



## **The Effects of ABRACADABRA Early Literacy Software on the Learning of Kenyan Elementary School Students: A Brief Report on the 2015 Study<sup>123</sup>**

**Philip C. Abrami, Anne Wade, Larysa Lysenko**

*Centre for the Study of Learning & Performance  
Concordia University, Montreal, Canada*

**Jonathon Marsh, Aga Khan Academies Unit, Paris, France**

**& Gioko Maina, Aga Khan Academy, Mombasa**

REVISED: February 17, 2017

### **Background**

In 2012, the Centre for the Study of Learning and Performance (CSLP) joined with the Aga Khan Academies unit and the Aga Khan Academy, Mombasa (AKA) and they together embarked on a preliminary investigation to explore the feasibility and impact of using ABRACADABRA (ABRA), early literacy software on grade-one students in Mombasa, Kenya. Children from local schools were bussed to the Aga Khan Academy, Mombasa and used the Academy computer lab to access ABRA. For a period of several months about once per week for up to two hours they used the software under the careful supervision of trained teachers and staff. Control students received traditional instruction following the national curriculum. At the conclusion of the program, ABRA students showed more significant gains on GRADE, a standardized test of reading skills, than their peers in control classes. ABRA students also scored higher on several Kenyan core subject examination including English, Math, Science and Social Studies. In 2013, the control students used ABRA and they also showed improvements in literacy skills.

In 2014, the research was extended but with an important difference. Instead of bringing the children to the Academy labs to use ABRA under the supervision of staff, the project took place in school computer labs. The experimental teachers were trained in the use ABRA and learned strategies on how to integrate the software into their English Language instruction. They were also provided with ongoing support by means of bi-weekly planning sessions and regular school visits. ABRA ambassadors, seasoned master teachers who had

---

<sup>1</sup> This research was made possible by a grant to the authors from the *SESEA project, Aga Khan Foundation Canada* and the *SSHRC Partnership Development* program.

<sup>2</sup> The authors express their appreciation to the Kenyan coordinators and ambassadors who worked extensively to train and support the teachers who implemented ABRACADABRA in their classrooms. The authors are also grateful to the CAMARA organization who outfitted the school computer labs and provided regular maintenance during the ABRA intervention.

<sup>3</sup> For additional information about ABRA or any of the software tools in the Learning Toolkit please contact Anne Wade at [wada@education.concordia.ca](mailto:wada@education.concordia.ca).

started using ABRA as early as 2012, facilitated these support activities. This time the experimental participants used the ABRA software over several months, with the control participants not using ABRA. The GRADE reading test that the students took when the intervention was completed also showed that the ABRA students outperformed their peers who did not use ABRA.

## The 2015 Experiment

The 2015 study, which we are briefly reporting here, was also conducted in public schools in Mombasa and Nairobi. Similar to 2014, teachers implemented the ABRA intervention in their classrooms for several months. But key differences included testing all students at the baseline, before they used ABRA as well as testing them at the conclusion of the intervention. In addition, we were able to establish pretest equivalence of the ABRA students versus the control students. In other words, the 2015 study was a stronger test of ABRA conducted under the authentic conditions of Kenyan classroom use.

This study was a pretest-posttest control group quasi-experimental design where we statistically controlled for the initial differences between ABRA and control students. There were a total of **22 teachers** (11 ABRA experimental teachers, 11 control teachers) and their **749 students** (307 ABRA students, 442 control students) Students were from grades 1, 2 & 3. Some had used ABRA the previous year, while others were first time users. We also recorded student gender so that we could compare changes in literacy scores for 366 boys versus 383 girls. In addition to collecting GRADE standard reading total score and subtest scores, we also collected and analyzed Kenyan national examination results. Finally, we used a number of different statistical strategies to analyze the scores. The results were consistent across all these analyses.

## Results

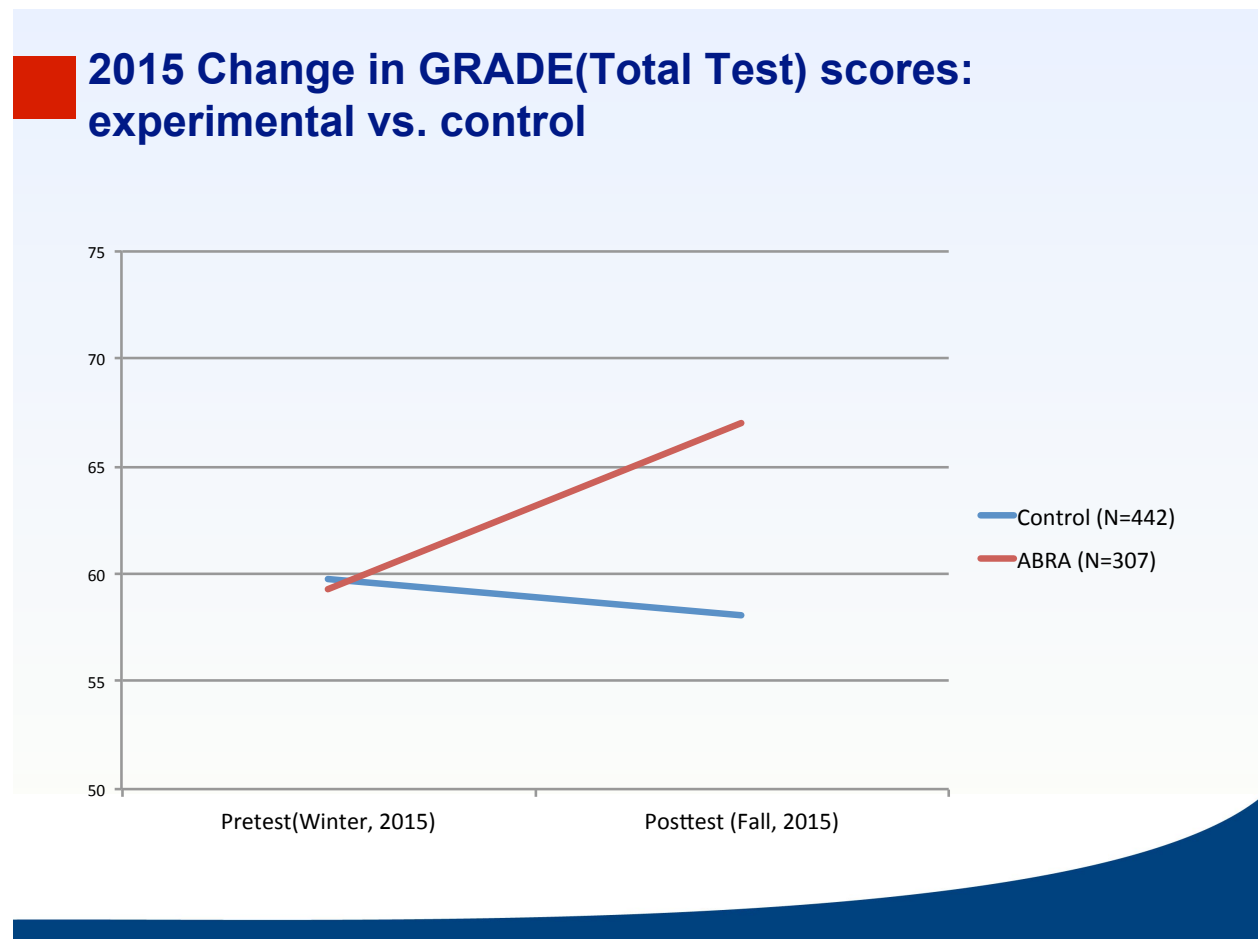
First, we compared ABRA (N=307) and control (N=442) groups at the pretest. This test of group differences did not reveal any significant differences between the ABRA and control groups on the GRADE subtests and total test scores ( $p_{\text{vocabulary}} > .09$ ;  $p_{\text{comprehension}} > .26$ ;  $p_{\text{total test}} > .7$ ;  $p_{\text{listening comprehension}} > .06$ ). Overall, these results lend credibility to the notion that the experimental and control students were mostly equivalent in literacy skills at the outset of the ABRA intervention. A summary of the ANOVA results of the difference scores on all the subscales of the GRADE tests is reported in Table 1.

**Table 1. GRADE means, standard deviations, change scores and difference between ABRA and control students**

GRADE scales	ABRA means (N= 307)			Control means (N=442)			F value and significance (** $p < 0.00$ )
	Post	Pre	Change	Post	Pre	Change	
<b>Vocabulary Composite</b>	44.42	41.77	2.65	40.86	42.98	-2.11	53.08***
<i>Standard Deviation</i>	<i>9.88</i>	<i>10.86</i>	<i>7.50</i>	<i>9.46</i>	<i>8.88</i>	<i>9.61</i>	
<b>Reading Comprehension</b>	22.56	17.48	5.08	17.21	16.83	0.38	62.71***
<i>Standard Deviation</i>	<i>9.25</i>	<i>7.75</i>	<i>8.94</i>	<i>8.01</i>	<i>7.67</i>	<i>7.28</i>	

<b>Total Test</b>	66.98	59.54	7.70	58.07	59.73	-1.65	81.58***
<i>Standard Deviation</i>	<i>17.74</i>	<i>15.58</i>	<i>13.35</i>	<i>15.92</i>	<i>14.83</i>	<i>14.33</i>	
Listening Comprehension	10.91	8.5	2.40	9.48	9.09	0.38	36.60***
<i>Standard Deviation</i>	<i>2.89</i>	<i>2.78</i>	<i>3.41</i>	<i>2.98</i>	<i>4.85</i>	<i>5.13</i>	

The results show that on GRADE subtests and Total Test, students in ABRA classes improved their scores at a significantly higher rate than students in control classes. The considerable effect size of 0.58 for the GRADE Total Test indicated that after having used ABRA, average students in the ABRA group improved by 22 percentile points over their peers in the control group who were exposed to traditional instruction. Figure 1 below represents the difference in mean change scores between the two groups on the GRADE Total score over time.

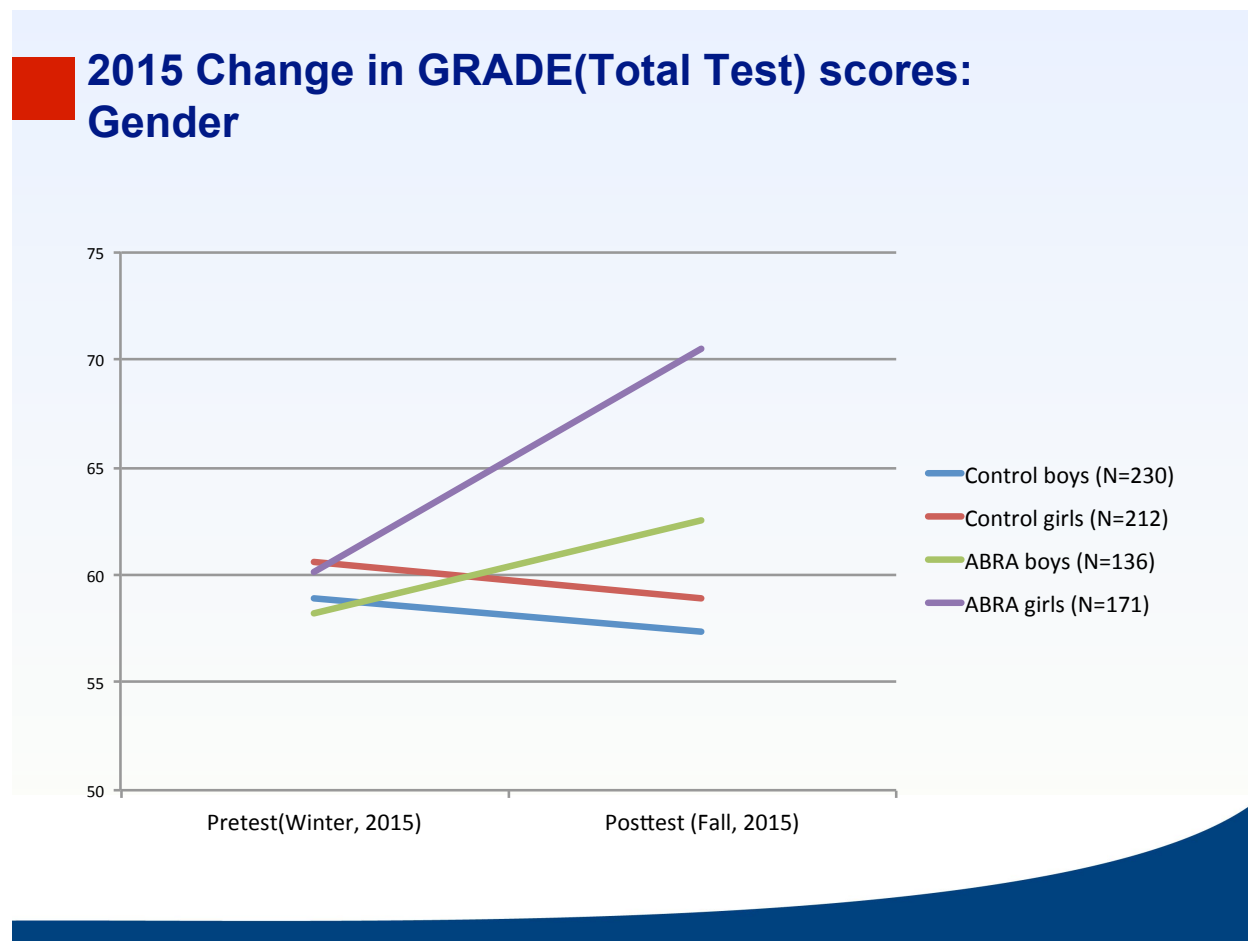


**Figure 1. GRADE test Total Reading Average Scores (change over time)**

Gender In addition to the main analysis, we examined if ABRA effects differed for boys and girls. Table 2 and Figure 2 split the GRADE Total Test scores for boys and girls in the ABRA and control classes. The data suggest that girls and boys benefited from ABRA with ABRA girls demonstrating higher gains than ABRA boys. Both genders in the ABRA classes showed enhanced performance on the GRADE compared to students learning to read in the traditional manner, with a focus on teacher-directed and recitation instruction.

**Table 2. GRADE Total Test Mean Scores by Gender**

GRADE scores	ABRA				Control			
	Girls (N=171)		Boys (N=136)		Girls (N=212)		Boys (N=230)	
	Post	Pre	Post	Pre	Post	Pre	Post	Pre
<b>Total Test</b>	70.53	60.13	62.53	58.21	58.85	60.6	57.36	58.92
<i>Standard Deviation</i>	16.20	16.48	18.63	16.79	16.13	15.04	15.73	14.12

**Figure 2. ABRA Effects Separated by Gender**

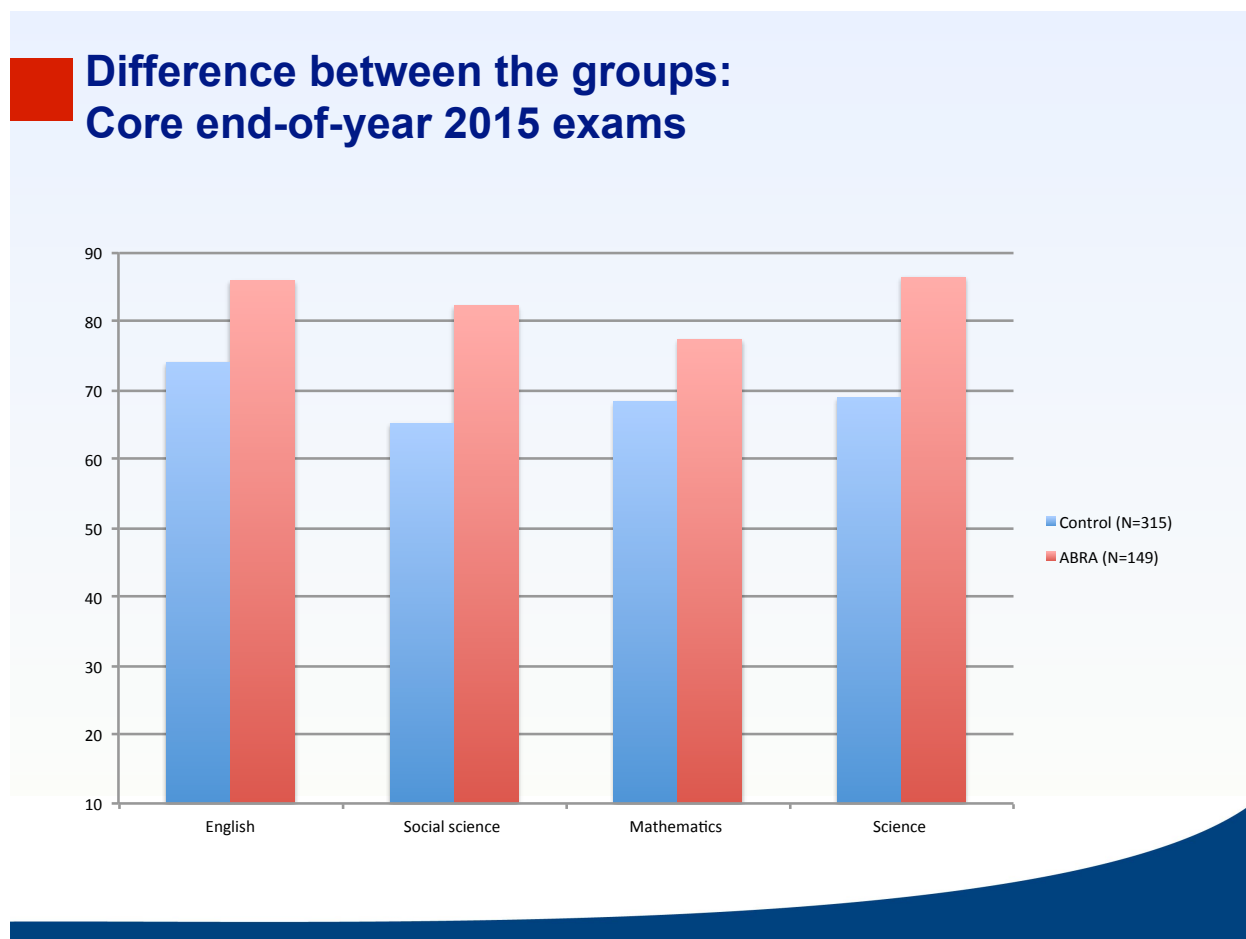
Kenya Exam Results To examine if the ABRA effects were associated with students' learning in the core curriculum subjects, we used the results of end-of-term exams provided by Kenya teachers. There was considerable drop in the sample size because exam results of only 464 students have been furnished for analyses. We compared the scores in English, Math, Science and Social Studies of control and ABRA students collected at the end of term three after statistically adjusting these scores using the GRADE pre-test total score as the covariate. The analyses were performed for English, Math, Science and Social Studies exam scores. The association between GRADE pretest scores and the exam scores was statistically significant and ranged from modest of .28 (Math) to .6 (English).

The tests for the effect of ABRA on English, Math, Science and Social Studies exam scores showed the difference between the groups was statistically significant ( $p < 0.001$ ). The statistics summarized in Table 3 and illustrated in Figure 3 show that students in the ABRA group performed higher than control students on each of the four core exams.

**Table 3. Core exams results for ABRA and control classes (adjusted means, and standard error values)**

<i>Core subject exams</i>	<i>ABRA Means<sup>1</sup> (N= 149)</i>	<i>Control Means<sup>1</sup> (N=315)</i>
<b>English</b>	85.86	74.03
<i>Standard Error</i>	<i>1.34</i>	<i>0.91</i>
<b>Mathematics</b>	77.40	68.31
<i>Standard Error</i>	<i>1.58</i>	<i>1.08</i>
<b>Science</b>	86.39	68.87
<i>Standard Error</i>	<i>1.23</i>	<i>0.84</i>
<b>Social Studies</b>	82.25	65.14
<i>Standard Error</i>	<i>1.20</i>	<i>0.83</i>

<sup>1</sup> Adjusted means for post-test scores and standard error calculated in the model. GRADE pre-test covariate scores model were evaluated at 58.18.



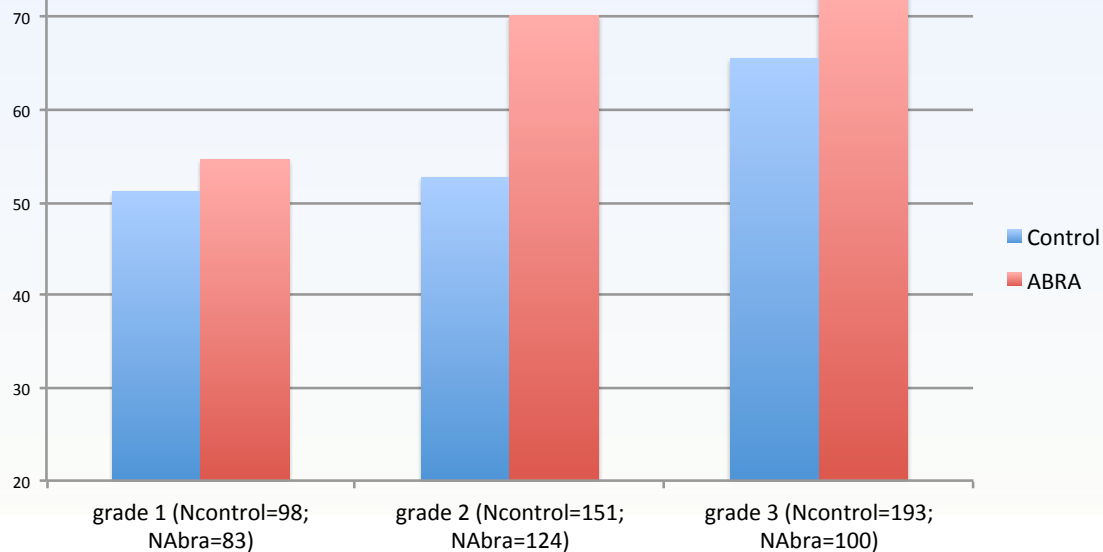
**Figure 3. Kenya End of Year Examination Results by Subject**

Grade Level Student grade level did not lessen the effects of ABRA. Students in Grades 1, 2 & 3 all benefited from ABRA regardless of whether they had used ABRA in the previous school year. Table 4 and Figure 4 allow one to follow how the mean GRADE Total Test scores changed from pre- to post-test by grade in ABRA and control groups. As expected the highest increase is noticeable for ABRA students in grades 2 and 3 as respectively 23% and 85% of students in these grades had been exposed to ABRA since 2014 for 1 or more years.

**Table 4. GRADE Total Test Mean Scores by Grade Level**

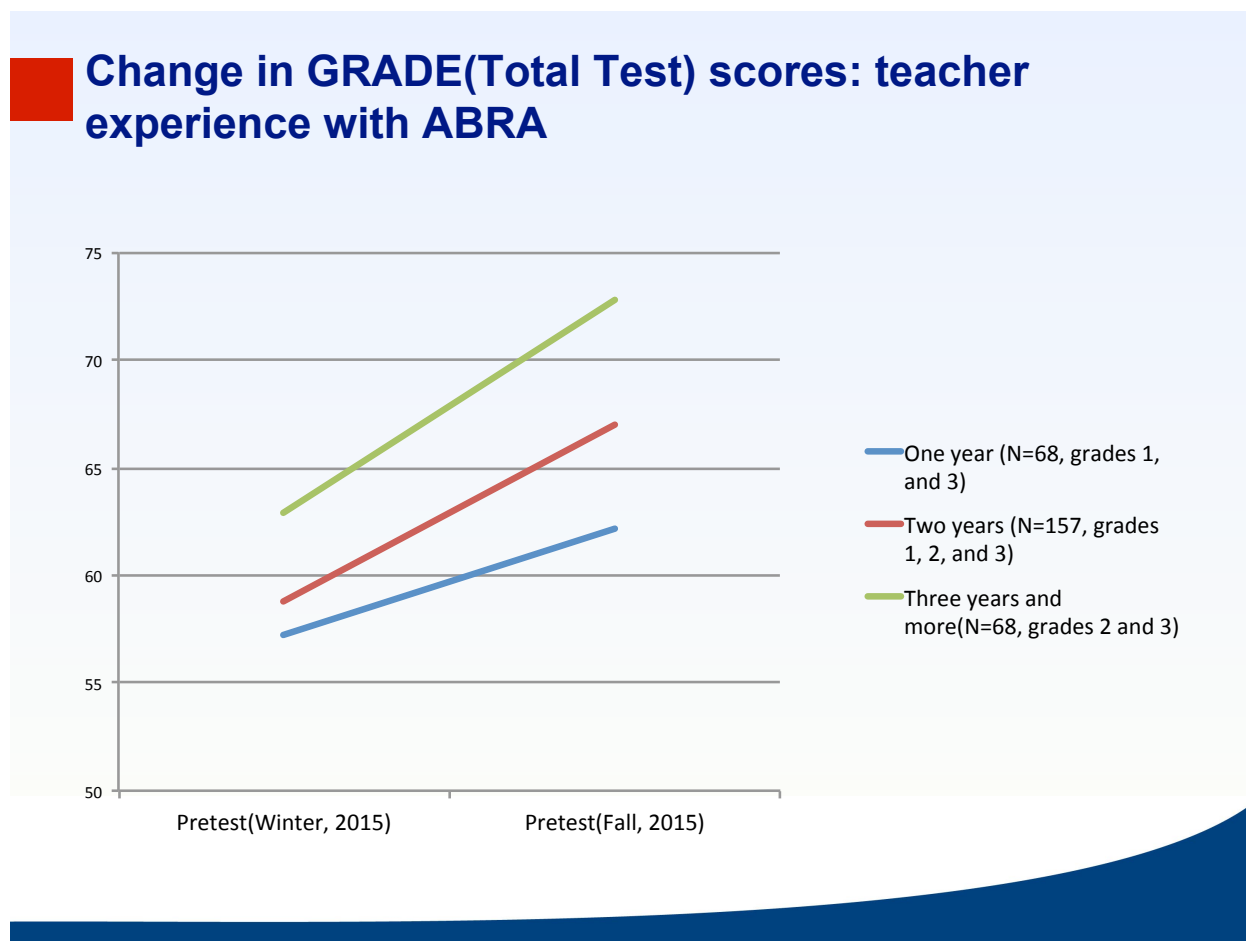
GRADE scores	ABRA						Control					
	Grade 1 (N=83)		Grade 2 (N=124)		Grade 3 (N=100)		Grade 1 (N=98)		Grade 2 (N=151)		Grade 3 (N=193)	
	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre
<b>Total Test</b>	47.58	44.01	69.85	59.6	79.54	71.56	47.37	50.93	51.79	57.46	68.43	65.96
<i>Standard Deviation</i>	14.38	14.95	12.12	13.33	11.57	9.93	8.97	12.26	13.05	14.63	14.53	13.39

## Difference between the groups on GRADE(Total Test) post-test scores: grade level



**Figure 4. Results by Student Grade Level**

Teacher Experience We also explored whether there were differences among teachers based on years of experiences using ABRA. Because of initial training and follow-up support as well as in-class experience over one or more years, we did not expect that novice users would have lower effects compared to experienced users. However, we were concerned that if there were novelty effects they would dissipate over time. However, as Figure 5 shows, there were no decrements in student learning linked to teacher experience.



**Figure 5. Years of Teacher Experience and ABRA Effects**

### Implications

These remarkable results are a testament to the evidence-based design of ABRA and quality teacher implementation in the authentic context of their schools. ABRA is not intended to supplement classroom instruction, but instead should be integrated into classroom instruction. The training and support provided by the ABRA coordinators and ambassadors coupled with teachers willing to work to improve teaching are what made the difference.

Several other improvements should make the efficacy of ABRA even stronger in years to come. First, we expanded and improved our teacher professional development resources and assembled them together in *The Learning Toolkit Teachers Guide: Kenya Edition*. Second, to enhance further student fluency and comprehension skills, we developed READS, a freely available digital repository of hundreds of books and stories in multiple languages including English and Kiswahili. READS fits easily on a USB key and means no Kenyan child will lack engaging reading material to practice and hone their literacy skills. Third, we more completely mapped ABRA activities and stories onto the Kenyan curriculum so that teachers will find integrating ABRA into their lessons especially easy. Fourth, we tackled the challenge of large class sizes and the reliance on frontal teaching by emphasizing cooperative small group techniques during ABRA lessons. Finally, to



complement gender-balanced stories and activities in ABRA, we offered support materials to teachers to help them adequately cultivate gender equality in their classrooms.

We are excited about the latest ABRA research and hope you are too. We think we've taken another step to creating a nation of readers in Kenya and beyond.