



**Every Child Can, Every Child Counts**  
**An evaluation of the Teacher Community Assistant Initiative (TCAI) Pilot**  
**Programme in Ghana**

**IGC – Draft Academic Paper**

**Annie Duflo**  
**Jessica Kiessel**

**Innovations for Poverty Action (IPA)**

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## Abstract

While school enrolment rates in developing countries have significantly improved in the last decade, learning levels have not matched this progress. Interventions that consist of adding resources in school, without any other changes in the classroom, are not sufficient to increase learning levels. Teachers deal with classes that are not only large but also include students with very different achievement levels, hindering the teacher's ability to target instruction at the right level. In order to complete the curriculum, teachers often need to leave a large fraction of pupils behind. Studies in India and Kenya have shown that significant improvements can be obtained at comparatively low-cost by ensuring that children get taught at the level that they are at, and in particular that the bottom-half of the class in the early grades does not get left behind. This can be achieved, for example, by recruiting community individuals to provide the low-performing students with more individualized attention and tutoring. Based on these insights, the Ghana Education Service (GES), in partnership with the Ghana National Association of Teachers (GNAT) and the National Youth Employment Program (NYEP), designed and are currently implementing the Teacher Community Assistant Initiative. Under this Initiative, four interventions aiming at focusing instruction at the child's level (remedial education to low performing pupils, during and after schools hours; revision groups; and teacher training focused on forming and teaching ability groups) are being tested. Preliminary results indicate that the remedial education interventions—in-school and after-school remedial classes, as well and teacher training —had significant positive effects on basic skills in reading and math, as well as on overall math skills. After-school remedial education with TCAs showed the strongest results in both subjects. Average effects ranged from 0.09 standard deviation (remedial education after school hours on overall test scores) to 0.17 standard deviations (effects of intervention 2 on basic literacy skills). Given an assignment rate to remedial classes of 34%, this suggests particularly strong effects for those participating in the remedial classes. These results are comparable to effects shown by other successful education interventions, though there is great potential for improvement after more treatment exposure and further honing of the program implementation.

## **I. Introduction**

While there has been a major push to increase enrolment at the primary level across the developing world, low educational outcomes have persisted. In Ghana for example, only 20 percent of grade 3 pupils reach national proficiency levels in English and 25 percent reach proficiency in math, according to Ghana's 2009 National Education Assessment. A closer look at student learning levels reveals a more dismal picture. At the early primary level, very few students are learning the basic skills they require to succeed in school. In fact, 50 percent of P1 pupils in Ghana can identify letters and single-digit numbers, while only 8 percent can read simple words and 45 percent can do a simple addition and subtraction. Without these skills, students fall farther and farther behind, with the gap between actual learning levels and proficiency standards growing each year (Innovations for Poverty Action 2011). With 30 percent of GDP already allocated to education, Ghana demonstrated a need for innovative and cost-effective solutions that would directly target the low learning levels of primary students, allowing them to build basic skills in order to catch up to proficiency standards, rather than falling farther behind, or, worse, dropping out altogether.

Many programs have focused on the resource gap in primary schools in the developing world, yet several studies have shown that improving resources alone—such as providing textbooks or flip charts, or additional teachers — may not achieve the desirable goals for a large fraction of the pupils, if they have not acquired the basic skills (Glewwe, Kremer, and Moulin 2002; Glewwe, Kremer, Moulin and Zitzewitz, 2004). Other reports on education quality have focused on the large ratio of untrained teachers, the necessity of providing them with formal training and of improving teachers' deployment. While these are undoubtedly important goals, long-term teacher training and adequate teachers' deployment is a long-term investment, and one that given budget constraints realistically will not be achieved in the next ten years. The quality issue therefore needs to be addressed now with measures that can have an impact quickly and that use efficiently an already limited budget.

Rigorous evidence is accumulating that significant improvements can be obtained at comparatively low-cost by spending more focused time ensuring that the bottom-half of the class in the early grades does not get left behind. Indeed, while Pupil to Teacher Ratios (PTR's) in Ghana are low in average, they hide wide disparities, so that teachers often have to deal with crowded classes and pupils with very different levels. Because of level disparities, it is a challenge to target instructional time at the right level for all pupils, and particularly for weaker students. Ironically, this situation is to some extent related to improved enrolment rates: Free education for all has successfully boosted the enrolment rates of students from poorer backgrounds who often have illiterate parents and no support at home. In the TCAI baseline survey for example, 54% of pupils only had a literate parent and 34% had no one at all to help at home with homework (Innovations for Poverty Action 2010). In order to complete the curriculum, teachers often need to leave a large fraction of pupils behind.

A 2005 study on programs in India demonstrated the effectiveness of minimally-trained volunteers providing focused attention to the weakest pupils in improving learning outcomes on basic skills in reading and math (Banerjee, Cole, Duflo, and Linden 2005). The program—known as the Balsakhi program—increased test scores of all children in treatment schools by an average of 0.14 standard deviations in the



first year, and 0.28 in the second year of treatment, as compared to schools in the control group— a major difference, and one that was achieved at an extremely low cost relative to other educational programs. The Pratham- run program cost about USD 2.25 per child per year, significantly lower than the cost of public education in India, which is about USD 78 per child per year—and among the most cost-effective education interventions tested thus far in the developing world. (Abdul Latif Jameel Poverty Action Lab. “Making Schools Work for Marginalized Children.” Policy Briefcase No. 2. November 2006.) Given Ghana’s similar educational context and desperate need for cost-effective, innovative interventions, the evidence from the Balsakhi study suggested that a similar program could provide a key answer to the gap in remedial education.

Education stakeholders often emphasize the need additional teachers, focusing on over-enrolment and high pupil-teacher ratios as the critical problems in developing-world schools. However, research suggests that the key difference-maker may be the emphasis on focusing instruction at the pupil’s actual learning levels. One study in Kenya demonstrated that while extra teachers were provided in several treatment groups, they only produced meaningful change when the classes were divided by initial learning levels. Pupils at all levels, high and low, benefited significantly from the tracking program, and the differences persisted a year after the program had finished. (Dupas, Duflo, and Kremer, 2008) Given the similarities in educational context across Ghana and Kenya and the ready availability of extra (untrained) teachers in Ghana, the successes of the Kenya study indicated an opportunity to replicate and extend the results in a new context. The results of this study also indicated the possibility that tracking pupils by ability could affect learning outcomes, even in the absence of additional teachers—an idea that could provide another path towards improved educational outcomes in the Ghanaian context.

Based on these results from India and Kenya, the Ghana Education Services (GES), Innovations for Poverty Action (IPA), the Ghana National Association of Teachers (GNAT), and the National Youth Employment Program (NYEP) collaborated to develop the Teacher Community Assistant Initiative (TCAI) to adapt these research insights to the Ghanaian context. Under this Initiative, three interventions were designed to focus instruction at the child’s level: adding community assistants to provide remedial education to the weakest half of the class, during or after school hours; or providing teacher training on how to form and teach ability groups. The TCAI evaluation uses a randomized design to test the effectiveness of this type of interventions on literacy and numeracy skills, in a new context and when implemented with a new, government partner. The efficacy of reduced classroom size was also evaluated in order to distinguish the class size effect from the remedial education effect. The goals of the evaluation are to identify which of those interventions are most cost-effective at improving learning levels, and to ensure that the most successful components of the program would be incorporated into Ghana’s overall primary education strategy, following the results.

Preliminary results from a follow up survey held just months after the launch of the TCAI Pilot indicate that remedial classes given by the Teacher Community Assistants (TCAs) had a positive effect on overall math scores. These results were stronger when looking at basic math and literacy skills. While overall after-school remediation by TCAs effects were stronger, differential treatment effects were found depending on district performance in educational indicators – indicating that school conditions were more likely to affect



remedial education during school hours. Teacher training also produced small but positive improvements in basic literacy skills, but only on the upper half of the class.

## **II. Evaluation Design**

In order to measure the efficacy of remedial education focused on the lowest level learner through the provision of teacher assistants during or after school, professional teacher training on remedial teaching methods and reduced classroom size on the learner outcomes and other measures of quality, 500 schools were randomly selected in 42 Districts, to be nationally representative. The schools were divided into 4 treatment groups and a control group. The variations in the program implemented were based on hypotheses that were brought up during earlier stakeholders' discussions, namely that Pupil Teacher Ratios (PTRs), and teachers' lack of training in teaching the basic skills, are important constraints to education quality and that interventions that address those issues would be equally effective. In addition, the study is designed to measure the best time to provide remedial education. While conducting classes after school provides additional instructional time to children who need it the most, children may be less likely to attend, the program may be not regarded as an integral part of the school day, and the TCA classes would not provide teachers with the opportunity to have smaller classes focused on upper level learners. Below is a brief description of each treatment and related research question for each intervention:

**Intervention 1** provides in-school remedial classes through Teacher Community Assistants (TCA) for the weakest students in each class, with targeted instruction in basic math and reading, in both English and the local language. This component emphasizes the focus on weaker students, and provides additional classroom attention with a TCA, so that children benefit from smaller class sizes and instruction targeted at their learning level. This treatment allows us to measure the impact of providing a remediation education for low level learners through the provision of an assistant, while also providing the teacher with an opportunity to focus on upper level learners.

**Intervention 2** provides remedial classes to lowest level learners using TCAs after school. This intervention, when compared to intervention 1, provides an opportunity to assess whether remedial education program works better when implemented after school hours, when students are more likely to have focused time with TCAs, or during school.

**Intervention 3** measures the impact of adding an assistant to the school, and of a reduction in class size, through the random division of classes evenly in half with the teacher and TCA switching between each day. The basic question here assesses the impact of reducing class size on quality.

**Intervention 4** provides teacher training to develop skills in providing small-group instruction targeted at students' actual learning levels. Two main questions are assessed here: Does providing training on remedial education to the regular teachers help quality? Does training the teachers help the weakest pupils or the best pupils more?

**Control** schools served as the comparison in measuring the treatment effects. No treatment was provided.

**Table 1: TCAI Interventions**

Intervention	TCA	Smaller Class Size	Focus on Weakest Students
<b>Intervention 1:</b> Remedial classes by TCAs during school hours. Remedial students identified by low initial achievement levels.	Y	Y	Y
<b>Intervention 2:</b> Remedial classes by TCAs after school hours. Remedial students identified by low initial achievement levels.	Y	N	Y
<b>Intervention 3:</b> Smaller classes by TCAs during school hours. Students chosen randomly.	Y	Y	N
<b>Intervention 4:</b> Teacher training focused on testing student learning levels and dividing classes into small groups by learning level.	N	N	Y
<b>Comparison group:</b> No intervention provided.	N	N	N

Sampling was done in two stages: First, 42 districts were randomly selected from 168 districts<sup>1</sup>, with stratification by the number of districts per region, the proportion of rural population in a district, and the district deprived rank.<sup>2</sup> (GES has classified districts into deprived and non-deprived based on factors including access to educational facilities, performance, pupil teacher ratio, enrolment rates, etc.). Then, within each of the 42 districts, 11 -12 schools<sup>3</sup> were randomly selected (using the Education Management Information Systems (EMIS) data), with stratification by PTRs and the urban/rural status of the school. Urban schools were oversampled: when possible, an equal number of urban and rural schools were selected, and when there were not enough urban/rural schools, all urban/rural schools were selected. As a result, 3 districts did not have enough rural schools, and therefore have more urban schools in the sample, while 21 districts did not have enough urban schools, so these districts have more rural schools than urban schools represented in the sample. Overall, urban schools were oversampled so that the differential impact of the program on urban and rural schools could be determined.

At the school level, a maximum of 25 pupils from each grade (P1 – P3) were randomly selected using the class registers’ photos collected during the preliminary Baseline school survey. When grades had less than 25 pupils, all pupils were interviewed. In two schools where class registers were not available, and the class enrolment above 25, a list of all pupils in the class with serial numbers was created at the time of the survey with the help of the Head Teachers, and a random table was used to do the random selection<sup>4</sup>. When possible, an equal number of male and female serial numbers were selected. If pupils were found by the

<sup>1</sup>There are 170 Districts in the Country, and 2 were excluded from the sampling frame at the request of the GES, which was having issues with those Districts regarding NALAP.

<sup>2</sup>Districts are given a deprived rank, on the basis of which a certain number of Districts get classified as “Deprived”. We used the deprived rank to stratify.

<sup>3</sup> We randomly selected in which District we would select 11 or 12 schools.

<sup>4</sup>A random table is a table where random numbers are provided in each of the column. For each school, surveyors are instructed to use one of the columns. The random numbers in this column are the serial numbers in the class register that should be selected.



surveyors to have stopped attending the school during the sample selection process, they were replaced in the sample (if the class had more than 25 pupils).

### *Randomization*

After the schools for the sample were selected, the baseline survey was conducted to gather essential data on the demographics and features of each of the 500 schools. The treatments were randomized across these schools, and balance checks were conducted to ensure that there were no statistically significant patterns in any of the 4 treatment groups or the control. Looking closely at factors such as average test scores, average pupil-teacher ratio, whether the pupil's father can read (a measure of family literacy) and whether the pupil sleeps on a mattress (an indicator for the pupil's family wealth), it was determined that these factors were all statistically balanced across all four interventions and the control—in other words, there were no significant demographic or school-quality differences between any of the interventions. This implies that differences in educational outcomes demonstrated between the interventions result from the programs, and not from any inherent differences or biases in the sample.

### *Survey Overview*

The evaluation design includes a baseline at the outset of the program and two “endline” surveys to test pupil learning levels, in addition to three rounds of midline surveys, which gather data on the ground-level realities of the program, including attendance of pupils, teachers, and TCAs; classroom activities and teaching behaviour; and other features of the program uptake. These surveys are described in depth below:

### *Baseline Survey*

The baseline survey included the following instruments:

- *Survey questionnaires* of the Head Teacher (HT), classroom teachers, school management committees (SMC) and parent teacher associations (PTA), community members, and pupils, to collect data on school infrastructure and quality, enrolment, teacher qualifications and background, and pupils' socio-economic characteristics.
- *Individually-administered oral tests* in English, math, and the local language (determined by the official language chosen by the National Literacy Acceleration Programme (NALAP)).

The testing tools were developed in collaboration with the Assessment Services Unit (ASU) of the Curriculum Research and Development Division (CRDD) of GES. The tools cover the critical objectives of the syllabus for P1 –P3., and are used commonly for all pupils across P1-P3. The baseline measurement tools were piloted on 300 children to test for validity and reliability.

### *Midline Survey*

TCAI used surprise visits by surveyors to document the daily school activities at the schools in the sample. The first midline tools included the following instruments:

- *Survey questionnaires* for Head Teachers, Intervention 4 classroom teachers, and (TCAs). These questionnaires gather data on the training and sensitization the school had received on TCAI, and on how the program is being implemented.



- *Observational surveys* on teacher and TCA attendance, teaching methods and activities in all schools in the sample. *Attendance and Remedial Attendance*: Data is collected on the school attendance of all selected pupils in the sample, and on their attendance in remedial classes for Interventions 1 and 2.

*Endline Surveys:*

*The endline* surveys include the oral assessment components of the Baseline Survey, and added one new testing component, a grade-wise written test, developed in collaboration with Ghana Education Services: In November and December 2011, the first endline surveys cover all pupils tested in P1, P2, and P3 during the first year of the evaluation, who had progressed in most cases to P2, P3, and P4. New pupils were added to the sample from the new P1 class, following the same procedure as the Baseline sampling method.

A second endline survey will be conducted during the 2012 -2013academic year, using parallel tools developed to match those used in the Baseline and the first endline.

### **III. Implementation**

The program started in May, when the initial trainings for TCAs and teachers were conducted. These trainings were led in collaboration with circuit supervisors and support from the Ghana National Association of Teachers (GNAT), running for approximately one week each. Additionally, in preparation for the monitoring component of the program, District Education Directors, District NYEP officials, District GNAT officials, Circuit Supervisors, Head Teachers (HTs) and School Management Committee (SMC) members attended sensitization on the program.

A midline survey, which was conducted in July 2011, after the first month of implementation, allowed to monitor closely how the interventions have been implemented. This survey consisted of interviews with TCAs and teachers, and otherwise mostly of observations by surveyors.

Overall, the interventions were implemented according to design. In Interventions 1, 2, and 3 (the three interventions that involved adding a community assistant), TCAs were successfully found in the local communities surrounding schools (it was a selection criteria that the TCAs come from the school community), and almost all spoke the first language of the children in their school placements. 99 percent of TCAs attended the initial training in May, while 85 percent Intervention 4 teachers attended the training.

The TCAs and teachers seemed to have adhered to the TCAI basic methodology: 99 percent of TCAs in Interventions 1 and 2 tested students to form remedial groups, while 90 percent of TCAs for Intervention 3 chose students randomly. This indicates that the TCAs correctly followed the basic premise of the treatments, with Interventions 1-2 focusing on the weakest pupils and Intervention 3 TCAs choosing pupils at random to divide the class in half.

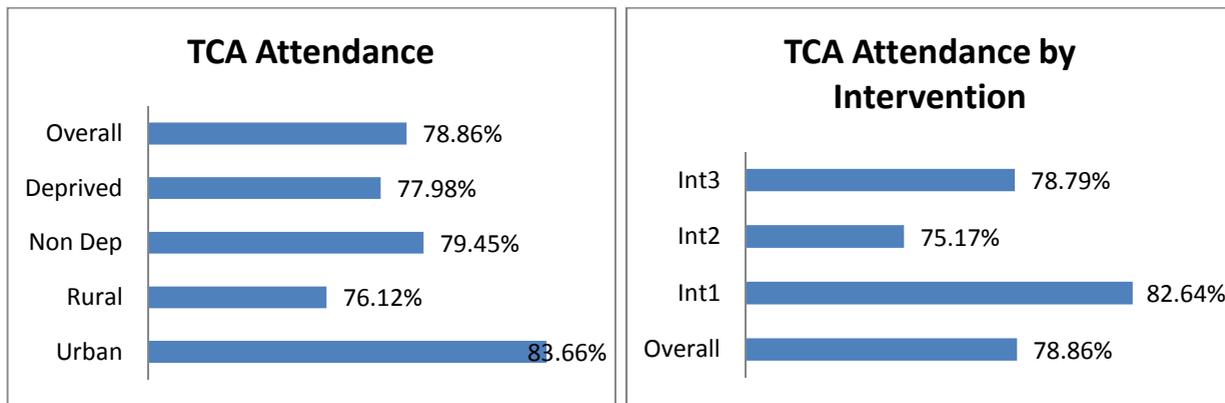
While there have been some concerns about spillover of treatments within the TCAI sample, spillovers seem to have been low. Three control schools have reported initiated their own imitation of the TCAI program in a district where a focus on basic schools has been championed by district leadership

However, as the pilot of a national program, TCAI faced several implementation challenges that may have affected the program's impact on pupil learning levels. First, the program started later than expected. Implementation of the TCAI Pilot began in May 2011 and lasted for 6 weeks during the 3rd term of the 2010-11 school year (June 2011) and 5-10 weeks (depending on when the first endline test was administered in the school) during the first term of the 2011-12 school year (September-October 2012). This means that the program had only been going on for 11 to 17 weeks when the endline took place. In addition, TCAs were actually not posted in schools until several months into the program.

Second, the attendance of the TCAs, while higher than that of teachers, was fairly low. During the first term of the program, only 79 percent of TCAs were present at the time of the survey visit. In addition, attendance rates continued to decrease, most probably because the payment of TCA stipends was also quite delayed, with the first instalment coming six months after the program roll-out. The attendance rates of TCAs hovered around 80 percent for all regions, with the exceptions of Volta, Northern, and most egregiously

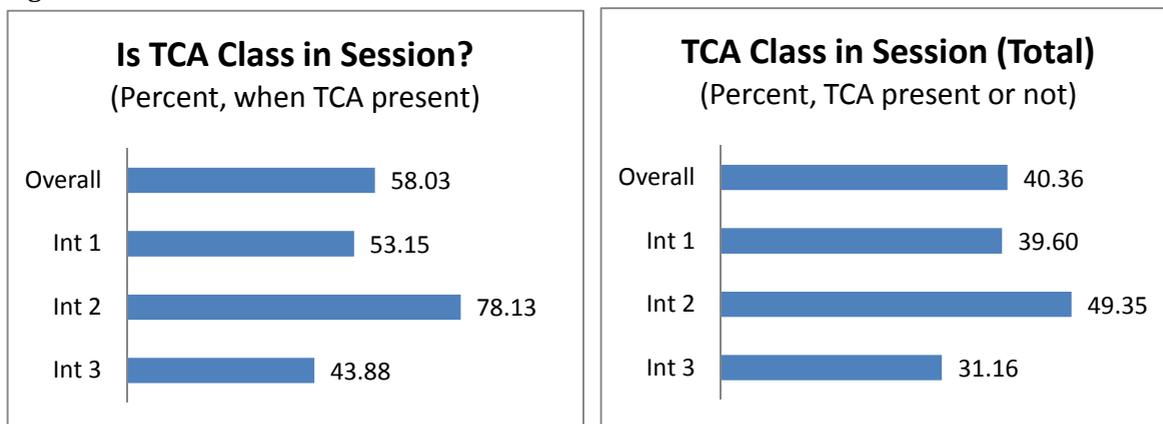
Upper West, which were substantially lower. The graphs below demonstrate the differences in attendance by rural-urban and deprived- non-deprived districts, and the differences in attendance by intervention. As expected by the implementation team, TCA attendance was higher in non-deprived districts, and much higher in urban districts than in rural. Attendance was also higher for TCAs in Intervention 1 and was markedly lower for TCAs in Intervention 2.

Figure 2: TCA Attendance



When the TCAs were in class, they were not necessarily teaching the remedial class (sometimes because it was not the assigned time, but often for other reasons). As a result, even though TCAs were more likely to be present during school hours, after-school TCAs were more likely to be holding a class session than their in-school counterparts, when in school. The graph below on the right side accounts for the after-school TCAs' markedly lower attendance, and, surprisingly, shows that despite lower attendance, Intervention 2 TCAs were still 14 percent more likely to have formed their class than their in-school counterparts. This is statistically significant at 10 percent confidence interval.

Figure 3: TCA Time on Task



Third, only 35-40 percent of pupils from the TCAI evaluation sample were been assigned the remedial class in intervention 1 and 2 schools at the time of the first midline survey and the first endline survey (as opposed to 50% as instructed). TCAs may be under-assigning pupils to the remedial classes, which could



mute the impact of the program, but it is also possible that TCAs are actually working with the number of pupils they can manage—which just happens to be lower than 50 percent — and that impact would be unaffected.

Fourth, TCAI’s proposed monitoring system did not work as anticipated. Circuit Supervisors (district level staff of GES), NYEP & GNAT rarely went to the schools. School Management Committees checked-in in only 20 percent of the schools, and on average went only during the first 2 weeks. Head teachers were most likely to monitor, but the initial 70 percent response rate has dropped to about 30 percent. The lack of monitoring may have contributed to irregular attendance of TCAs, and may have also affected the implementation of the teaching methodology and program structure in schools.

To summarize, overall the interventions seem to have been implemented according to their design. However, implementation issues resulted in low exposure to the program (because of program delays, low time on task and low assignment rates).

#### **IV. Preliminary Results: Teacher and Pupils’ attendance, and Teachers’ teaching**

A potential concern with the remedial education model – in particular during schools hours – was that teacher’s attendance, or time on task, could decrease because of the presence of an assistant (as happened in the Kenya program mentioned above, when the program was not monitored by School Management Committees). One could also argue that teachers’ attendance should increase, because of interest arising from the new teaching methodologies, and the additional resources provided.

Overall, attendance of school staff in the sample schools was quite low across all treatments. 7 percent of the schools were closed when visited. When schools were open, head teacher and teacher absenteeism was very high: 36 percent of Head Teachers (HTs) were absent from school, while 25 percent of the Assistant Head Teachers (AHTs) and teachers were also absent at time of survey.<sup>5</sup> On average, only 75 percent of classroom teachers were present at the time of survey, while 79 percent of TCAs were present at the time of the survey visit. Attendance and other intermediate outcomes are discussed in depth below with respect to TCAs in Interventions 1, 2, and 3; and Intervention 4 teachers.

During the first midline survey, teacher attendance improved significantly in Intervention 1 and 4 schools (remedial education during school hours, and teacher training), to 82 percent and 78 percent respectively as compared to 71 percent in the control group. These groups are the only treatments for which classroom teachers come into direct regular contact with the TCAI program—through interaction with the remedial class TCA in Intervention 1 schools, and through training in Intervention 4 schools. This contact may explain the improved attendance records of these teachers, an important positive externality of the TCA program. However, these impacts were not visible anymore in the second midline survey (of which analysis

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<sup>5</sup>Head Teachers (HTs) in Ghanaian schools are essentially the equivalent to Principals in US schools.



is still on-going), so they may have been due to initial enthusiasm for the program, or perception of being watched because of it.

In schools where teachers had received professional training on remedial methods, 50 percent of the teachers were found to be in their classrooms when present as compared to 34 percent for the control group. Teachers were found to be chatting or engaging in other personal activities nearly 20 percent of the time. Teachers in Intervention 4, who were trained by TCAI, were 16 percent more likely to be teaching than the control group teachers and this difference is statistically significant.

Although the interventions aim to target learning levels rather than attendance, one may have expected attendance to increase – because the pupils enjoy the class more, or because they are learning more. However, none of the interventions seemed to have affected pupils' attendance. Pupil attendance was low across all schools in the sample, with no statistical difference in attendance between the different TCAI interventions. It shows that average student attendance during the first midline is 72 percent with no statistical difference in pupil attendance across interventions. Deprived district attendance is lower than non deprived and rural attendance lower than urban.

Classroom teachers in Intervention 1 and 4 also made progress in implementing the TCAI teaching methodology, with significant improvements in pupil participation, and, in Intervention 4 classes, significantly higher use of small group teaching. These factors play into the results found in the first round of Endline testing, which is explored in the following section.

## **V. Preliminary Results: Learning Outcomes**

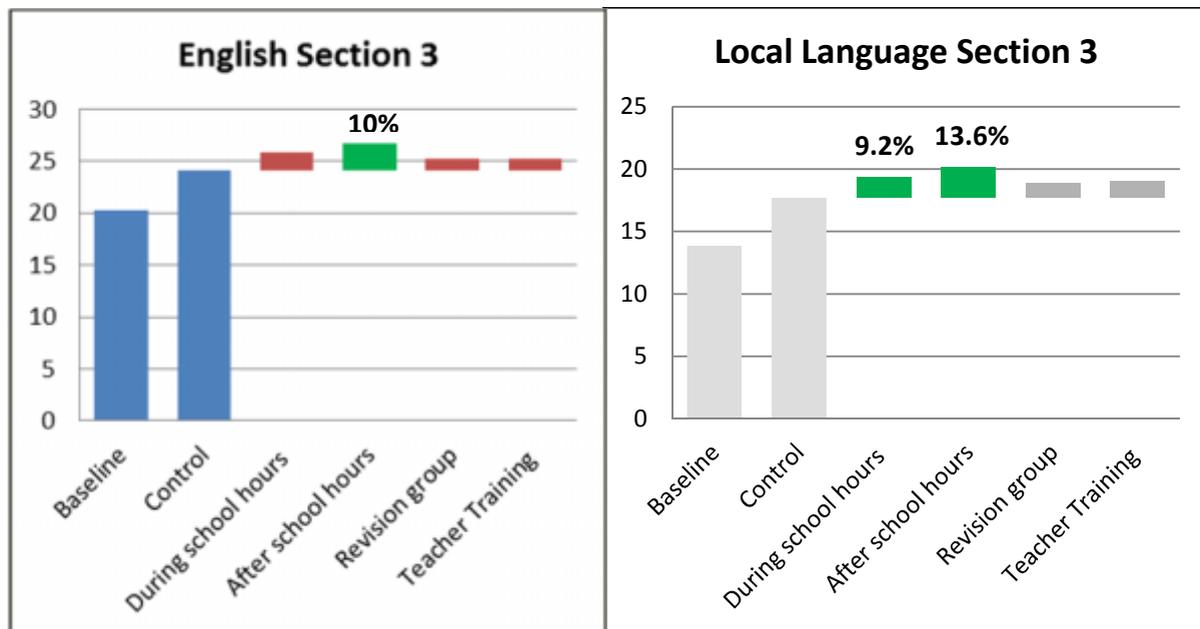
Preliminary results suggest that the TCAI program delivers improved learning outcomes to pupils in measures of basic literacy and numeracy. Improvements are highest in basic skills that were the focus of the TCA and teacher trainings. Impact on learning outcomes is highest in the after school program (Intervention 2), with some effects on learning outcomes from the in-school remedial TCA program (Intervention 1). Teacher training also had some positive effects, but only on basic literacy in upper half of the class. These improved learning outcomes were achieved despite the relatively short exposure to the program, approximately 10 weeks, separated by the summer break, before the first endline testing was conducted in November 2011, indicating the potential for further impact as the program develops. The results discussed below are based on the oral, one-on-one tests conducted in literacy - English and the local languages - and numeracy of the first endline survey, and are still subject to further analysis.

### *Impacts on overall test scores*

Overall, the TCAI interventions did not have a significant effect on overall learning levels, although they did show impact of 0.09 standard deviations at the 10 percent significance level for Intervention 2 (remedial education after school hours). However, this hides differential treatments effects when looking at sections and skills that the program was more likely to have affected.

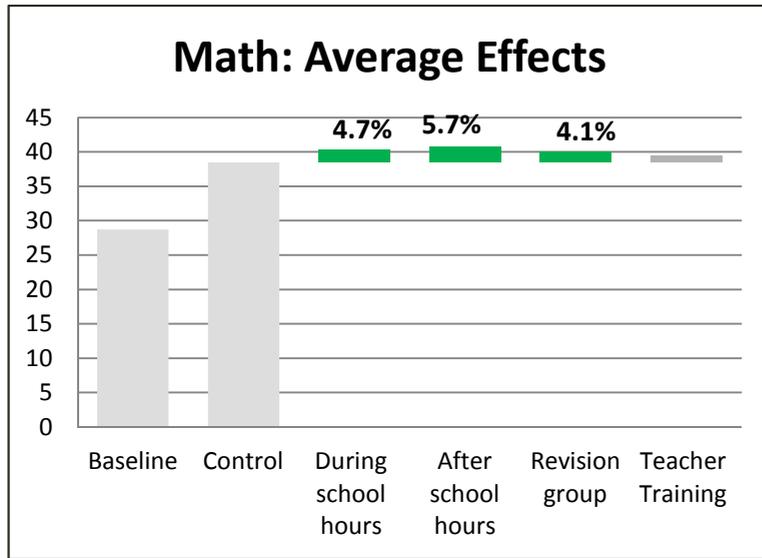
Although the study did not show impact on the literacy measures overall, the training only had focused on pre-reading and reading skills. Hence, the section 3 of the test was the only one likely to be affected. The pre-reading and reading section was indeed affected for Intervention 2 in both English and the local language (test scores in this section are higher than the comparison group by 10% for English and 13.6% for local language – around 0.14 standard deviations in both cases), while the local language test also showed positive effects for Intervention 1 (test scores are higher than the comparison group by 9.2%). These results are shown in the graphs below. In all graphs, bars in green indicate statistically significant results and additional effect when compared to the control. The difference between the baseline bar and control bar gives the natural progression in test scores in the absence of the program.

**Figure 1: Literacy Results for Pre-Reading and Reading**

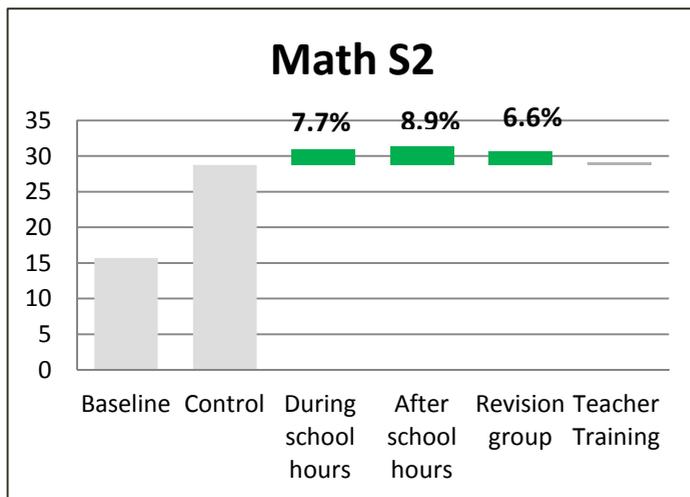


The study demonstrated significant impact on overall math outcomes in the three TCA interventions—that is, the two remedial TCA class interventions as well as the randomly split revision group intervention. Both Interventions 1 and 2 demonstrated significant impact in the computation (arithmetic) section of the math test. The graph below illustrates the overall effects of the interventions on math outcomes.

**Figure 2: Average Effects on Math Scores**



Most impacts on math come from section 2 (computations) and to some extent from section 1 (number recognition) for intervention 2. The effect of intervention 1 on computations was 0.12 standard deviations (an increased by 7.7% compared to the control group); and the effect of intervention 2 on section 2 was 0.14 standard deviations.

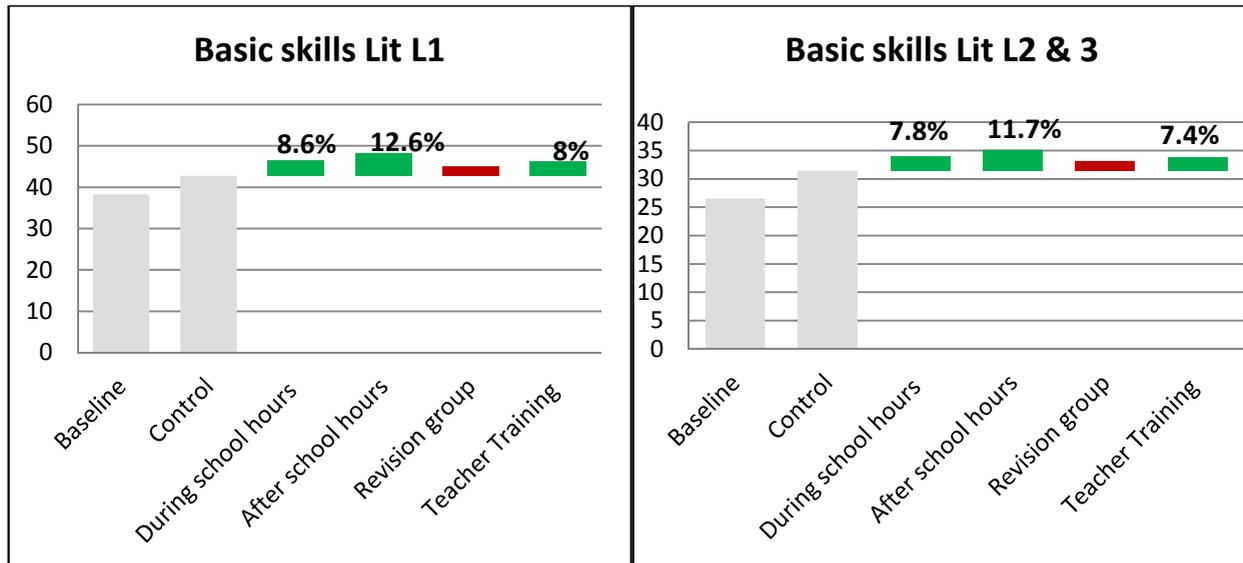


*TCAI Impact on Basic Skills*

The TCAI Pilot’s fundamental goal was to improve student learning outcomes on basic skills, and the preliminary results indicate that the program has demonstrated impact in these areas. The graphs below show the impact of each intervention on basic literacy skills, i.e on questions in the test that were identified by the implementation team as being most likely to be affected based on the training focus. All three of the “remedial” interventions (in which TCAs and teachers were provided with training in the TCAI

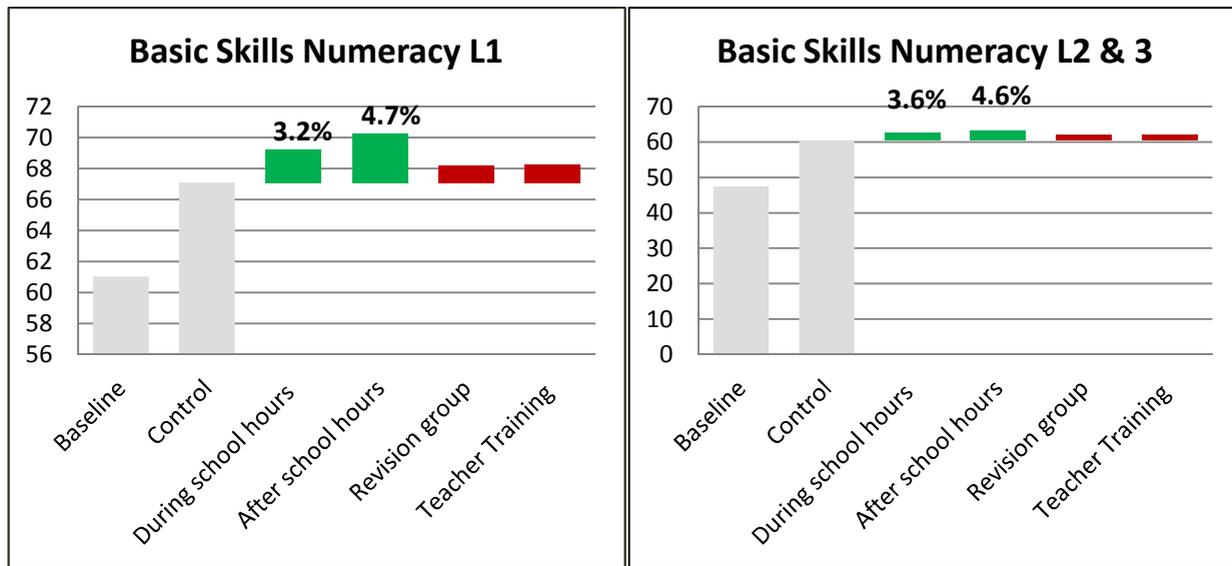
methodology) demonstrated significant impact in both Level 1 (alphabet identification) and Levels 2-3 (reading basic words and sentences). The greatest impact was seen in the after-school intervention schools. Impact was highest for intervention 2, where scores are 0.17 sd higher than in the control group for level 1 skills.

**Figure 3: Impact on Basic Reading Skills**



Basic math skills also showed significant impact in schools for both the TCA remedial interventions—during and after school. Treatment effects were greater for the after-school intervention. The impact on basic skills in numeracy for Level 1 (number recognition) is shown on the left, and Levels 2-3 (simple arithmetic) on the right below.

**Figure 4: Impact on Basic Math Skills**



*Impact on Targeted (Weakest) Pupils, and on Treated pupils (assigned to a remedial class).*

The interventions were meant to target the weakest half of the class, so we looked at the impacts on pupils below the median. Overall, however, effects can be seen among pupils below and above the median (in other words, targeted and non targeted pupils). This is consistent with the fact that the targeting was not perfectly correlated with the baseline survey results, and that pupils were assigned to the remedial class both below and above the median, which probably occurred because pupils were largely at sub-standard learning levels, and it may have been difficult for teachers to identify the very weakest pupils. Overall, it seems that pupils who were assigned, whether below or above the median, benefited.

On the other hand, Intervention 4 also had a statistically significant effect on basic literacy skills, but only for the pupils above the median. This suggests that teachers may have focused more time on teaching and on basic skills, and may have been giving more attention to some of their sub groups, but were not effective at targeting instruction to the weakest pupils.

While it is difficult to rigorously estimate the impact of the program on those who actually took the remedial class in intervention 1 and 2, one can estimate it. Assuming that the program only had an effect on pupils who were assigned to the remedial class (which is hard to verify, but a very reasonable assumption for intervention 2), it means that the impact of the program on the treated pupils must be about three times the average impacts mentioned above. This means that impact on the treated, under this assumption, would range from 0.27 standard deviations (impact on overall test scores for intervention 2) to 0.58 standard deviations (impacts on basic literacy skills of intervention 2). These are very high impacts for such a short program.



## **VI. Understanding Differences between impacts of different interventions**

In theory, the in-school remedial TCA program possesses certain advantages. We expect that in-school contact hours with pupils will be higher than in the after-school program due to more consistent attendance. The in-school remedial TCA classes may also benefit from increased supervision from Head Teachers, and therefore increased TCA attendance. Finally, this program could have beneficial spill-over effects on pupils not selected for the remedial class, by reducing overall class size. However, these benefits appear to be offset by the relatively disruptive environment of the normal Ghanaian school day.

However, TCA remedial classes provided after school was found to have the strongest impact in improving student achievement on basic skill indicators in literacy and numeracy, indicating that, preliminary results from TCAI indicate that students may actually benefit most from additional, targeted instruction after the normal school day. This is an important result, as the logistical challenges of the after-school programs are often viewed as a major impediment to program implementation.

This result is probably partly explained by the fact that though TCAs presence in school is less frequently in Intervention 2 schools, they spent significantly more time on task (actually teaching their remedial class) than those in the Intervention 1 schools. This may be because the school day is more hectic, and the in-school classes may be affected by more disruptions from sports and other school programs, or the Head Teacher is more likely to re-allocate the TCA's services to other activities, or because schools are less likely to have adequate supplementary teaching space available for TCAs to hold their classes.

Additional understanding comes from looking at differential impacts based on whether a District was Deprived or not – a status that most often correlates with the school environment and school conditions. Both Interventions 1 and 2 showed statistically significant impact in non-deprived districts and both interventions showed higher impacts in non deprived than in deprived areas — but their relative impact was different in the two district types. While Intervention 1 was slightly more effective than Intervention 2 in non-deprived areas, Intervention 2 had a small impact in Deprived Districts (although not always significant), while intervention 1 did not have any impacts in Deprived Districts). This suggests that the in-school program may benefit more from the improved infrastructure and organizational support of non-deprived schools, while pupils in deprived areas may benefit more from supplementary instruction than from pull-out classes in an already disorganized or under-supplied school. In “deprived” areas, TCA classes during school may not be provided with adequate space or school materials such as desks, which could also affect the results of the intervention—but after school, TCAs would more likely have access to a classroom space in which to conduct their remedial class.

The randomly-split revision group intervention demonstrated almost no significant impact on learning outcomes. Consistently with the initial hypothesis, this may be because TCAs were not meant to focus their instruction on basic skills or on the weakest pupils—a key feature that seemed to lead to the results discussed above.



Although intervention 4 teachers seemed to be teaching more often than most other teachers during the Midline 1 visits in June 2011, they may not have been emphasizing instruction on the lowest achieving pupils. As mentioned in the learning outcomes section above, this may explain why weaker pupils in Intervention 4 schools did not demonstrate significant progress in the first endline.

Finally, the results indicate that the program is most effective in areas with better basic resources and infrastructure, such as available teaching space, more motivated school principals, etc. This may point to the importance of providing extra support to remedial programs in highly deprived (low-resource) regions, where desperately-needed programs are less likely to succeed.



## **VII. Conclusion**

The program demonstrated quite strong results, given the challenges described in the implementation section of this report. The impacts described in the Learning Outcomes section above are in the range of results shown in other major education program evaluations in the developing world, and suggest a great deal of potential given the relative age of the TCAI program.

There are several things that are expected to change in the coming months, as the new program matures, which could further enhance the impact of the interventions. As refresher trainings continue, the average quality of teaching by the TCAs should move closer to the standard set by the best performing TCAs. This will also be affected by the payment of TCA stipends, which could affect attendance significantly, and could therefore impact time on task—something that appears to have major implications for learning outcomes. Monitoring by Head Teachers, circuit supervisors, and other partners may improve as the program continues, which could also positively affect time on task. Finally, data from the midline surveys and first endline suggest that only 35-40 percent of pupils were selected to join the remedial class, rather than 50 percent. Since the strongest effects (by far) were demonstrated by pupils selected by the class, it is expected that as the TCAs work with a higher percentage of this key target group, overall impact could increase.

Given the promising results of the first phase of the TCAI pilot, particularly in the after-school remedial TCA intervention schools, the program seeks to continue in collaboration with the Ghanaian government, using rigorous evidence to inform remedial education policy nation-wide. With further honing of the program's implementation, it is expected that the impact of the TCAI program could increase in the second endline, helping children across Ghana to learn the basic skills they need to succeed.

## Appendices

### Appendix 1: Randomization Tables

The tables below demonstrate the statistical equality in demographic and school-quality factors across the four interventions and control group.

**Figure 5: Comparison of Average Test Scores in Different Intervention Groups**

Linear regression Number of obs = 32281  
F( 4, 499) = 0.62  
Prob > F = 0.6485  
R-squared = 0.0013  
Root MSE = 16.834

(Std. Err. adjusted for 500 clusters in school)

alltests_ave	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
treat1	-.3827214	1.299639	-0.29	0.769	-2.93616	2.170717
treat2	-.3352623	1.423762	-0.24	0.814	-3.132569	2.462044
treat3	-.1948054	1.375969	-0.14	0.887	-2.898212	2.508601
treat4	-1.714255	1.303602	-1.32	0.189	-4.275481	.8469711
_cons	31.35453	1.004602	31.21	0.000	29.38076	33.3283

## Appendix 2: Regression Tables for Intermediate Outcomes

### TCA Time on Task: Intervention 2

The regression table below shows that the TCAs in Intervention 2 were significantly more likely to be teaching at the time of the survey visit during the first Midline survey.

	tca_class_insession
treat2	0.0975 (1.37)
Constant	0.396*** (8.24)
Observations	303

t statistics in parentheses

= " \* p<0.05      \*\* p<0.01      \*\*\* p<0.001 "

### Assignment of Remedial Classes:

Intervention 1 & 2 Pupil Status	%
Assigned Remedial Class	39.20
Attended Remedial Class if Assigned - Overall	35.32
Attended Remedial Class if Assigned - Intervention 1	34.04
Attended Remedial Class if Assigned - Intervention 2	36.91

**Teacher Attendance by Intervention:**  
**teacher\_present\_sig**

---

treat1	0.103*
	(2.53)
treat2	-0.00896
	(-0.19)
treat3	-0.0178
	(-0.37)
treat4	0.0681
	(1.58)
Constant	0.719***
	(21.39)

Observatio 1423

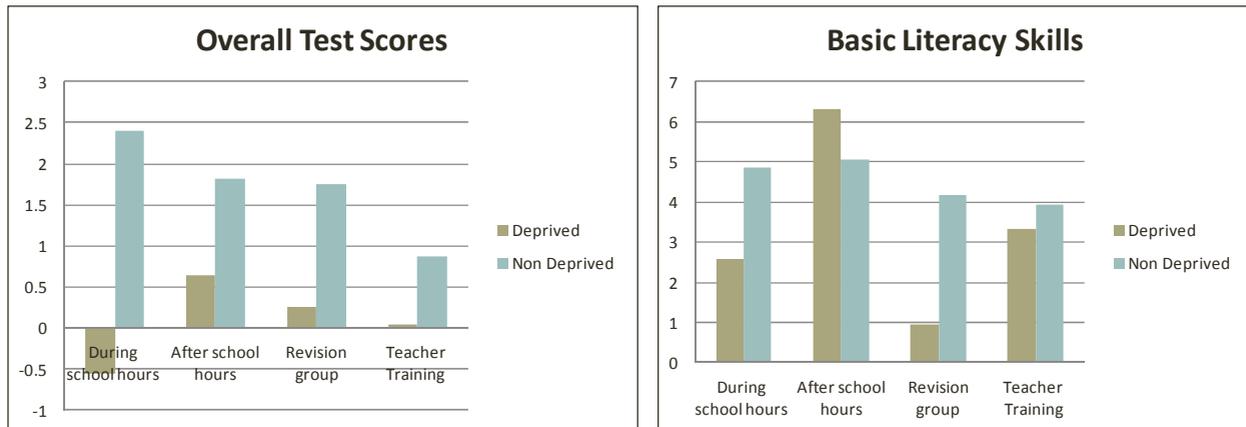
t statistics in parentheses

= "\*" p<0.05 \*\* p<0.01 \*\*\* p<0.001"

## Appendix 3: Tables and Charts for Learning Outcomes

### Test Scores and Literacy Scores by District Type

The graphs below compare the treatment effects across deprived and non-deprived districts.



### Summary of Statistical Results:

	Control	During School hours	After School hours	Revision group	Teacher Training
Overall Test Scores	33.0		4.4		
English	22.3				
Loc Lang	38.1				
Math	38.5	4.7	5.7	4.1	
English Sec 1	24.2				
English Sec 2	17.6				
English Sec 3	24.2		10.7		
Loc Lang Sec 1	53.1				
Loc Lang Sec 2	47.7				
Loc Lang Sec 3	17.7	9.2	13.6		
Math Sec 1	61.7	2.8	3.1		
Math Sec 2	28.7	7.7	9.0	6.6	
Math Sec 3	24.4				
Basic Skills Lit Level 1	42.8	8.6	12.7	5.2	8.0
Basic Skills Lit Level 2	31.4	7.9	11.7	5.5	7.5
Basic Skills Math 1	67.1	3.2	4.7		
Basic skills Math 2-3	60.5	3.6	4.6		

Regression Results: Effect on basic skills , literacy section

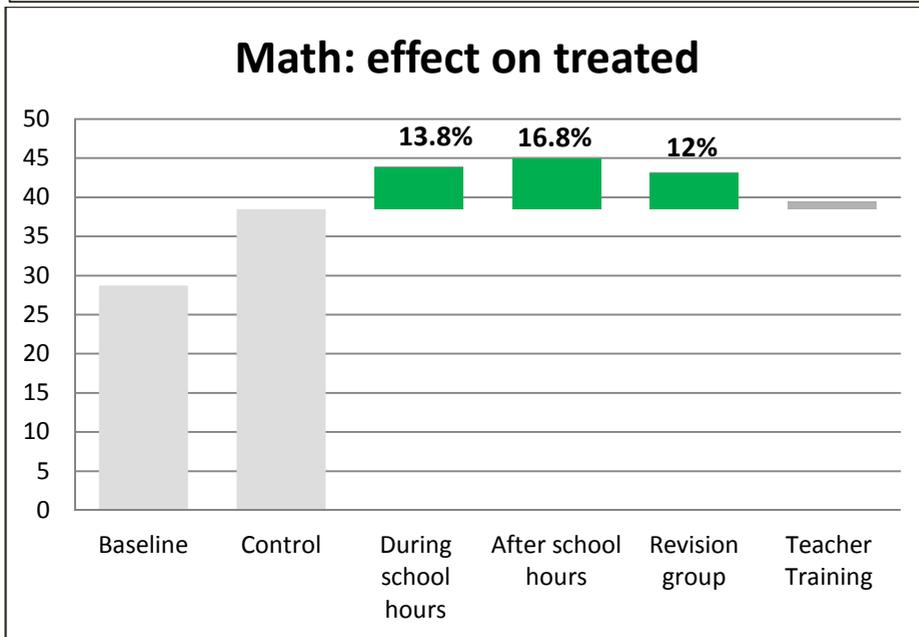
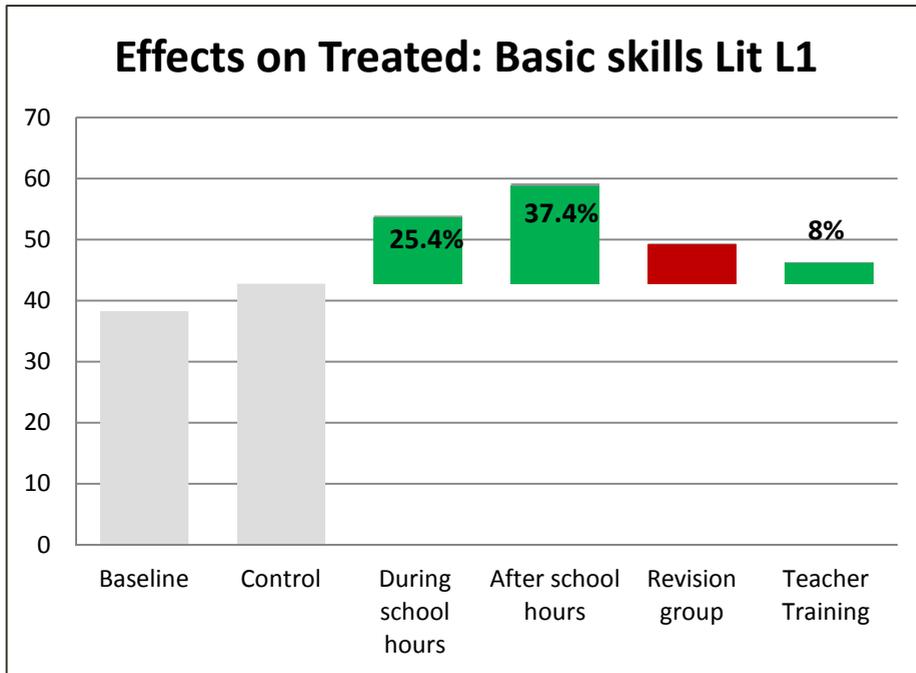
	(1) bs_lev2	(2) bs_lev2 overall,treat 1,2
bl_bs_lit_l2 3	0.704*** (58.00)	0.704*** (57.71)
bl_ptr_real	-0.0167 (-0.66)	-0.0173 (-0.67)
treat1	2.530* (2.11)	
treat2	3.770** (3.00)	
treat3	1.765 (1.37)	1.765 (1.37)
treat4	2.393* (2.03)	2.392* (2.03)
treat12		3.148** (2.99)
_cons	13.48*** (11.16)	13.50*** (11.10)
N	17398	17398
ysd	26.31	26.31

Regression Results: Effect on basic skills,math level 1

	(1) bs_math, overall	(2) bs_math, overall,tereat 1,2
bl_bs_num_ l1	0.387*** (27.93)	0.387*** (27.93)
bl_ptr_real	-0.0136 (-0.52)	-0.0136 (-0.52)

treat1	1.645 (1.40)	
treat2	1.711 (1.43)	
treat3	0.920 (0.74)	0.920 (0.74)
treat4	1.151 (0.93)	1.151 (0.93)
treat12		1.678 (1.57)
_cons	44.15*** (24.91)	44.15*** (24.87)
<i>N</i>	17398	17398
ysd	24.38	24.38

**Effects on the Treated (Pupils in Remedial Classes):**





## **References**

- Abadzi, Helen. Instructional Time Loss in Developing Countries: Concepts, Measurement, and Implication. The World Bank Research Observer, 2009.
- Abdul Latif Jameel Poverty Action Lab. "Making Schools Work for Marginalized Children." Policy Briefcase No. 2. November 2006.
- Banerjee, Abhijit, Shawn Cole, Esther Duflo, and Leigh Linden. 2005. Remedying Education: Evidence from Two Field Experiments in India. Department of Economics, MIT.
- Duflo, Esther, Pascaline Dupas and Michael Kremer. 2008. "Peer Effects and the Impact of Tracking: Evidence from a Randomized Evaluation in Kenya."
- Glewwe, Paul, Michael Kremer, and Sylvie Moulin. "Textbooks and Test Scores: Evidence from a Prospective Evaluation in Kenya." Mimeo, Harvard University, November, 2002.
- Glewwe, Paul, Michael Kremer, Sylvie Moulin, and Eric Zitzewitz. "Retrospective vs. Prospective Analyses of School Inputs: The Case of Flip Charts in Kenya," NBER Working Paper #8018, 2000, forthcoming in Journal of Development Economics.
- Innovations for Poverty Action. "Teacher Community Assistant Initiative: Baseline Report." August 2011.
- Innovations for Poverty Action. "Teacher Community Assistant Initiative: Midline 1 Report." September 2011.