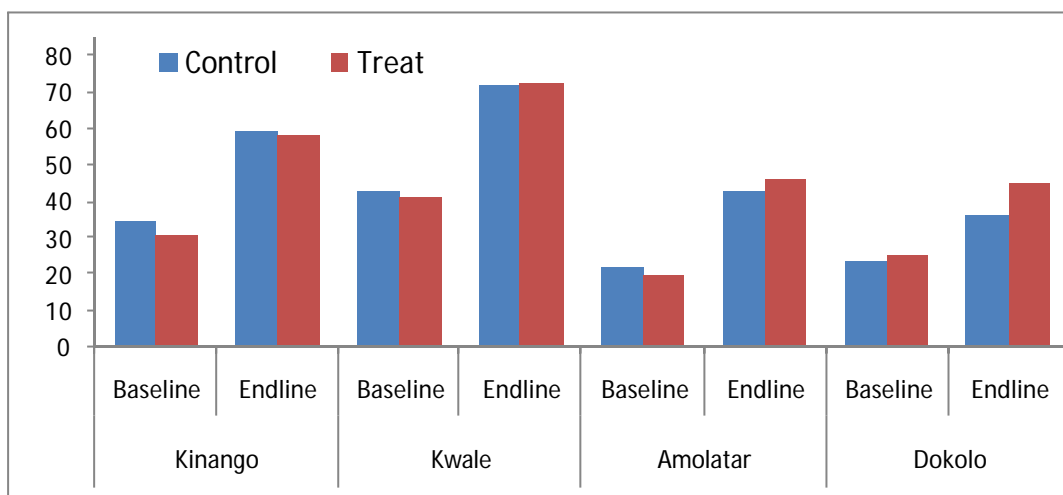


Appendix 6.21: Speaking skills: Summary

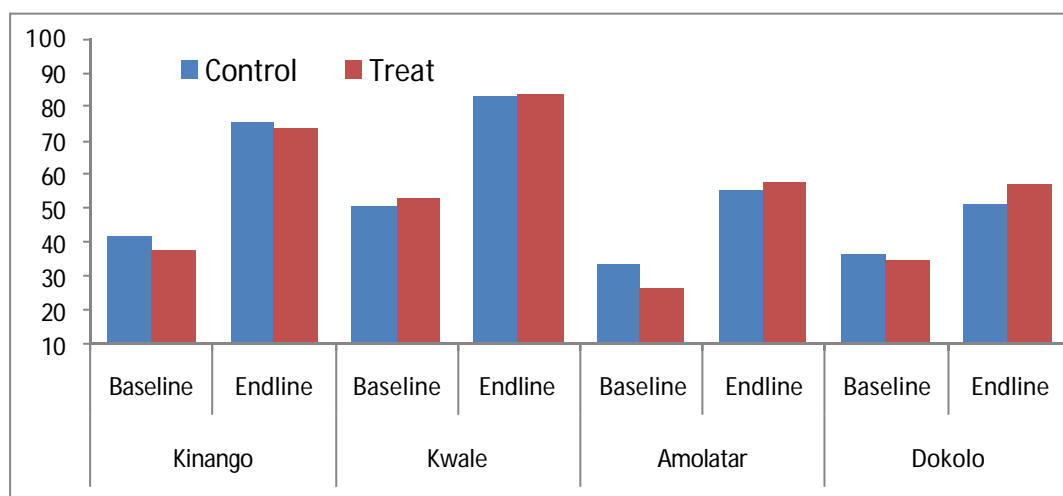
District/ Cohort	Endline						Baseline					
	Control			Treatment			Control			Treatment		
	n	Mean	Std. dev	n	Mean	Std. dev	n	Mean	Std. dev	n	Mean	Std. dev
Kinango												
Grade 1, 2010	647	76.33	16.60	779	76.06	15.75	724	63.54	21.16	882	64.93	20.01
Grade 1, 2009	604	81.63	13.61	762	80.93	14.77	656	62.71	21.09	767	62.41	21.18
Grade 2, 2009	591	83.43	13.14	760	82.19	13.01	651	66.45	17.81	762	66.12	15.84
Kwale	435	79.97	15.35	558	80.00	12.16	529	66.82	20.48	627	71.13	18.73
Grade 1, 2010	411	85.60	10.59	530	84.42	11.61	441	70.82	19.35	554	72.08	18.60
Grade 1, 2009	393	84.31	9.43	528	83.44	10.72	438	76.74	14.51	552	76.46	15.21
Grade 2, 2009	520	62.10	19.78	553	61.24	21.18	514	43.74	20.53	531	41.44	21.22
Amolatar	465	72.27	19.51	484	72.74	18.11	465	46.42	22.74	473	43.27	21.84
Grade 1, 2010	483	75.60	15.29	487	77.02	13.18	458	64.73	20.37	487	58.69	22.26
Grade 1, 2009	766	48.09	20.40	718	55.05	20.81	757	39.43	24.19	718	43.53	23.96
Grade 2, 2009	625	60.55	19.16	581	64.15	16.49	589	44.52	19.92	562	42.56	20.07
Dokolo	618	69.66	14.69	573	69.14	15.07	595	58.04	16.79	565	58.90	14.91
Grade 1, 2010	647	76.33	16.60	779	76.06	15.75	724	63.54	21.16	882	64.93	20.01
Grade 1, 2009	604	81.63	13.61	762	80.93	14.77	656	62.71	21.09	767	62.41	21.18
Grade 2, 2009	591	83.43	13.14	760	82.19	13.01	651	66.45	17.81	762	66.12	15.84

Reading Skills

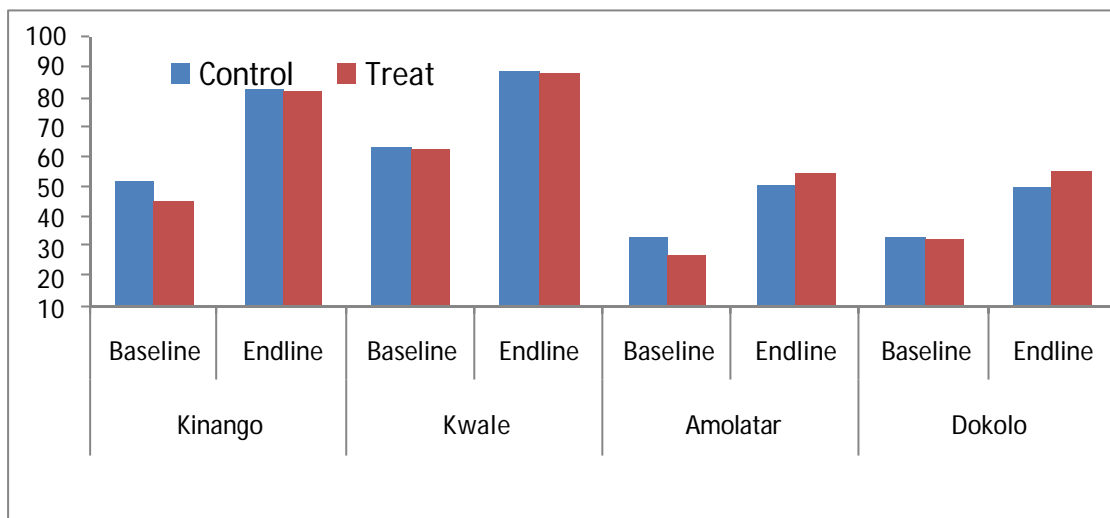
Appendix 6.22: Reading skills: Grade 2, 2010



Appendix 6.23: Reading skills: Grade 1, 2009



Appendix 6.24: Reading skills: Grade 2, 2009



Appendix 6.25: Reading skills: Summary

District/ Cohort	Endline						Baseline					
	Control			Treatment			Control			Treatment		
Kinango	n	Mean	Std. dev	n	Mean	Std. dev	n	Mean	Std. dev	n	Mean	Std. dev
Grade 1, 2010	647	59.21	25.51	779	57.75	27.15	724	33.87	19.62	882	30.61	18.81
Grade 1, 2009	604	74.98	25.08	762	73.44	25.78	656	41.65	23.01	767	37.40	20.85
Grade 2, 2009	591	82.23	23.34	760	82.13	23.77	651	51.58	28.37	762	45.13	27.38
Kwale												
Grade 1, 2010	435	72.00	24.77	558	72.51	24.81	529	42.71	21.22	627	40.77	21.09
Grade 1, 2009	411	82.21	20.03	530	82.95	21.22	441	50.11	24.21	554	52.98	25.43
Grade 2, 2009	393	88.18	17.59	528	87.22	18.92	438	63.20	27.17	552	62.42	28.28
Amolatar												
Grade 1, 2010	520	42.71	22.37	553	45.83	22.59	514	21.28	16.09	531	19.36	14.08
Grade 1, 2009	465	55.26	22.87	484	57.49	23.68	465	33.31	21.12	473	26.29	18.58
Grade 2, 2009	483	50.10	23.48	487	54.56	22.91	458	32.99	19.49	487	27.04	15.96
Dokolo												
Grade 1, 2010	766	35.63	20.27	718	44.93	21.37	757	22.94	17.10	718	24.84	17.67
Grade 1, 2009	625	51.54	22.91	581	57.12	23.69	589	36.61	20.22	562	35.01	18.22
Grade 2, 2009	618	49.36	22.38	573	55.26	24.61	595	32.50	17.08	565	32.24	16.46

References

- Charmaz, K. (1983). The grounded theory method: An explication and interpretation. In *Contemporary Field Research: A Collection of Readings*. Robert M. Emerson, editor. Boston, MA. Little Brown and Co. Publishers, 106-126.
- Evans, D.K & Ghosh, A. (2008). Prioritizing Educational Investments in Children in the Developing World. Rand Labor and Population Working Paper # 587.
- Glewwe, P., Ilias, N., & Kremer, M. (2003). Teacher incentives. Working Paper 9671, National Bureau of Economic Research. Accessed 17/11/2009 at: <http://www.nber.org/papers/w9671>
- Glewwe, P., Kremer, M., & Moulin, S. (2007). Many Children Left Behind? Textbooks and test scores in Kenya. Accessed 19/11/2009 at: http://www.economics.harvard.edu/faculty/kremer/files/kntxtb18_2007July10.pdf
- Glewwe, P., Kremer, M., Moulin, S., & Zitzewitz, E. (2000). Retrospective Vs. prospective analyses of school inputs. The case of flip charts in Kenya. Working Paper 8018, National Bureau of Economic Research. Accessed 19/11/2009 at: <http://www.nber.org/papers/w8018>.
- Goffman, E. (1974). Frame analysis. North Western University Press.
- Hutchison, D. and Styles, B. (2010). A Guide to Running Randomised Controlled Trials for Educational Researchers. Slough: NFER.
- Kremer, M., Miguel, E., Thornton, R., & Ozier, O. (2005). Incentives to Learn, World Bank Policy Research Working Paper 3546. Accessed 20/11/2009 at: <http://econ.worldbank.org>
- Levin, H.M. (1995). 'Cost-effectiveness Analysis', in Martin Carnoy (eds.) International Encyclopaedia of Economics of Education. Oxford, Pergamon.
- Mishler, E. G. (1986). Research interviewing, context and narrative. Cambridge, MA. Harvard College
- Oketch, M., Ngware, M., Mutisya, M., Ciera, J., Abuya, B., & Musyoka, P. (2009) East African Quality in Early Learning (EAQEL) Baseline Findings Report. African Population and Health Research Center (APHRC).
- O'Neill, D. (2009). A Cost-Benefit analysis of Early childhood Intervention: Evidence from a Randomised Evaluation of a Parenting Programme. Institute for study of Labor Discussion Paper series # 4518, Bonn, Germany.

- Petrou, S. & Gray, A. (2011). Economic Evaluation alongside Randomised Controlled Trials: Design, Conduct, Analysis, and Reporting. *BMJ*, 2011.
Available at <http://resources.bjm/subscribers/>.
- Reinikka, R. & Svensson, J. (2005). Fighting Corruption to Improve Schooling: Evidence from a newspaper campaign in Uganda. *Journal of the European Economic Association*, 5(3):1–9
- Vermeersch, C. & Kremer, M. (2004). School Meals, Educational Achievement and School Competition: Evidence from a Randomized Evaluation. Accessed 22/11/2009 at: http://www.povertyactionlab.org/sites/default/files/publications/100_Kremer_School_Competition.pdf
- Willie, C.V. (2000). The evolution of community education: Content and mission. *Harvard Educational Review*, 70(2), 191-210.