



*EdData II*

# RTI Presentations, EGRA/EGMA Workshop

56th Annual Conference of the Comparative and  
International Education Society (CIES), April 2012

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56th Annual Conference of the Comparative and  
International Education Society (CIES), April 2012

## **Presentations from April 22, 2012**

Prepared for  
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# **Preface and Acknowledgments**

The presentations in this document were prepared for use in a one-day workshop titled “Understanding the Early Grade Reading and Math Assessments: From Development to Data Analysis,” led by RTI International at the annual conference of the Comparative and International Education Society (CIES) in San Juan, Puerto Rico, April 22, 2012.

The USAID EdData II project (Task 1, EHC-E-01-04-00004-00) sponsored the costs of workshop development and implementation. EdData II is led by RTI International.

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# Development and Rationale of the Early Grade Reading and Mathematics Assessments

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The University of Texas at Austin  
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RTI International

# Agenda

- Brief Introduction
- Early Grade Reading Assessment
- Q & A
- Early Grade Mathematics Assessments
- Q & A

# Assess

- Generally, to evaluate the nature, quality, ability, extent, or significance of (something).
- In education, the process of documenting, **usually in measurable terms**, knowledge, skills, attitudes, and beliefs.

# Assessment Type: Screening

- Brief assessment that focuses on critical skills strongly predictive of future growth and development
  - At the student level you can identify children likely to need extra instruction.
  - At the school level you can identify gaps in instruction.

# Results

- Provide data to:
  - Intervene early and strategically during critical windows of development
  - Develop and promote a comprehensive system of instruction
  - Identify need, allocate resources, and design and modify instruction
  - Address academic failure and success from a school-wide, systematic perspective

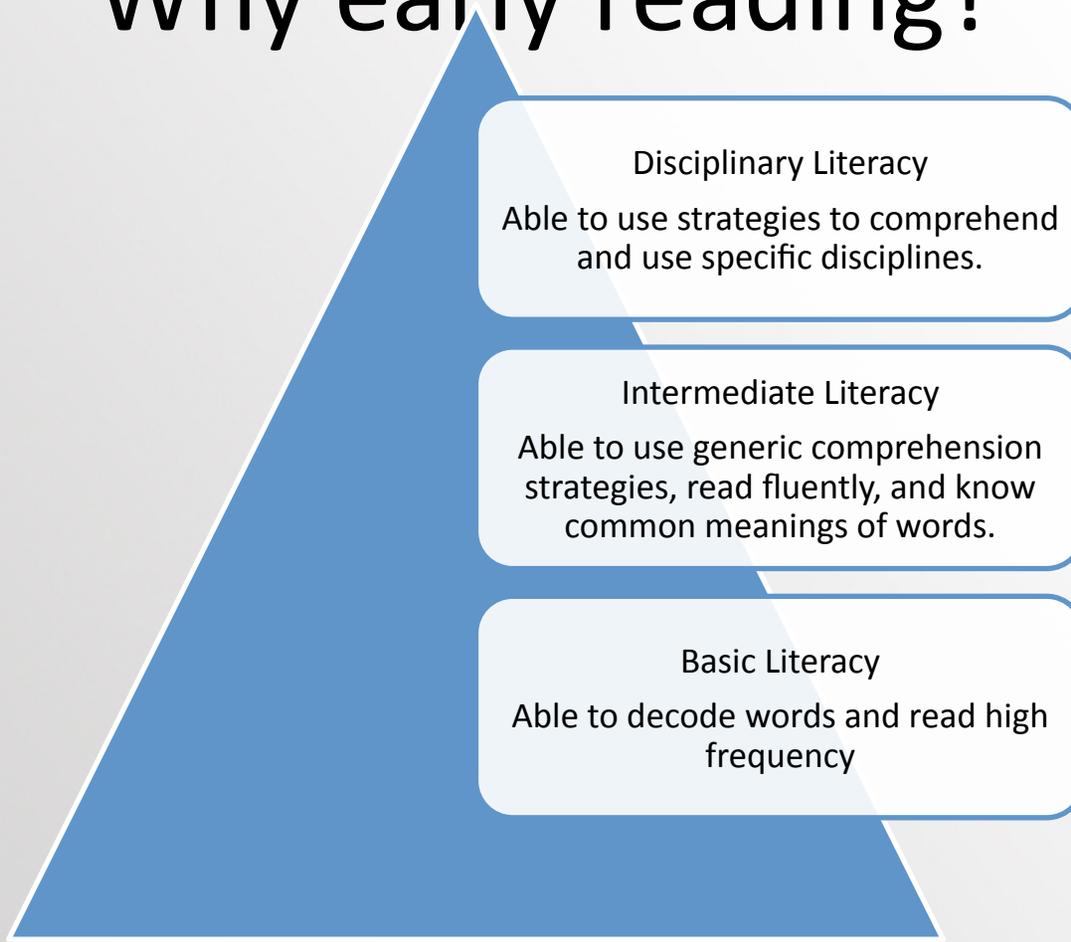
# EGRA

Date

# Why early reading?

- It is widely recognized that illiteracy can have a negative impact on the individual as well as his or her community.
- Absolute vs. functional illiteracy
- Literacy is more than learning to read and write but includes the acquisition of higher level competencies needed to become a social and productive member of society. (UNESCO, 2006).

# Why early reading?



## Disciplinary Literacy

Able to use strategies to comprehend and use specific disciplines.

## Intermediate Literacy

Able to use generic comprehension strategies, read fluently, and know common meanings of words.

## Basic Literacy

Able to decode words and read high frequency

# Why early reading?

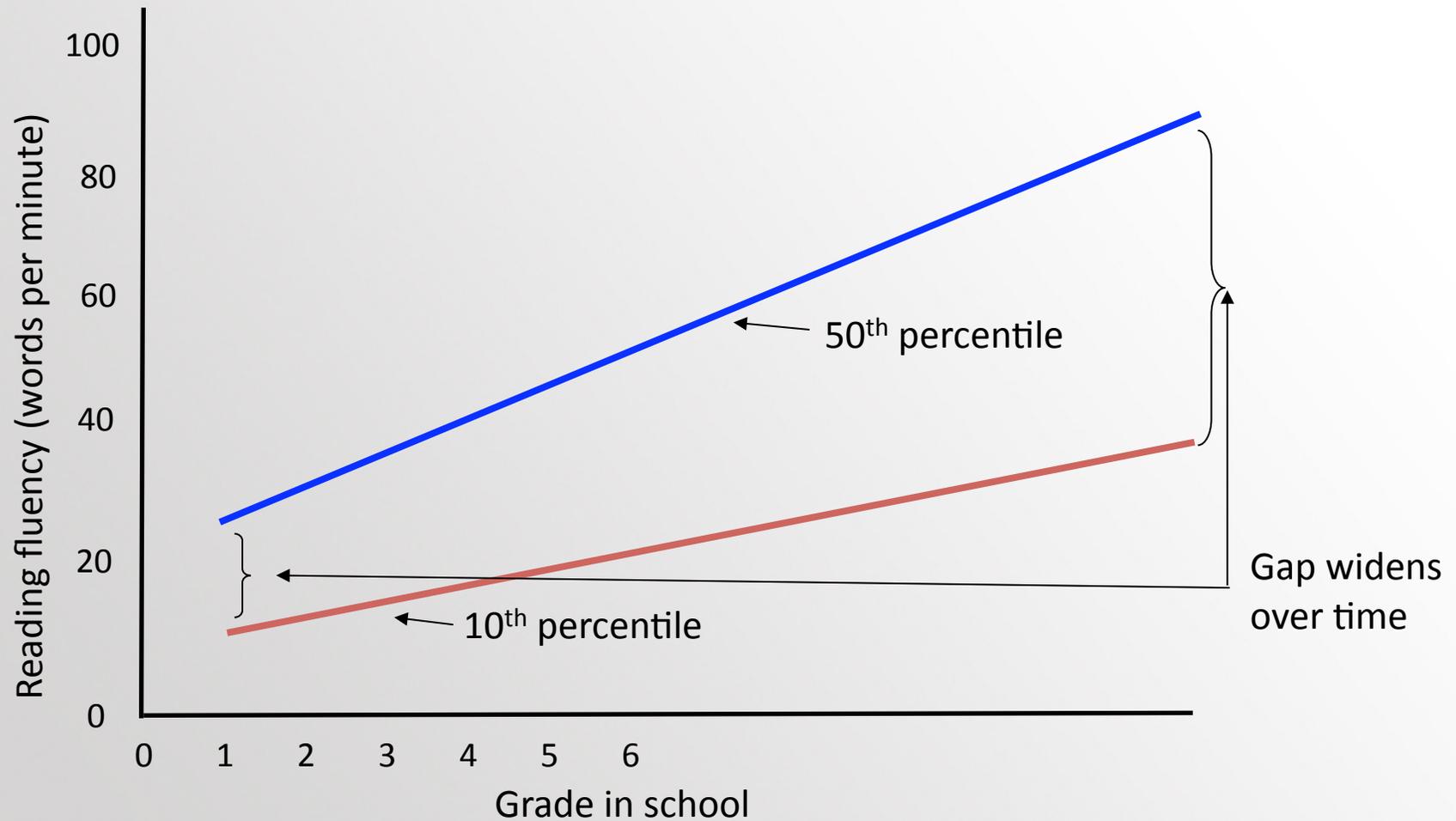
- Children begin to develop skills that help them develop literacy skills before formal schooling such as:
  - capacity to hear phonological distinctions,
  - phonological awareness from exposure to rhymes and song,
  - knowledge of letter shapes and names;
  - experiencing “reading” environmental print;
  - being in command of several thousand vocabulary words; and
  - understanding the grammar and discourse rules of the language/s they speak

# Why early matters

- However, in developing countries students may not develop all of these skills prior to entering school.

In that case, what happens in school becomes vitally important!

# Early matters.



(Source: Good, Simmons and Smith, 1998)

# Early Matters

- Students fail to learn to read because of
  - limited early literacy experiences;
  - Insufficient instruction or practice; or
  - failure to master basic decoding skills because of poor phonemic awareness or alphabetic principle.

# Reading components and EGRA Protocols

<b>Component</b>	<b>Measure</b>
<b>Letter Recognition</b>	<b>Letter Naming Fluency</b> <b>Letter Sound Fluency</b>
<b>Phonological Awareness</b>	<b>Initial Sound Discrimination</b> <b>Initial Sound Identification</b>
<b>Alphabetic Principle</b>	<b>Syllable Sound Fluency</b> <b>Nonsense Word Fluency</b>
<b>Accuracy and Fluency with Text</b>	<b>Word Reading Fluency</b> <b>Oral Reading Fluency</b>
<b>Comprehension</b>	<b>Reading Comprehension</b>

# Why these areas?

- They are predictive of later reading difficulty.
- They are easily measured.
- Instruction in these areas has an impact on student outcomes.
- If these areas are addressed, we can change trajectories.

# Why fluency?

- Fluency measures assess not only whether or not a child knows something, but whether they have integrated the knowledge, can process the information automatically, and can apply in different contexts.
- To be successful readers, basic reading competencies have to be automatic.

# Measure Development

- For each measure:
  - Rules were followed for each measure.
  - Rules reflect orthography of language.
  - Level of difficulty was controlled.
  - Order of items does not progress from easier to more difficult.

# Letter Knowledge

- Accuracy and fluency in naming letters
  - Letter naming
- Accuracy in identifying sounds of letters

# Rules

- Letter naming
  - Have a mix of most common and less common letters.
  - The order does not progress from easier to more difficult.
  - Consider the font.

# Alphabetic Principle

- Accuracy in mapping sounds to print
- Fluency in mapping sounds to print
  - Non-word reading

# Rules

- Alphabetic principle
  - Use only letter combinations that are possible in the language
  - Follow orthography rules
  - Make sure words are not real words in another language children might know

# Oral Reading Fluency

- Accuracy in reading decodable words and irregular words.
- Fluency is reading decodable and irregular words.

Word reading  
Short passage

# Word Level Reading

- Familiar Words

# Word Level Reading

- Non-words

# Passage Criteria

- Narrative passage
- 60-100 words
- Grade appropriate
- Universal theme

# Comprehension

- Reading comprehension
  - Ability to answer literal questions
  - Ability to answer textually implicit

# Levels of Questions

- Explicit (2)
  - Can be found in the text directly
- Textually implicit (2)
  - Can be found in the text but the reader will have to draw from more than one place
- Implicit (1)
  - Derived from the text and reader's knowledge

- Questions???
- Comments



EdData II  
Education Data for Decision Making

# Development and Rationale of the Early Grade Math Assessment

CIES 2012, April 22

April 2012

Prepared by Wendi Ralaingita  
RTI International, Research Triangle Park, North Carolina, USA

## About the Presentation

- This presentation was prepared for use in a one-day workshop titled “Understanding the Early Grade Reading and Math Assessments: From Development to Data Analysis,” led by RTI International at the annual conference of the Comparative and International Education Society (CIES) in San Juan, Puerto Rico, April 22, 2012.
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# Why Math?



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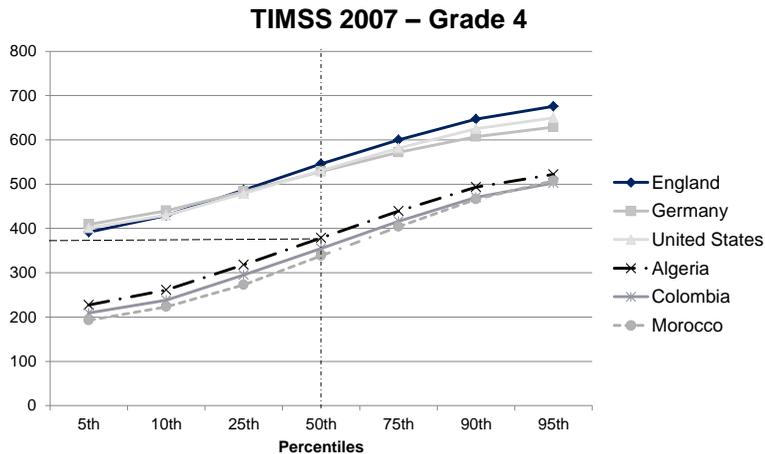
## Why Math?

- Being able to access information through understanding and manipulating numbers can have a positive impact on an individual's day-to-day life
- Early grade mathematics forms the foundation for skills in higher-level mathematics, as well as in science, technology, and engineering (STEM)
- Recent meta-analyses of longitudinal data show that early math skills have the greatest predictive power of later academic achievement (Duncan et al., 2007; Romano et al., 2010)

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., et al. (2007). School readiness and later achievement. *Developmental Psychology*, 43(6), 1428-1446 and correction, 44(1), 232.  
Romano, E., Babchishin, L., Pagani, L. S., & Kohen, D. (2010). School readiness and later achievement: Replication and extension using a nationwide Canadian survey. *Developmental Psychology*, 46(5), 995-1007.

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## Why EGMA?



TIMSS = Trends in International Mathematics and Science Study (international achievement assessments)

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## EGMA Development Process

1. Conduct extensive literature review, establish conceptual framework (based on review of research conducted over the past 60 years)
2. Contact experts in the field who had done similar work in the U.S. and beyond
3. Develop draft tasks
4. Convene an expert panel to discuss skills and tasks to be included in the EGMA
5. Pilot EGMA
6. Review pilot, revise instrument
7. Apply EGMA
8. Expert panel review and recommendations – refine instruction and item specifications

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## EGMA Development Process

### EGMA applications to date

- Kenya
- Liberia
- Malawi
- DR Congo
- Mali
- Rwanda
- East Timor
- Zambia
- Morocco
- Iraq
- Jordan



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## EGMA Specifications

- Overall instrument features
  - Quick administration, easy to score
  - High face validity
  - Oral administration
  - Feasible to administer in developing-country contexts, including context-specific adaptations as needed

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## EGMA Specifications

- subtasks – Criteria for inclusion
  - Represent a progression of foundational skills that support proficiency in mathematics
  - Research indicates predictive power
  - Include measures of both conceptual understanding and procedural fluency/automaticity
  - Common in many curricula for early grades
  - Teachable

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## EGMA Subtasks

### Number Identification (Timed)

- Allows children to use knowledge which they have gained through auditory means (their ears) and connect this with printed numbers, like 4.
- Numbers serve to describe set sizes and measurements
  - Quantity
    - Six children
  - Length/Distance
    - Five miles or 2 days
  - Area
    - Ten square miles
- Students need to be able to identify numbers with automaticity.

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## EGMA Subtasks

### Number identification (timed)

2	9	0	12	30
22	45	39	23	48
91	33	74	87	65
108	245	587	731	989

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## EGMA Subtasks

### Number Discrimination (Comparison)

- In order to be able to discriminate between two different quantities (numbers) children must understand:
  - Number order
  - Place value
- If children cannot discriminate between two numbers, they will not be able to do higher mathematics like addition, subtraction, multiplication, and division.

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## EGMA Subtasks

### Number Discrimination (Comparison)

7	5	<u>7</u>	1	0	94	78	<u>94</u>	1	0
11	24	<u>24</u>	1	0	146	153	<u>153</u>	1	0
39	23	<u>39</u>	1	0	287	534	<u>534</u>	1	0
58	49	<u>58</u>	1	0	623	632	<u>632</u>	1	0
65	67	<u>67</u>	1	0	867	965	<u>965</u>	1	0

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## EGMA Subtasks

### Missing Number (Patterns)

- Recognizing patterns is fundamental in mathematics
- Leads to beginning of multiplication
  - 2, 4, 6, is one way of figuring out  $2 \times 3$
- Supports problem-solving and foundations of algebra
- Facilitates flexibility and efficiency in mathematical thinking
  - 1, 2, 3, 4, 5, 6, 7
  - 10, 20, 30, 40, 50, 60, 70
  - 25, 50, 75, 100, 125, 150, 175

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## EGMA Subtasks

### Missing Number (Patterns)

1

5	6	7	(8)	10
---	---	---	-----	----

6

348	349	(350)	351	10
-----	-----	-------	-----	----

2

14	15	(16)	17	10
----	----	------	----	----

7

28	(26)	24	22	10
----	------	----	----	----

3

20	(30)	40	50	10
----	------	----	----	----

8

30	35	(40)	45	10
----	----	------	----	----

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## EGMA Subtasks

### Addition and Subtraction – Level 1 (Timed)

- Addition and subtraction are the basis for many later mathematical skills
  - Multiplication
  - Division
  - Algebra
  - Geometry
- If students do not master the most basic addition and subtraction problems with automaticity, they will struggle with even more complicated addition and subtraction, much less multiplication, division, etc.

## EGMA Subtasks

### Addition – Level 1 (Timed)

$1 + 3 = (4)$	$7 + 8 = (15)$
$2 + 3 = (5)$	$4 + 7 = (11)$
$6 + 2 = (8)$	$7 + 5 = (12)$
$4 + 5 = (9)$	$8 + 6 = (14)$
$3 + 3 = (6)$	$9 + 8 = (17)$
$8 + 1 = (9)$	$6 + 7 = (13)$

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## EGMA Subtasks

### Subtraction – Level 1 (Timed)

$4 - 3 = (1)$	$15 - 8 = (7)$
$5 - 3 = (2)$	$11 - 7 = (4)$
$8 - 2 = (6)$	$12 - 5 = (7)$
$9 - 5 = (4)$	$14 - 6 = (8)$
$6 - 3 = (3)$	$17 - 8 = (9)$
$9 - 1 = (8)$	$13 - 7 = (6)$

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## EGMA Subtasks

### Addition and Subtraction – Level 2

- More difficult problems – allows for better capture of a range of abilities
- Extends principles and procedures of addition and subtraction to include place value:
  - $2 + 4 =$
  - $12 + 4 =$
  - $12 + 24 =$

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## EGMA Subtasks

### Addition – Level 2 (Timed)

$13 + 6 = (19) \quad \boxed{1} \quad \boxed{0}$

$18 + 7 = (25) \quad \boxed{1} \quad \boxed{0}$

$12 + 14 = (26) \quad \boxed{1} \quad \boxed{0}$

$22 + 37 = (59) \quad \boxed{1} \quad \boxed{0}$

$38 + 26 = (64) \quad \boxed{1} \quad \boxed{0}$

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## EGMA Subtasks

### Subtraction – Level 2 (Timed)

$19 - 6 = (13)$      

$25 - 7 = (18)$      

$26 - 14 = (12)$      

$59 - 37 = (22)$      

$64 - 26 = (38)$      

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## EGMA Subtasks

### Word Problems

- "Problem solving means engaging in a task for which the solution method is not known in advance." (NCTM, 2000)
- The word problems reflect the different "types" of addition and subtraction problems (join, separate, part-part-whole, compare or equalize), as well as basic principles of multiplication, and show whether a child can work conceptually through real-life problems to figure out the answer (minimizing procedural factors)

National Council of Teachers of Mathematics (NCTM) [USA]. (2000). *Principles and standards for school mathematics*. Reston, Virginia: NCTM.

## EGMA Subtasks

### Word Problems

#### Exercise 1

👤: 2 children are on the bus. [pause and check]  
3 more children get on. [pause and check]  
How many children are on the bus altogether?

✓ ✗ Correct answer: 5

#### Exercise 2

👤: There are 6 children on the bus. [pause and check]  
2 are boys. The others are girls. [pause and check]  
How many girls are there on the bus?

✓ ✗ Correct answer: 4

#### Exercise 3

👤: There are 2 children on John's bus. [pause and check]  
There are 8 children on Mary's bus. [pause and check]  
How many more children must join John's bus so that it has the same number of children as Mary's bus?

✓ ✗ Correct answer: 6

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## EGMA – Future Steps

- Addition of two additional subtasks recommended by expert panel:
  - *Relational Reasoning*: Being able to consider numerical and/or spatial relationships, particularly for solving problems (i.e.,  $5 + 2 = 2 + \underline{\quad}$  or  $52 + 3 - 3 = \underline{\quad}$ )
  - *Spatial Reasoning*: Being able to visualize spatial patterns and mentally manipulate them
- Development of EGMA toolkit

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## Uses of EGRA/EGMA – General Guidelines

- What EGRA/EGMA can do:
  - Target EARLY competencies – can show how students are doing in mastering those early skills
  - Help to identify specific weaknesses/strengths and relationships with supporting factors
- EGRA/EGMA can be used:
  - To give a “snapshot” of performance, based on random sample
  - To help determine areas of focus for improvement
  - In impact and program evaluation – to help show how policy and instructional changes are working
  - At the school/classroom level (with some adaptation)
- EGRA/EGMA can/should NOT be used:
  - For targeting higher-level skills
  - On a census-level basis (cannot test all students)
  - For high-stakes accountability

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## Matching Approach to Purpose

### Types of EGRA Surveys, According to Purpose

If you are interested in...	EGRA can be used as a...
<ul style="list-style-type: none"> <li>• Obtaining a rough estimate or picture of students’ reading ability in a particular population</li> </ul>	<p><b>Reading “Snapshot”:</b> Using all or selected EGRA subtasks, the assessment can quickly determine reading levels to raise awareness about reading challenges and motivate policy makers, ministry staff, donors, and civil society to take action.</p>
<ul style="list-style-type: none"> <li>• Ascertaining students’ reading ability throughout the country</li> <li>• Identifying differences in student literacy development across regions, languages, types of schools, and sex</li> <li>• Determining the effect of language policy on students’ reading development</li> </ul>	<p><b>National or System-Level Diagnostic:</b> Using all subtasks relevant to the curriculum and language, EGRA can thoroughly examine gaps in reading competencies to help improve policy, curriculum, and pre-service and professional development programs for teachers.</p>

From RTI International & International Rescue Committee (IRC). (2011, July). *Guidance notes for planning and implementing EGRA*. Available from <https://www.eddataglobal.org/reading/index.cfm?fuseaction=pubDetail&id=318>

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## Matching Approach to Purpose

### Types of EGRA Surveys, According to Purpose

If you are interested in....	EGRA can be used as a...
<ul style="list-style-type: none"><li>• Knowing whether a particular reading intervention is effective in improving children's reading performance</li><li>• Comparing the effectiveness of different programs aimed at improving reading outcomes</li></ul>	<b>Impact Evaluation:</b> Using relevant subtasks, an EGRA survey can be used to detect change over time in student performance resulting from an intervention aimed at improving reading instruction and learning outcomes.
<ul style="list-style-type: none"><li>• Identifying whether students in a particular classroom are developing reading skills with current interventions</li><li>• Identifying whether instruction needs to be differentiated for students in a classroom</li><li>• Monitoring student progress</li></ul>	<b>Classroom Assessment:</b> Using selected subtasks relevant to classroom instruction, teachers can apply EGRA to conduct a mastery check of a whole class or to monitor progress of particular students against norms and benchmarks for the grade in order to inform instruction at the classroom level.

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## More Information

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Education Data for Decision Making

# Administering EGRA and EGMA

Rules and tips for ensuring quality administration  
and results

April 2012

Prepared by Jessica Mejia and Alison Pfelepsen  
RTI International, Research Triangle Park, North Carolina, USA

## About the presentation

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## General administration principles

- **Verbal consent** of students and teachers to participate in the study must be obtained.
- Participants' rights to the **anonymity** of their results must be protected.
- All participants in research, including children, are to be treated with **respect and dignity**.
- Before beginning the test, assessors should **build rapport and make the child feel comfortable**. We want them to be relaxed during the test so that they can do their best.

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## Assess – Do not teach!



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## Administration principles

- **Consistency in administration** is key, to offer every child the same opportunity to perform
- **Stick to the script** and administration rules!
- Make sure to retain **complete records**
- Missing data can mean wasted effort

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## Administrator materials

- Scoring sheet (to be marked by assessor)
- Student “stimuli sheet” (with items to be read)
- Stopwatch
- Clipboard
- Pencil
- Eraser

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## Consent

### Verbal Consent

- Let me tell you why I am here today. I work with the Ministry of Education and we are trying to understand how children learn to read. You were picked by chance, like in a raffle or lottery.
- We would like your help in this. But you do not have to take part if you do not want to.
- We are going to play a reading game. I am going to ask you to read letters, words and a short story out loud.
- Using this stopwatch, I will see how long it takes you to read.
- This is NOT a test and it will not affect your grade at school.
- I will also ask you other questions about your family, like what language your family uses at home and some of the things your family has.
- I will NOT write down your name so no one will know these are your answers.
- Once again, you do not have to participate if you do not wish to. Once we begin, if you would rather not answer a question, that's all right.
- Do you have any questions? Are you ready to get started?

Check box if verbal consent is obtained:  YES

*(If verbal consent is not obtained, thank the child and move on to the next child, using this same form)*

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## Getting to know EGRA and EGMA

- Before you start:
  - Fill in demographic information
  - Introduce yourself and establish rapport
  - Obtain verbal consent
- For each subtask:
  - Read directions to child verbatim
  - Provide examples
  - Make sure you know if it's a timed or untimed test
  - Score test according to rules

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## Demographic information

A. Date of Assessment :	Day: _____ Month: _____	I. Class:	1 = Class One 2 = Class two
B. Enumerator's Name :		J. Stream Name:	
C. School Name :		K. Pupil Unique Code:	
D. District:		L. Student's Age :	
E. Zone:		M. Student's Gender	1 = boy      2 = girl
F. School Shift :	1 = Full day 2 = Morning only 3 = Afternoon only	N. Time Started: _____ : _____ AM / PM	
G. Multigrade Class ?	0 = No      1 = Yes		
H. Order of Assessment	1 = First 2 = Second 3 = Third		

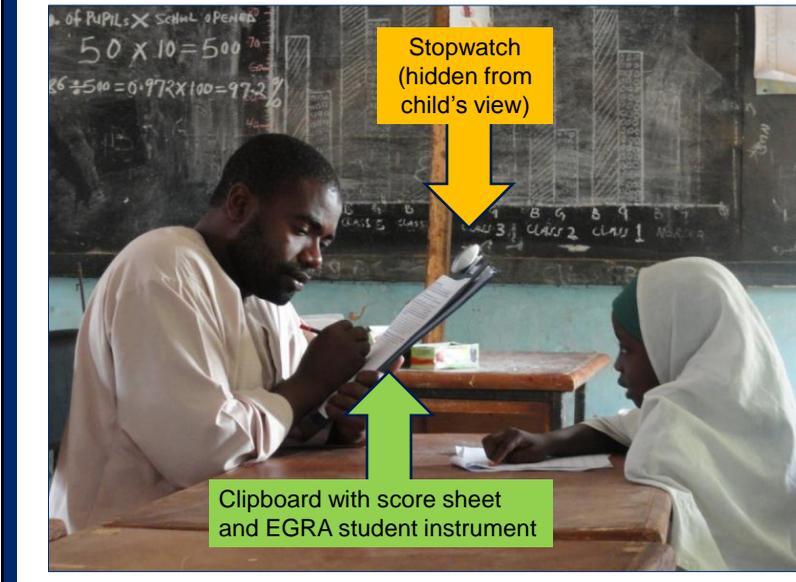
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## Holding your clipboard and stopwatch

1. Hold your clipboard, along with your stopwatch, in your non-dominant hand.
2. Place your pen or pencil in your dominant hand.
3. Slant your clipboard so it points toward the student's forehead.
4. Practice turning your stopwatch on and off while holding the clipboard, stopwatch, and pencil.

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## Holding your clipboard and stopwatch



## Holding your clipboard and stopwatch

Handling these materials in this way is not as easy as it looks.

It takes some time and practice for assessors to become comfortable so that the materials do not distract them from the test administration.

Task 2. Nonword decoding

Sheet M2

⌚ 60 seconds

Here are some made-up words. I would like you to read as many as you can. Do not spell the words, but read them. For example, this made-up word is: "ut".

**Let's practise:** Please read this word [point to the next word: dif].  
*[If the student says "dif", say]: "Very good: "dif"*  
*[If the student does not say "dif" correctly say]: "This made-up word is "dif."*

**Now try another one:** Please read this word [point to the next word: mab].  
*[If the student says "mab", say]: "Very good: "mab"*  
*[If the student does not say "mab" correctly say]: "This made-up word is "mab."*

When I say "begin," read the words as quickly and carefully as you can. Read the words across the page, starting at the first row below the line. I will keep quiet and listen to you, unless you need help. Do you understand what you are to do?  
**Ready? Begin.**

⌨ ( / ) Mark any incorrect nonsense words with a slash.  
 ( ) Mark the final nonsense word read with a bracket.

Example:				
1	2	3	4	5
vob	tep	reb	fem	bis
zay	yut	gux	pef	het
raz	mak	mip	lep	sab

(5)

(10)

(15)

If you have marked as incorrect all of the answers on the first line with no self-corrections, discontinue this exercise, check the box at the bottom, and go on to the next exercise.

• If the time on the stopwatch runs out (60 seconds).

• If a child stops on a word for 3 SECONDS.

**Instructions to be read to the student**

**Instructions for the assessor on how to administer and score the test**

**The section of the test where the assessor records the student's responses**

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## Timed vs. untimed EGRA subtasks

- **Timed subtasks:**  
 Several of the EGRA subtasks have a ONE-MINUTE limit, in order to measure the child's FLUENCY. These instruments require the use of a stopwatch (examples: letter identification, word reading, oral reading fluency)
- **Untimed subtasks:**  
 Child is not timed, so a stopwatch is not required (examples: phonemic awareness, listening and reading comprehension)

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## EGRA – Administering a timed subtask

- (/) Mark any incorrect letters with a slash
- ( ) Mark the final letter read with a bracket

Example: A v L

	1	2	3	4	5	6	7	8	9	10	
e	f	d	R	m	i	w	r	i	H		(10)
o	n	F	a	e	A	t	T	e	y		(20)
n	G	W	o	C	t	i	H	e	o		(30)
r	E	s	Y	n	U	S	t	s	e		(40)
D	t	I	o	t	p	l	i	s	g		(50)
L	N	I	E	I	x	k	r	z	A		(60)
n	w	a	O	H	e	P	d	t	s		(70)
s	o	E	h	e	m	a	M	b	E		(80)
J	r	c	s	v	h	R	u	B	a		(90)
u	E	Q	N	a	T	I	h	A	O		(100)

➤ Time remaining on stopwatch at completion (number of SECONDS):

➤ Check this box if the exercise was discontinued because the child had no correct answers in the first line.

## EGRA – Administering an untimed subtask

### Section 2. Initial Sound Identification

This is NOT a timed exercise and **THERE IS NO STUDENT SHEET**. Read aloud each word twice, and have the student say the initial sound. Remember to model the “pure” sounds: /p/, not “puh” or “pay.” Say:

This is a listening exercise. I want you to tell me the beginning sound of each word. For example, in the word “pot”, the first sound is “/p/”. In this exercise, I would like you to tell me the first sound you hear in each word. I will say each word two times. Listen to the word, then tell me the very first sound in that word.

Let’s practice. What is the first sound in “mouse”? “Mouse.”

[If the child responds correctly, say]: Very good, the first sound in “mouse” is /mmmm/.

[If the child does not respond correctly, say]: Listen again: “mmmouse”. The first sound in “mouse” is /mmmm/.

Now let’s try another one: What is the first sound in “day”? “Day”.

[If the child responds correctly, say]: Very good, the first sound in “day” is /d/.

[If the child does not respond correctly, say]: Listen again: “day”. The first sound in “day” is /d/.

Do you understand what you are to do?

[If the child says no, say]: Just try your best.

What is the first sound in “_____”? “_____”? [Repeat the word twice]					
Map	<u>/mmmm/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Say	<u>/sssss/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Up	<u>/uh/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Go	<u>/g/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Now	<u>/nnnn/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Can	<u>/k/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Fish	<u>/ffffff/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Pig	<u>/p/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Run	<u>/rrrrr/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response
Look	<u>/lllll/</u>	<input type="radio"/> Correct	<input type="radio"/> Incorrect	<input type="radio"/> Don't know	<input type="radio"/> No Response

Check this box if the exercise was discontinued because the child had no correct answers in the first five words :

### Administration icons

-  • Indicates if subtask uses stimulus sheets
-  • Indicates whether subtask has time limit
-  • Indicates auto-stop
-  • Indicates when child should be prompted to next item
-  • Indicates to read directions verbatim

18

## Administration icons



- Indicates how to record student responses



( / ) Incorrect or no response

( ] ) After the last number read



( ✓ ) 1 = Correct.

( ✕ ) 0 = Incorrect or no response.



- Indicates special materials needed

19

## Basic EGRA administration rules

- **3-second rule:** If a child hesitates to answer for more than three seconds on a given EGRA item, mark the item incorrect and ask the child to go on.
- **Early stop rule:** If a child is unable to provide a correct answer on any item in the first row or section of a subtask, thank the child, mark the box at the bottom of the scoring page, discontinue the subtask and move on to the next subtask.

20

## Basic EGRA scoring rules

**Incorrect answers and omissions:** Put a slash through incorrect answers and non-responses ( / )

**Skipped letters, words or lines:** Draw a line through any row of words or letters skipped

~~A t p R x B w o m e~~

**Self corrections:** If student self-corrects within 3 seconds, circle the item already slashed through and score as correct (*time is used*)



21

## Basic EGRA scoring rules

**Dialectical differences** – score as correct

**Articulation differences** – score as correct

**Bracketing:** When the child stops reading (or you tell him/her to stop because 60 seconds is up), write a bracket behind the last word read.



22

## Basic EGRA scoring rules

**Repeating questions:** If a child asks you to repeat a question or does not understand, you can repeat it only **ONCE**.

**Comprehension questions:** Only ask questions that pertain to the lines of text that the student has read. **Do NOT ask questions for text that the student has not read.**

23

## Example of scoring for familiar word reading

Example:    cat        sick        made

	1	2	3	4	5	
	go	sad	up	find	come	(5)
	help	two	run	see	down	(10)
	red	and	play	at	you	(15)
	chair	man	when	now	under	(20)
	please	soon	like	they	good	(25)
	<del>thank</del>	<del>going</del>	<del>are</del>	<del>know</del>	<del>him</del>	(30)
	jump	once	ask	fly	want	(35)
	must	green	sing	those	always	(40)
	many	which	upon	sit	clean	(45)
	stop	big	me	house	girl	(50)

Time remaining on stopwatch at completion (number of SECONDS):

Check this box if the exercise was discontinued because the child had no correct answers in the first line.

24

# EGMA administration



25

## EGMA administration – Timed subtasks

Sheet A needed

60 sec limit

What the assessor says

### Task 1: Number Identification

Sheet A

60 seconds

Here are some numbers. I want you to point to each number and tell me what the number is. I am going to time you and will tell you when to begin and when to stop.

- [point to first number] Start here. [glide hand from left to right]. Are you ready? . . . Start.

- What number is this ?

<input type="checkbox"/>	( / )	Incorrect or no response			
<input type="checkbox"/>	( )	After the last number read			
2	9	0	12	30	
22	45	39	23	48	
91	33	74	87	65	
108	215	587	781	989	

Stopping & moving conditions

Record here

Record time left here

What to record

• If the time on the stopwatch runs out (60 seconds).

• If a child stops on a number for 5 SECONDS.

Time left (seconds):

What to record

26

## EGMA administration – Examples

Task 2: Number	B1	⌚ x
<p><b>P1:</b></p> <p>👤 Look at these numbers. Tell me which number is bigger. 8 4</p> <p>✓👤 That's correct, 8 is bigger. Let's do another one.</p> <p>✖👤 The bigger number is 8. [Point to 8] This is 8. [Point to 4] This is 4. 8 is bigger than 4. <i>Let's do another one.</i></p>		
<p><b>P2:</b></p> <p>👤 Look at these numbers. Tell me which number is bigger. 12 22</p> <p>✓👤 That's right, 22 is bigger. Let's continue.</p> <p>✖👤 The bigger number is 22. [Point to 22] This number is 12. [Point to 22] This is 22. 22 is bigger than 12. Let's continue.</p>		

What the assessor says

Response if the answer is correct.

Response if the answer is NOT correct.

## EGMA administration – Untimed subtasks

Task 2: Number Discrimination	B2 & B3	⌚ x																																																		
<p>👤 Look at these numbers. Tell me which number is bigger.</p> <p>[Repeat for each item]</p> <p>✓ 1 = Correct.</p> <p>✖ 0 = Incorrect or no response.</p>	<p>What to record</p> <table border="1"> <tbody> <tr> <td>7</td><td>5</td><td><u>7</u></td><td>1</td><td>0</td> <td>94</td><td>78</td><td><u>94</u></td><td>1</td><td>0</td> </tr> <tr> <td>11</td><td>24</td><td><u>24</u></td><td>1</td><td>0</td> <td>146</td><td>153</td><td><u>153</u></td><td>1</td><td>0</td> </tr> <tr> <td>39</td><td>23</td><td><u>39</u></td><td>1</td><td>0</td> <td>287</td><td>534</td><td><u>534</u></td><td>1</td><td>0</td> </tr> <tr> <td>58</td><td>49</td><td><u>58</u></td><td>1</td><td>0</td> <td>623</td><td>632</td><td><u>632</u></td><td>1</td><td>0</td> </tr> <tr> <td>65</td><td>67</td><td><u>67</u></td><td>1</td><td>0</td> <td>867</td><td>965</td><td><u>965</u></td><td>1</td><td>0</td> </tr> </tbody> </table> <p>Record here</p>	7	5	<u>7</u>	1	0	94	78	<u>94</u>	1	0	11	24	<u>24</u>	1	0	146	153	<u>153</u>	1	0	39	23	<u>39</u>	1	0	287	534	<u>534</u>	1	0	58	49	<u>58</u>	1	0	623	632	<u>632</u>	1	0	65	67	<u>67</u>	1	0	867	965	<u>965</u>	1	0	<p>No time limit</p> <ul style="list-style-type: none"> <li>• If the child gets 4 successive errors</li> <li>• If the child doesn't respond after <u>5 SECONDS</u>.</li> </ul>
7	5	<u>7</u>	1	0	94	78	<u>94</u>	1	0																																											
11	24	<u>24</u>	1	0	146	153	<u>153</u>	1	0																																											
39	23	<u>39</u>	1	0	287	534	<u>534</u>	1	0																																											
58	49	<u>58</u>	1	0	623	632	<u>632</u>	1	0																																											
65	67	<u>67</u>	1	0	867	965	<u>965</u>	1	0																																											

Sheets B2 & B3 needed

No time limit

What the assessor says

What to record

Record here

Stopping and moving condition

## EGMA administration – Addition, Level 2

Task 4B: Addition: Level 2		D3	⌚ x
<p> Paper and pencil.</p> <p> Here are more addition exercises. You may use this paper and pencil if you want to. You do not have to do so. Start here [point to first problem].</p> <p> (✓) 1 = Correct.   (x) 0 = Incorrect or no response.</p> <p>13 + 6 = (19)    <input type="text" value="1"/> <input type="text" value="0"/></p> <p>18 + 7 = (25)    <input type="text" value="1"/> <input type="text" value="0"/></p> <p>12 + 14 = (26)    <input type="text" value="1"/> <input type="text" value="0"/></p> <p>22 + 37 = (59)    <input type="text" value="1"/> <input type="text" value="0"/></p> <p>38 + 26 = (64)    <input type="text" value="1"/> <input type="text" value="0"/></p>		<ul style="list-style-type: none"> <li>• If the child did not answer any Level 1 question correctly.</li> <li>• If the child makes 4 consecutive errors.</li> <li>• If a child uses an inefficient strategy (e.g., tick marks), as the child "Do you know another way to solve the problem?"</li> <li>• If a child continues to use an inefficient strategy or stops on an item for 5 SECONDS.</li> </ul>	
<p>To solve the problems, the child used:</p> <p><input type="checkbox"/> Fingers/tick marks</p> <p><input type="checkbox"/> Paper and pencil calculations</p> <p><input type="checkbox"/> Solved the problems in their head</p>			

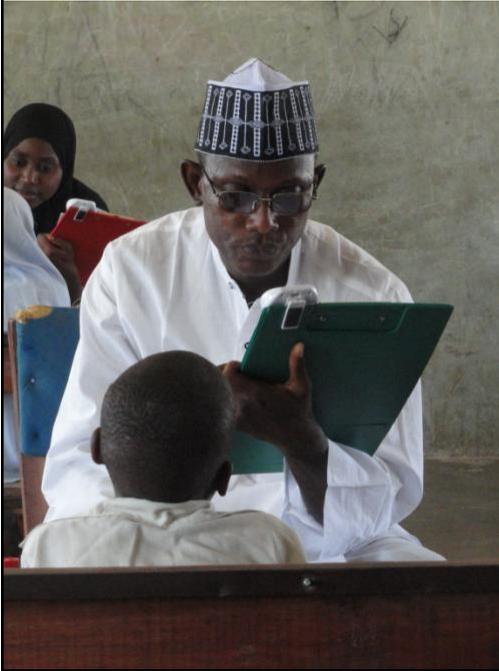
29

## EGMA administration – Word problems

Task 6: Word Problems (practice)		x	⌚ x
<p> Counters, paper and pencil.</p> <p> I have some exercises that I am going to ask you to do for me. Here are some objects to help you. You can use them if you need them, but you don't have to use them. Listen very carefully to each exercise. If you need, I will repeat exercise for you. Okay, let's get started.</p> <p> There are three children in the bus. One child gets out of the bus. How many children are left in the bus.</p> <p> That's right. There are two children left in the bus. Let's do some more.</p> <p> Imagine these counters are children [point to counters]. Count out three children. These children are in the bus. One child gets out of the bus. Using the counters, show me one child getting out of the bus with the counters. How many children are left in the bus? That's right. There are two children left in the bus. Let's do some more.</p>		<p> x</p>	

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## Common administrator errors



- Forgetting to put bracket and/or time remaining
- Not adhering to 3-second rule (5 seconds for EGMA)
- Not reading directions verbatim
- Not starting stopwatch on time, or forgetting to stop it
- Overly encouraging or assisting children

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## Importance of supervision



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## EGRA and EGMA administration – Supervision

Supervision is key to accurate EGRA and EGMA administration and data collection.

The supervisor monitors how the assessor is giving the test. After the child leaves, the supervisor gives the assessor any feedback necessary to improve technique and ensure reliability of data.

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## Electronic data collection



- Easier assessment
- Better data
- Faster results

Video of EGRA administration using Tangerine: [vimeo.com/36907469](https://vimeo.com/36907469)

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## Benefits of using Tangerine

- Easier to administer – fewer materials to juggle
- Reduces administrator error
- Reduces time from data collection to results – no data entry stage
- Reduces loss of data as well as inconvenience of paper (paper waste, storage, and carrying)
- Easier to add languages, reformat, etc.



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## Now, let's practice!



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# Data Analysis and Reporting

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Souhila Messaoud-Galusi, Ph.D.  
RTI International

# Agenda

- Definitions
- Descriptive statistics
- Example results
  - Baseline
  - Efficacy Study
- Q&A

# Basic Definitions

- Mean
- 2, 3, 3, 3, 5, 8, 11 (5)
- Median
- 2, 3, 3, 3, 5, 8, 11 (3)
- Mode
- 2, 3, 3, 3, 5, 8, 11 (3)
- Standard deviation
- (3.3)
- Construct Validity
- Effect Size

# EGRA and EGMA

- Have timed and untimed subtests
  - Timed subtests assess automaticity
  - Untimed subtest assess accuracy

# Basic Descriptive Statistics

- Means and standard deviations
  - Correct unit per minute
  - Percent correct

# Other Descriptive Statistics

- Zero Scores
- Benchmarks

# Results: Baseline

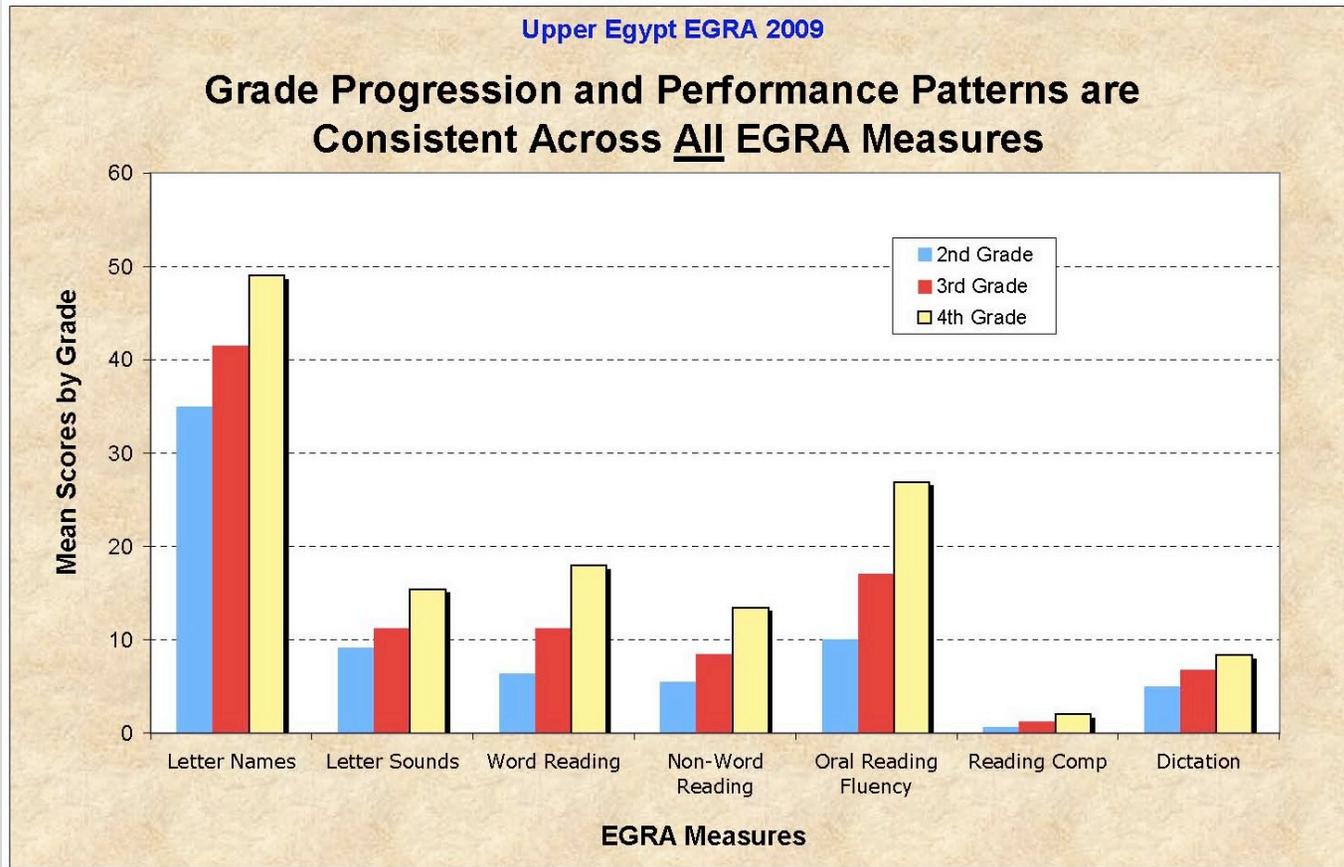
- What do students know and when do they know it?
- Distribution
- Stratified

# Data second to fourth grade

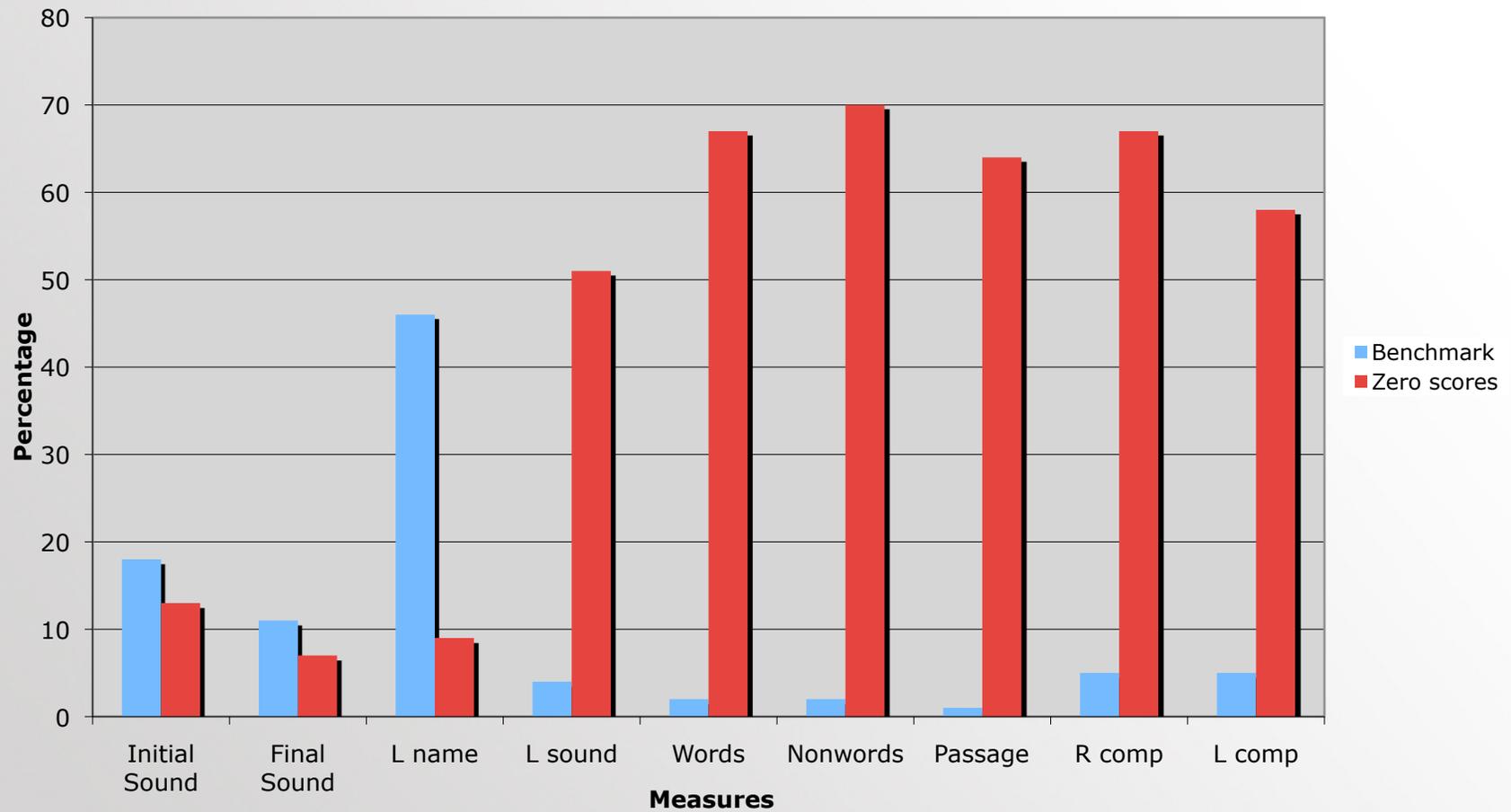
Girls' Improved Learning Outcomes Project (GILO)

Upper Egypt EGRA 2009

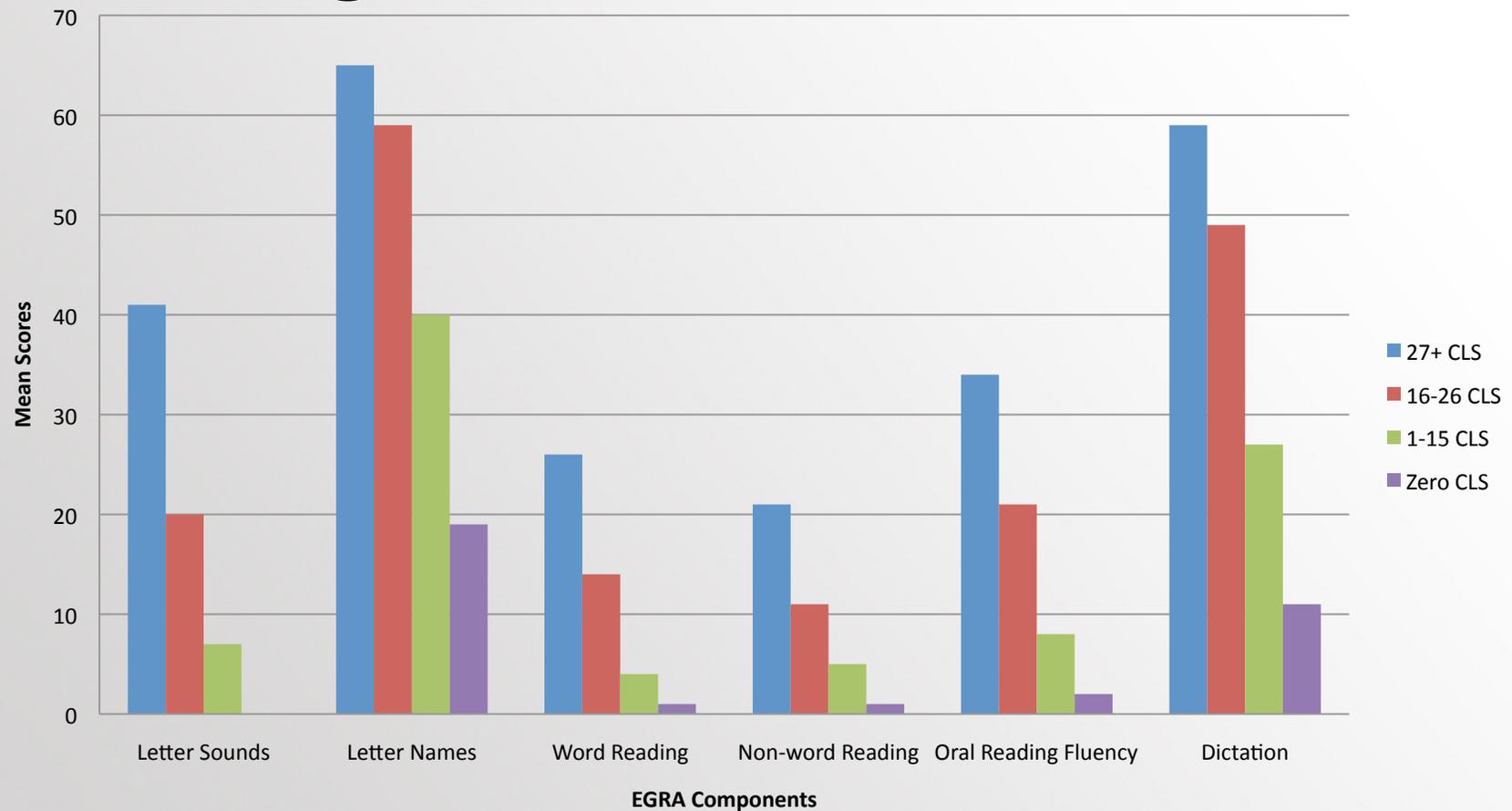
**Grade Progression and Performance Patterns are Consistent Across All EGRA Measures**



# Data Second Grade



# Knowing sounds makes a difference



# Basic EGMA Analysis

- Automaticity (timed) measures (*Number ID, Addition/Subtraction level 1*)
  - Frequency (Number correct per minute)
  - Accuracy (Correct/attempted)
- Untimed measures (*Quantity comparison, Number patterns, Addition/subtraction level 2, Word problems*)
- Can examine with and without zero-scores (??)
- Item-level analysis

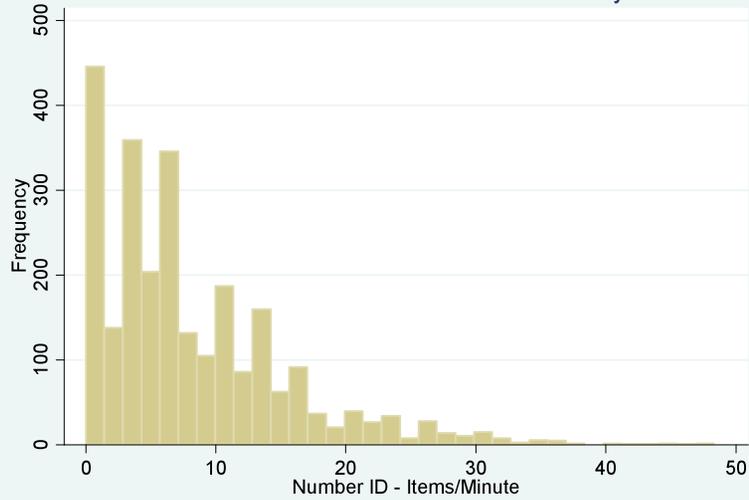
# Basic EGMA Analysis

- Timed sections
  - Automaticity (items/minute) =  $60 * (\# \text{ correct}) / (\text{Elapsed seconds})$

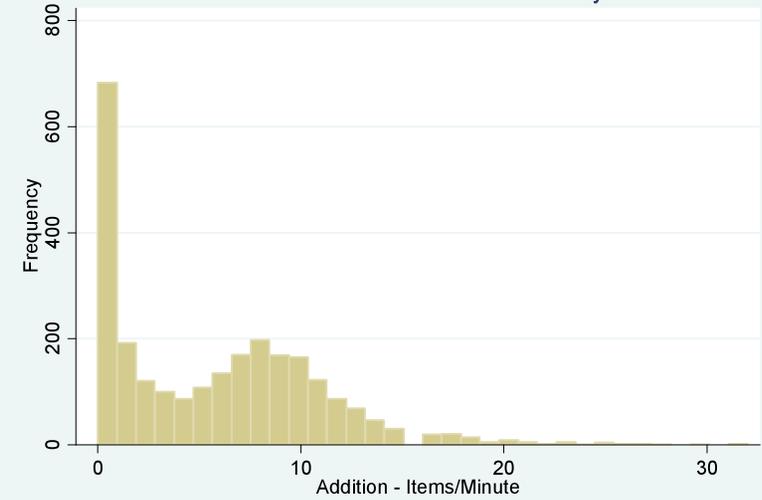
Sub-task	Mean Items/ Minute (all scores)	Mean Items/ Minute (non-zero only)
Number Identification	10.4	11.8
Addition	3.1	5.4
Subtraction	2.0	4.4

# Basic EGMA Analysis

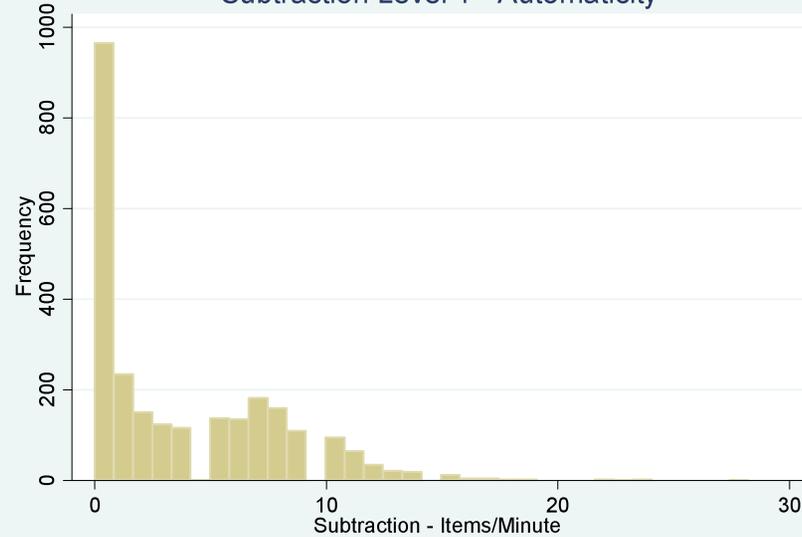
Number Identification - Automaticity



Addition Level 1 - Automaticity



Subtraction Level 1 - Automaticity



# Basic EGMA Analysis

- Timed sections
  - Automaticity (items/minute) =  $60 * (\# \text{ correct}) / (\text{Elapsed seconds})$
  - Accuracy (% correct/attempted) =  $(\# \text{ corrected}) / (\# \text{ attempted})$

Sub-task	Mean Items/Minute (all scores)	Mean Items/Minute (non-zero only)
Number ID	10.4	11.8
Addition	3.1	5.4
Subtraction	2.0	4.4

## Addition Level 1

	Automaticity (items/min.)	Mean % Correct
Country 1	7.74	58%
Country 2	6.71	80%

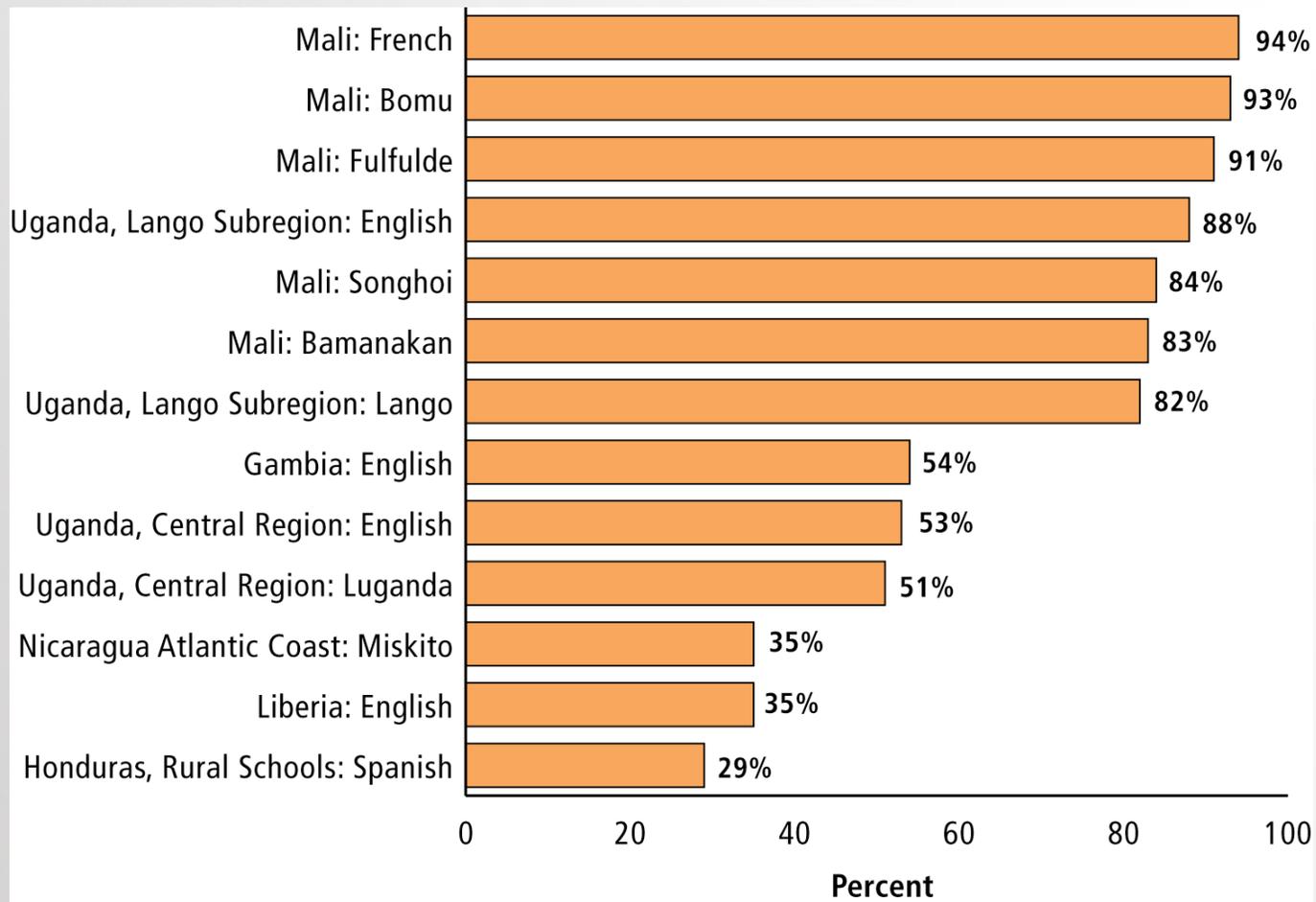
# Basic EGMA Analysis

- Un-timed sections
  - Total score (# correct/total)

Sub-task	Percent with zero scores	Mean % Correct – with zero scores	Mean % Correct – without zero scores
Number Comparison	26%	44%	59%
Number Patterns	51%	20%	40%
Word Problems	21%	46%	58%

# Across Countries

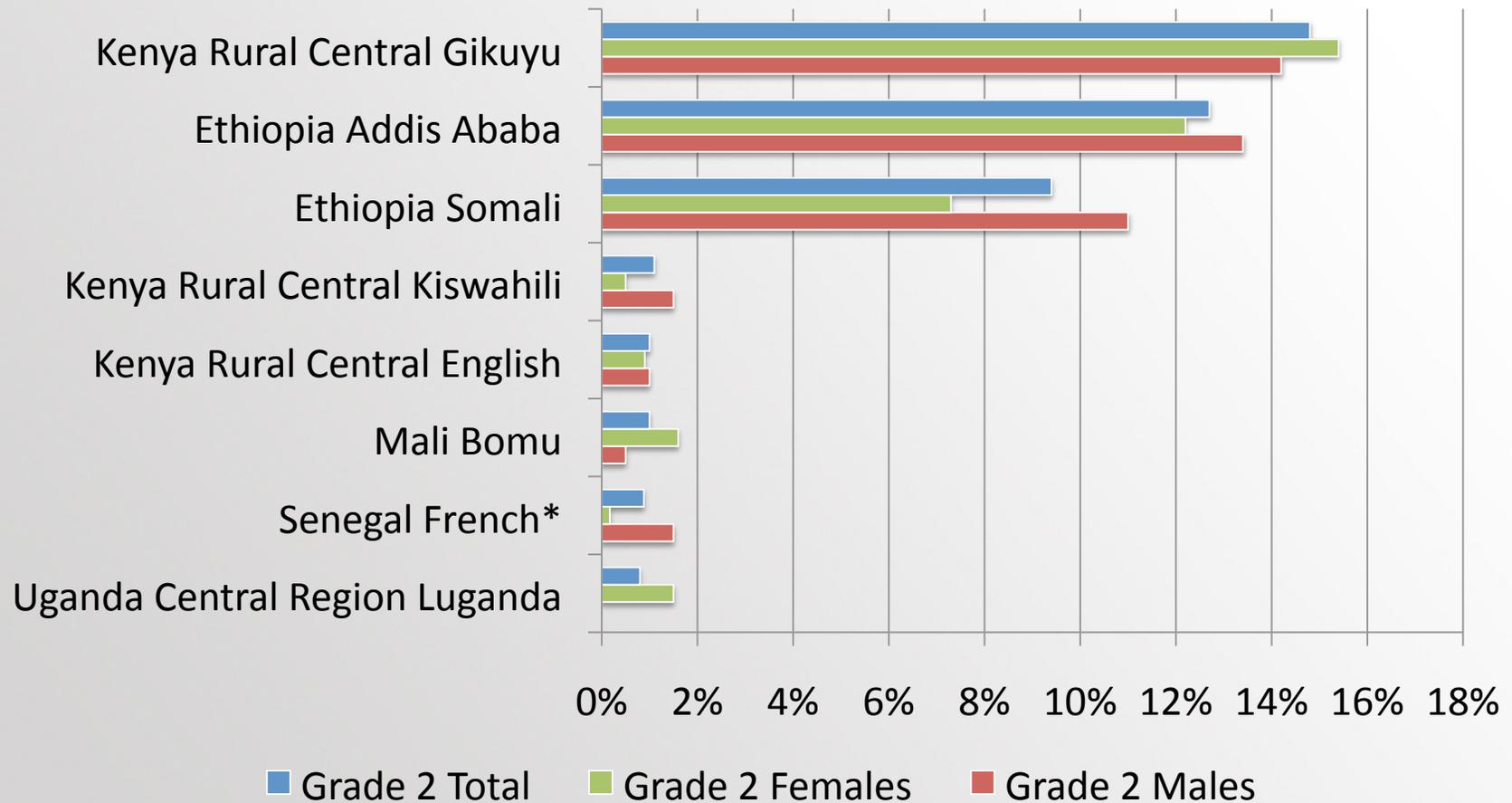
Percentage of Students Who Could not Read a Single Word, 2008-2009



Source: End of Grade 2 Early Reading Assessments. Complete reports available at [www.eddataglobal.org](http://www.eddataglobal.org)

# Across Countries

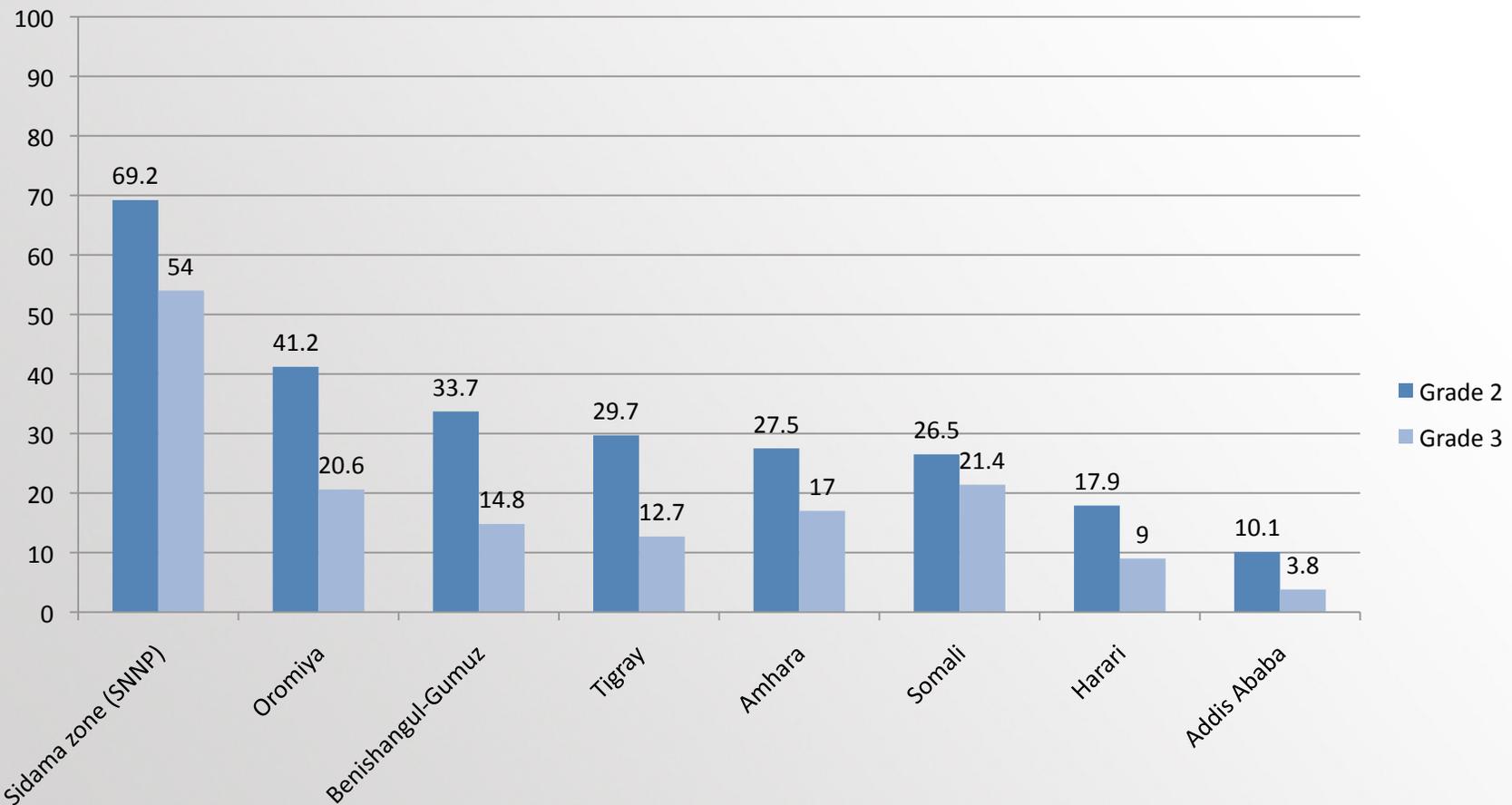
Percentage of Students Reading with at least 80% Comprehension, 2008-2010



\*Senegal French is Grade 3

# Within a Country

Percentage of Students Who Could not Read a Single Word, Ethiopia 2010 by Region



# Experimental Design

- Experimental research has the goal of identifying relationships.
- It is necessary to identify effective practices.

# Basic Definitions (Boudah, 2011)

## Experimental design

- usually includes (a) selection of experimental participants, (b) direct manipulation of an independent variable, and (c) measurement of outcomes.
  - Dependent variable is the variable the researcher analyzes (outcome).

# Basic Definitions (Boudah, 2011)

- Quasi-experimental research attempts to determine if an independent variable has a direct impact on a dependent variable **but** random assignment is problematic or impossible.

## Basic Definitions (Boudah, 2011)

- Statistical significant: a change in a dependent variable is greater than the predicted change due to chance.
- Significance level (or probability): level at which mean difference in population is not due to chance (.05 = 5% probability the outcome is due to chance or 95% probability the outcome can be attributed to the intervention).
- Effect size: the degree of difference between groups or conditions (practical significance)

## Basic Definitions (Boudah, 2011)

- Unit of analysis: the focus of the data analysis; it can be on individual performance, class performance, or school performance.
- Unit of analysis should match the unit of assignment.

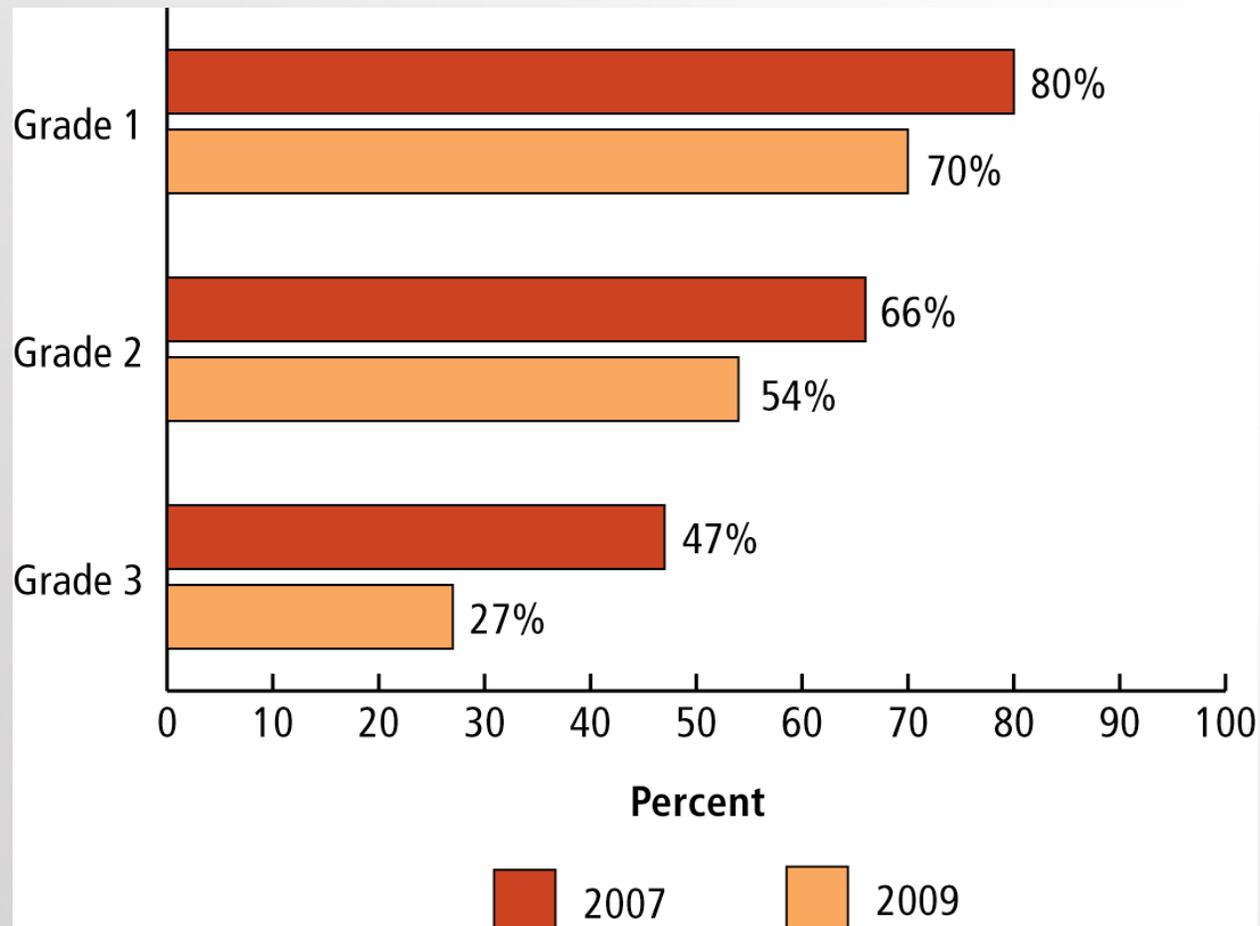
# Results: Interventions

- Descriptive Statistics
- Inferential Statistics
  - Statistically significant difference between experimental and control groups

# DESCRIPTIVE STATISTICS

# Change in zero scores

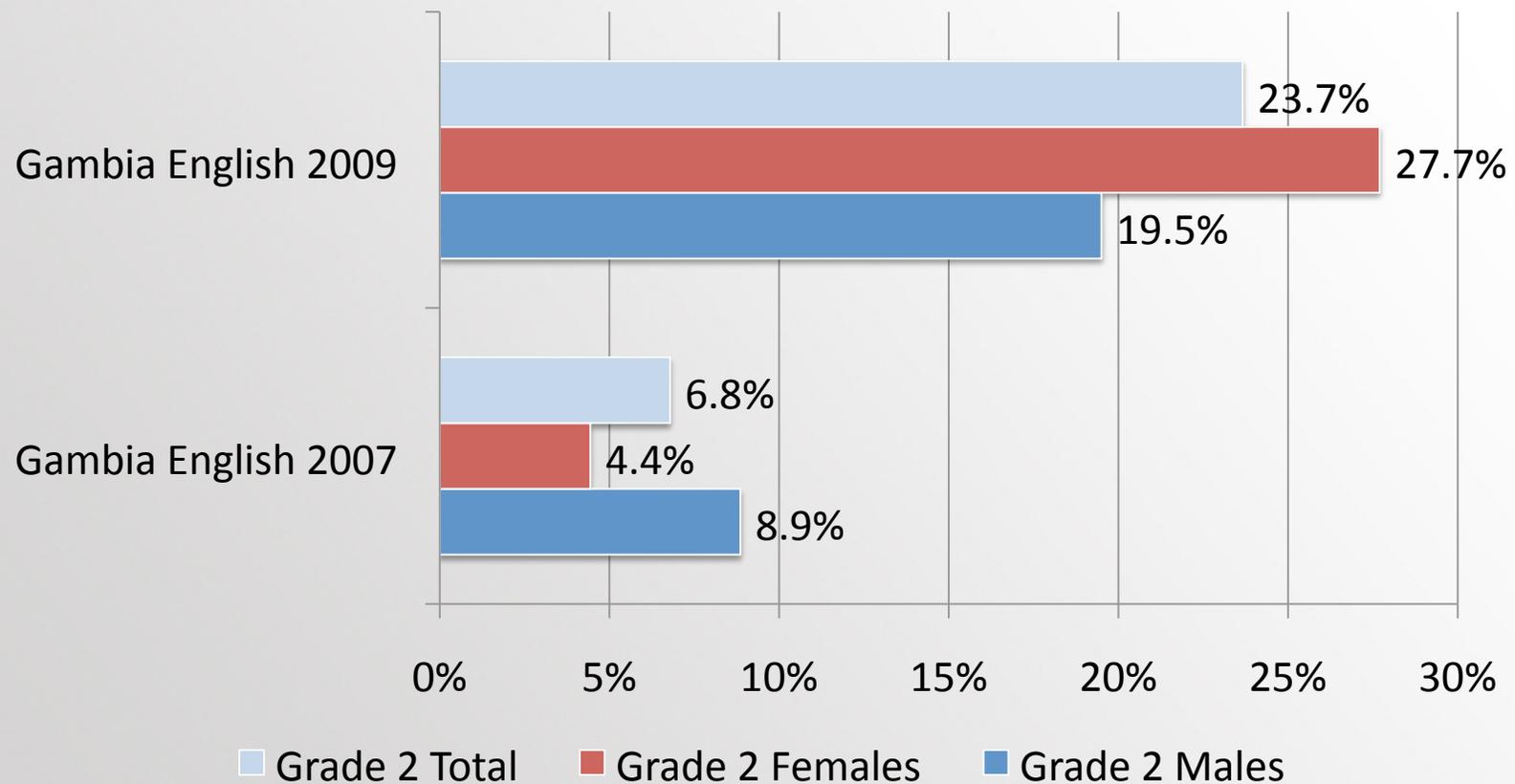
Percentage of Students Who Could not Read a Single Word, 2007 and 2009



Source: Sprenger-Charolles, 2008; Ministry of Basic and Secondary Education, 2009.

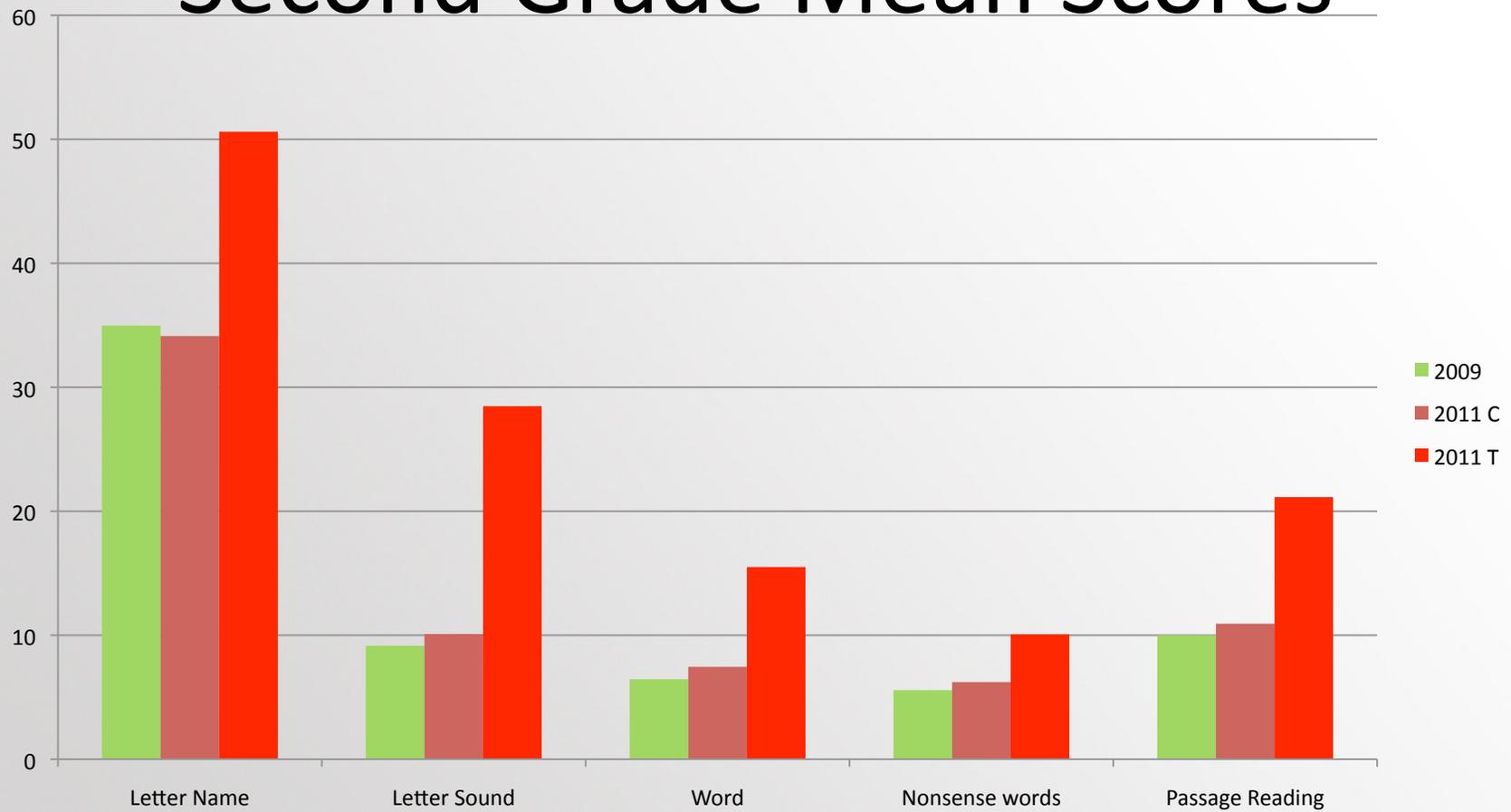
# Change: Percent meeting benchmark

Percentage of Grade 2 Students Reading with at least 80% Comprehension

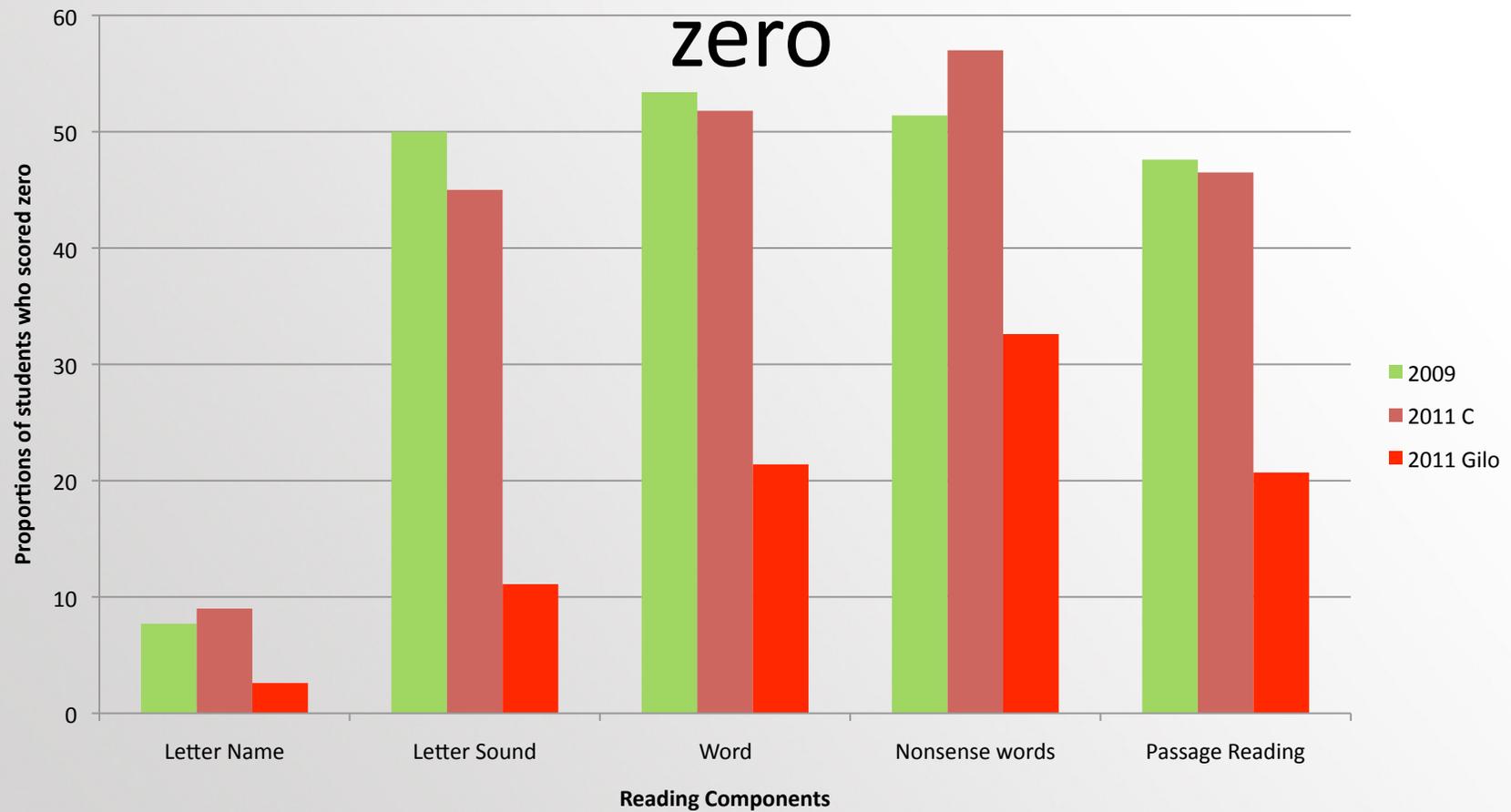


Source: Sprenger-Charolles, 2008; Ministry of Basic and Secondary Education, 2009.

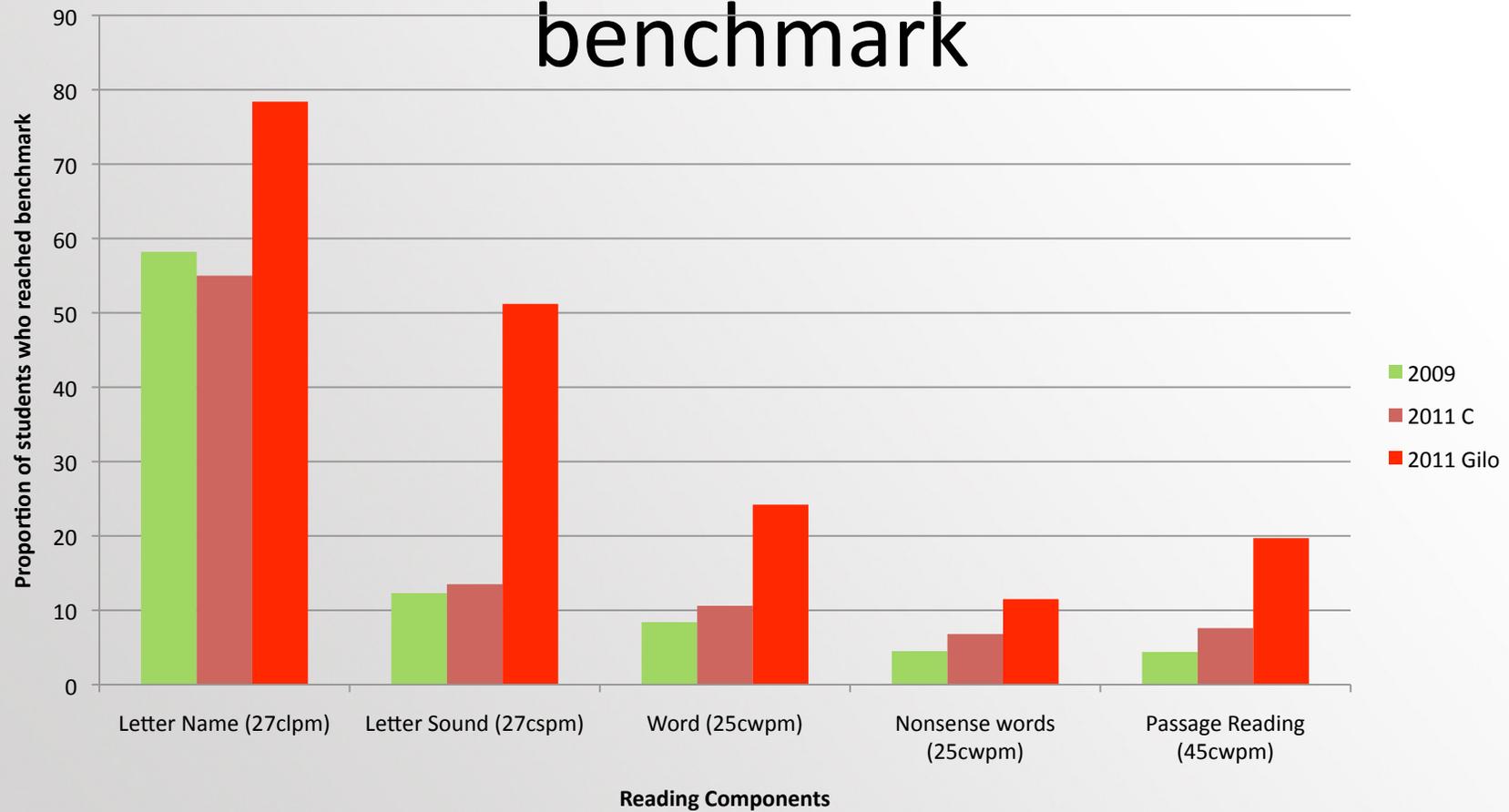
# Second Grade Mean Scores



# Proportion of students who scored

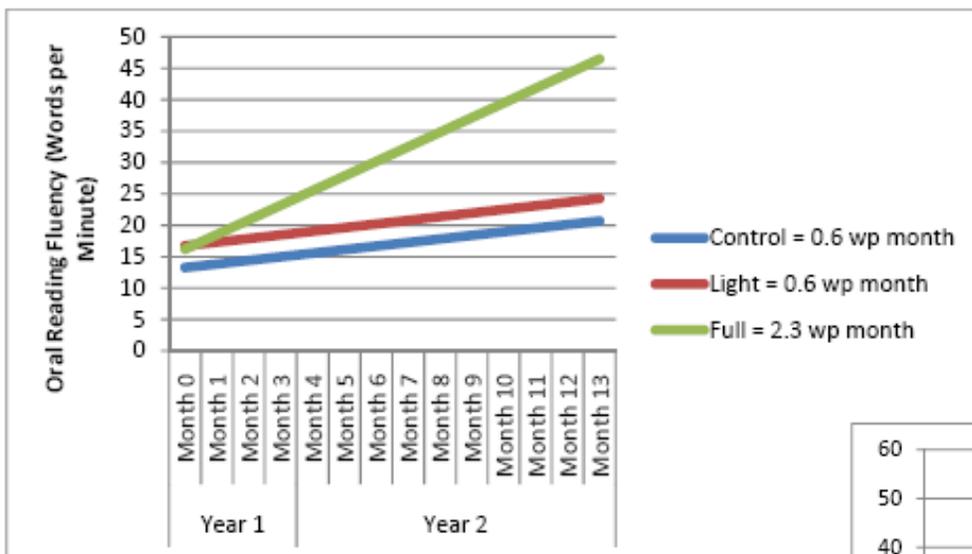


# Proportion of students who met benchmark

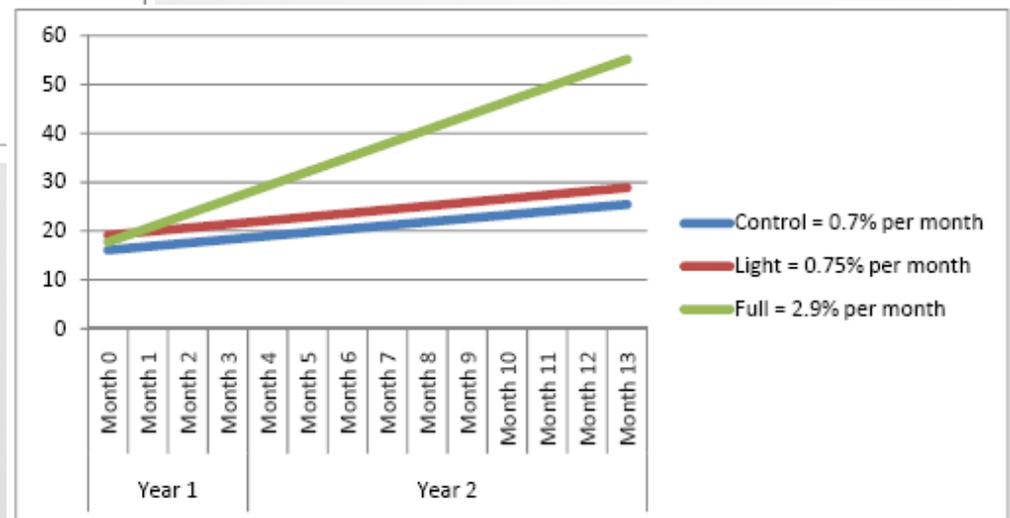


# Change: Using slope

Rate of Improvement in Treatment and Control Schools:  
Oral Reading Fluency



Rate of Improvement in Treatment and Control Schools:  
Comprehension



Source: End of Grade 2 Results. Hasbrouck and Tindal, (2006); Piper (forthcoming).

## Quick quiz

- What would you rather see, 100% growth or 400% growth?
- It depends.
- ORF score from 10  $\longrightarrow$  20
- ORF score from 2  $\longrightarrow$  8

# INFERENCEAL STATISTICS

# Inferential Statistics

- Are used to determine whether there is a statistically significant difference between groups on outcome measures.

# Effect Sizes

- Usually only calculated for comparisons with a statistically significant difference
- Group effect sizes
  - Program posttest mean minus control posttest mean divided by pooled posttest SD (Hedges  $g$ )

- Questions????
- Comments.

# Exercises



**USAID**  
FROM THE AMERICAN PEOPLE



World Change Starts  
with Educated Children.®

EdData II  
Education Data for Decision Making

# Using Results for Improvement and Policy Dialogue

CIES 2012, April 22

April 2012

Prepared by Marcia Davidson, Room to Read; and  
Amber Gove, RTI International  
RTI International, Research Triangle Park, North Carolina, USA

## About the presentation

- This presentation was prepared for use in a one-day workshop titled "Understanding the Early Grade Reading and Math Assessments: From Development to Data Analysis," led by RTI International at the annual conference of the Comparative and International Education Society (CIES) in San Juan, Puerto Rico, April 22, 2012.
- The USAID EdData II project (Task 1, EHC-E-01-04-00004-00) sponsored the costs of workshop development and implementation. EdData II is led by RTI International.

## Outline

- Policy dialogue and getting to yes
- Example policy/strategy changes
- Case study exercises: Liberia
- Resources

3

## Policy dialogue and getting to yes

## Policy dialogue and getting to yes

- Brilliant study or data collection does not always translate into action
- Theory of change
- Think global, act local
- Build from the bottom up
- Understand key actors and their motivations

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## Policy dialogue and getting to yes (cont'd)



6

## Policy dialogue and getting to yes (cont'd)

<b>Audience</b>	<b>Values</b>
<b>Barriers</b>	<b>Ask</b>

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**Example policy/strategy changes**

## Example policy changes

- Peru: National debate leading to presidential pledge to have all children reading by end of grade 2
- The Gambia: Revamped approaches to teacher professional development and creation of local language pilot (5 languages)
- Mali: Renewed focus on teacher quality and development of instructional materials in local languages

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## Example policy changes (cont'd)

- Liberia: Pilot program under expansion to more than 2,000 schools with Ministry of Education (MOE) and USAID support
- Ethiopia: Interest from MOE in improvement of early reading instruction, textbooks, and curriculum following results of large-scale national assessment
- Malawi: Redesign of textbooks and instructional approaches to reflect reading research best practice and linguistic characteristics of Chichewa

10

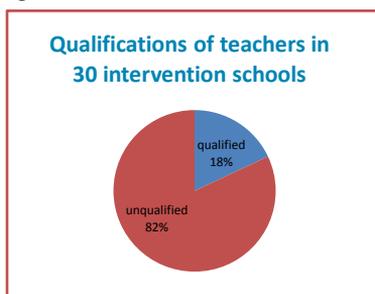
## Case study exercises: Liberia

### One country's context

- The following provides basic data on the primary school context in Liberia.
- Consider this information as you prepare for several group activities using EGRA data to inform policy dialogue with the goal of improving children's reading skills.

## Facts about education in Liberia

- 47% of teachers do not have a West African Examinations Council (WAEC) certificate
- 82% of teachers are unqualified
- 90% of school principals do not have a WAEC certificate
- There are over 16 local languages and the language of instruction is English
- More than 35% of primary teachers are not receiving any salary
- Few textbooks, few basic learning materials
- Large class sizes



Out of 154 teachers sitting grade 6 tests:

- 8 passed math test
- 5 passed English test

Out of 23 qualified teachers:

- 6 passed maths
- 2 passed English test

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## Using results for improvement and policy dialogue

### Issues

- EGRA baseline data in Liberia
- What do we know about the context?
  - Teacher qualifications
  - Class size
  - Availability of books and other learning materials
  - Time spent teaching reading
  - Quality of reading instruction
  - Sources of support to schools

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## Using results for improvement and policy dialogue (cont'd)

- EGRA is a general outcome measure, or GOM—not a mastery test. Advantages of using a GOM: reflects progress toward a goal
- EGRA is curriculum neutral: If a student is making progress in learning to read in any program, it will be reflected in EGRA scores

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## Group Task I

GROUPS of 8-10

Link the baseline data to one of the 5 key areas below and develop a strong argument for investing funds to improve these areas:

- **Texts.** Textbook and reading book scarcity in all languages.
- **Time.** Student and teacher attendance and poor use of available classroom time.
- **Teach.** Low teacher qualifications, lack of instructional support, and lack of knowledge about how to teach reading.
- **Test.** Support for international, national, civil society, and/or classroom-based assessments.
- **Tongue.** Instruction should take into account the mother tongue of the child.

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## Group Task I (cont'd)

- Identify a presenter and an official you want to persuade
- Using the data on the following slide, develop a presentation to convince the audience according to your group number:
  - Donor official (Group 1)
  - Ministry of Education (Group 2)
  - Director of national teachers union (Group 3)
  - Private sector representative (Group 4)
- 15 minutes to prepare the presentation
- 10 minutes to present

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## Assessment data for use in presentations

<i>Baseline EGRA Scores: Grades 2-3 combined</i>	
Grades 2-3 baseline letter-naming fluency scores: Mean correct letters named in one minute	61.2
Grades 2-3 baseline familiar word reading fluency scores: Mean correct words read in one minute	9.3
Grades 2-3 baseline unfamiliar word reading fluency scores: Mean correct words read in one minute	2.3
Grades 2-3 baseline oral reading fluency score: Mean correct words read in one minute	19.6
Grades 2-3 baseline reading comprehension score: Mean percent of questions answered correctly	1.3 / 5 total

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## Social mobilization through community reading report cards: Group Task II

Group exercise (10 minutes):

1. Using the report card data on the next slide, plan a presentation to the district/regional Ministry of Education to discuss whether this school is meeting expectations for progress in reading.
2. Consider the classroom and the individual child's scores:
  - Is the teacher an effective reading teacher?
  - What recommendations would you make to the teacher?

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## Report card data for use in presentations

Supplementary reading report card for parents, grade 2

	Term 1		Term 2		Term 4		Term 6 / end of year	
<b>Your child</b>	<b>Goal</b>	<b>Score</b>	<b>Goal</b>	<b>Score</b>	<b>Goal</b>	<b>Score</b>	<b>Goal</b>	<b>Score</b>
Letter-reading (letters per minute)	30	21	50	25	70	34	80	50
Story-reading (words per minute)	10	7	20	14	30	18	40	38
Story understanding	5/5	0/5	5/5	2/5	5/5	2/5	5/5	3/5
<b>School average</b>	<b>Goal</b>	<b>Score</b>	<b>Goal</b>	<b>Score</b>	<b>Goal</b>	<b>Score</b>	<b>Goal</b>	<b>Score</b>
Letter-reading (letters per minute)	30	30	50	52	70	71	80	81
Story-reading (words per minute)	10	11	20	23	30	33	40	44
Story understanding	5/5	3/5	5/5	3/5	5/5	4/5	5/5	4/5

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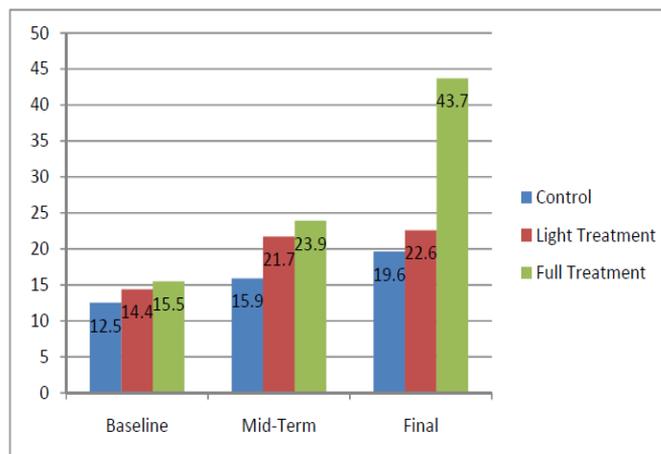
### Group Task III: Policy dialogue on baseline–endline assessment

- If the intervention works:
  - What are the policy dialogue priorities?
  - What are the next stage goals?
  - Where should resources be focused to support the continued effort?
  - Who (institutions/organizations/individuals) needs to own the success and the effort?
- 10-minute discussion in groups
  - 5 minutes per group to report out

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### Sample graph of treatment impact

Figure 22: Bar Chart Showing the Impact of Full (green) and Light (red) Treatment on Oral Reading Fluency



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## **Policy dialogue at the national level: Continuing the conversation**

- In country X, a new reading course was developed and taught at all teacher training institutes
- Local reading competitions were held that identified schools as centers of excellence
- Radio shows were broadcast with tips for teachers and parents
- A national reading campaign was initiated in collaboration with donors, both local and international

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## **Setting targets for student achievement**

- Endline data can provide important information on how to set targets/goals for student reading achievement.
- The next slide provides a radial plot demonstrating scores obtained at the 90th percentile for students in a country.

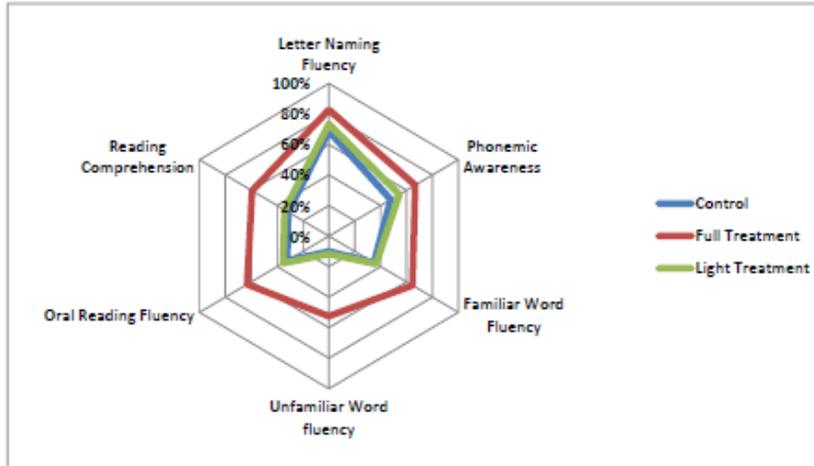
### **QUESTIONS:**

- How might these scores be considered in planning national targets?
- What are important cautions/concerns that need to be considered?

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## Sample radial plot of treatment impacts

Figure 20: 90th Percentile of Liberian Benchmarks, Compared to Treatment Groups



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Resources

## Additional reading resources: Top 10

1. Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, Massachusetts: MIT Press.  
<http://mitpress.mit.edu/catalog/item/default.asp?tid=9063&ttype=2>
2. Chabbott, C. (2006). *Accelerating early grades reading in high priority EFA countries: A desk review*. <http://www.equip123.net/docs/E1-EGRinEFACountriesDeskStudy.pdf>
3. National Institute of Child Health and Human Development [US]. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction: Reports of the subgroups* (NIH Publication No. 00-4754). <http://www.nationalreadingpanel.org/Publications/summary.htm>
4. Moats, L. (1999). *Teaching reading IS rocket science: What expert teachers of reading should know and be able to do*. Washington, DC: American Federation of Teachers. <http://www.aft.org/pubs-reports/downloads/teachers/rocketsci.pdf>

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## Additional reading resources: Top 10 (continued)

5. Hirsch, E. D., Jr. (2003). Reading comprehension requires knowledge: Of words and the world. *American Educator* (Spring), 1–44.  
[http://www.aft.org/pubs-reports/american\\_educator/spring2003/AE\\_SPRNG.pdf](http://www.aft.org/pubs-reports/american_educator/spring2003/AE_SPRNG.pdf)
6. Abadzi, H. (2006). *Efficient learning for the poor*. Washington, DC: The World Bank.  
[http://www.worldbankinfoshop.org/ecommerce/catalog/product?item\\_id=5784103](http://www.worldbankinfoshop.org/ecommerce/catalog/product?item_id=5784103)
7. Snow, C. E., Burns, M. S., & Griffin, P. (Eds.). (1998). *Preventing reading difficulties in young children*. Washington, DC: Committee on the Prevention of Reading Difficulties in Young Children and National Academy Press.  
<http://www.nap.edu/catalog/6023.html>
8. Neuman, S. B., & Dickinson, D. K. (Eds.). (2001). *Handbook of early literacy research* and Dickinson, D. K., & Neuman, S. B. (Eds.). (2006). *Handbook of early literacy research, Vol. 2*. New York: The Guilford Press.

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## Additional reading resources: Top 10 (continued)

9. Gove., A., & Cvelich, P. (2011). *Early reading: Igniting education for all. A report by the Early Grade Learning Community of Practice* (Rev. ed). Research Triangle Park, North Carolina: RTI International.  
<http://www.rti.org/pubs/early-reading-report-revised.pdf>
10. Gove, A., & Wetterberg, A. (Eds.). (2011). *Early grade reading assessments: Application and interventions for early literacy*. Research Triangle Park, North Carolina: RTI Press. <http://www.rti.org/publications/rtipress.cfm?pubid=17752>

Contact information: Amber Gove, [agove@rti.org](mailto:agove@rti.org)

Instruments and resources: EdData II project website, [www.eddataglobal.org](http://www.eddataglobal.org)

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## Additional math resources: Top 10

1. Mathematics Learning Study Committee, [U.S.] National Research Council. (2001). *Adding it up: Helping children learn mathematics*. Washington, DC: National Academies Press.  
[http://www.nap.edu/catalog.php?record\\_id=9822#toc](http://www.nap.edu/catalog.php?record_id=9822#toc)
2. Mathematics Learning Study Committee, [U.S.] National Research Council. (2005). *How students learn: Mathematics in the classroom*. Washington, DC: National Academies Press.  
[http://www.nap.edu/catalog.php?record\\_id=11101](http://www.nap.edu/catalog.php?record_id=11101)
3. U.S. Department of Education. (2008). *Foundations for success: The final report of the National Mathematics Advisory Panel*. Washington, DC: U.S. Department of Education.  
<http://www2.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf>

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## Additional math resources: Top 10 (continued)

4. Dehaene, S. (1997). *The number sense: How the mind creates mathematics*. New York: Oxford University Press.
5. [U.S.] National Council of Teachers of Mathematics (NCTM). (2000). *Principles and standards for school mathematics*. Reston, Virginia: NCTM.
6. Kilpatrick, J., Martin, W. G., & Schifter, D. (Eds.). (2003). *A research companion to principles and standards for school mathematics*. Reston, Virginia: National Council of Teachers of Mathematics.
7. Lester, F. K. (Ed.). (2007). *Second handbook of research on mathematics teaching and learning*. Reston, Virginia: National Council of Teachers of Mathematics.
8. Bishop, A. J. (Chief Ed.). (1996 and 2003). *International handbook of mathematics education and Second international handbook of mathematics education*. Dordrecht, Holland: Kluwer Academic Publishers.

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## Additional math resources: Top 10 (continued)

9. English, L. D. (Chief Ed.). (2002). *Handbook of international research on mathematics education*. Mahwah, New Jersey: Lawrence Erlbaum Associates; AND (2009). *Handbook of international research on mathematics education* (2nd ed.). New York: Routledge.
10. Clements, D. H., Sarama, J., & DiBiase, A.-M. (2004). *Engaging young children in mathematics: Standards for early childhood mathematics education*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Contact information: [wralaingita@rti.org](mailto:wralaingita@rti.org)

Instruments and resources: EdData II project website, [www.eddataglobal.org](http://www.eddataglobal.org)

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