Numeracy Boost: Strengthening the foundation of early grades math

Numeracy for Development Community of Practice
November 7, 2012

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Save the Children®
Presentation overview

Why numeracy?

What is Numeracy Boost?
  – Student assessment
  – Teacher training
  – Community action

Going forward
Literacy Boost

3 components:

*Student assessment*
- Phonemic awareness
- Letter Knowledge
- Fluency/Accuracy
- Vocabulary
- Comprehension

*Teacher Training*

*Community Action*
- Reading Buddies
- Reading Camps
- Reading Festivals
Literacy and numeracy gains

Average Math Scores (% correct)

- **Malawi Grade 2**: Literacy Boost 58%, Comparison 52%
- **Malawi Grade 4**: Literacy Boost 48%, Comparison 43%
- **Nepal Grade 2**: Literacy Boost 59%, Comparison 48%
Math assessment results 2

Average Math Score (% correct)

- Malawi Standard 2: 55%
- Malawi Standard 4: 46%
- Nepal Grade 2: 56%
- Bangladesh Grade 3: 48%
- Vietnam Grade 3: 57%
Stage 1-R&D

- In country focus group discussions
- Teacher knowledge surveys
- Local curriculum and math competencies analysis and comparison
- Expert workshop
- Analysis of the NCTM and CCSSM
Key Questions and Assumptions

Are there a range of math skills that students need to know?

Can teachers be taught to teach math?

Is math an innate skill?

Is it possible to develop a math toolkit that could be applied in a number of different contexts?
### Grade 1 Curriculum Focal Points

**Number and Operations and Algebra:** Developing understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts

Children develop strategies for adding and subtracting whole numbers on the basis of their earlier work with small numbers. They use a variety of models, including discrete objects, length-based models (e.g., lengths of connecting cubes), and number lines, to model “part-whole,” “adding to,” “taking away from,” and “comparing” situations to develop an understanding of the meanings of addition and subtraction and strategies to solve such arithmetic problems. Children understand the connections between counting and the operations of addition and subtraction (e.g., adding two is the same as “counting on” two). They use properties of addition (commutativity and associativity) to add whole numbers, and they create and use increasingly sophisticated strategies based on these properties (e.g., “making tens”) to solve addition and subtraction problems involving basic facts. By comparing a variety of solution strategies, children relate addition and subtraction as inverse operations.

**Number and Operations:** Developing an understanding of whole number relationships, including grouping in tens and ones

Children compare and order whole numbers (at least to 100) to develop an understanding of and solve problems involving the relative sizes of these numbers. They think of whole numbers between 10 and 100 in terms of groups of tens and ones (especially recognizing the numbers 11 to 19 as 1 group of ten and particular numbers of ones). They understand the sequential order of the counting numbers and their relative magnitudes and represent numbers on a number line.

**Geometry:** Composing and decomposing geometric shapes

Children compose and decompose plane and solid figures (e.g., by putting two congruent isosceles triangles together to make a rhombus), thus building an understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine figures, they recognize them from different perspectives and orientations, describe their geometric attributes and properties, and determine how they are alike and different, in the process developing a background for measurement and initial understandings of such properties as congruence and symmetry.

### Grade 2 Curriculum Focal Points

**Number and Operations:** Developing an understanding of the base-ten numeration system and place-value concepts

Children develop an understanding of the base-ten numeration system and place-value concepts (at least to 1000). Their understanding of base-ten numeration includes ideas of counting in units and multiples of hundreds, tens, and ones, as well as a grasp of number relationships, which they demonstrate in a variety of ways, including comparing and ordering numbers. They understand multidigit numbers in terms of place value, recognizing that place-value notation is a shorthand for the sums of multiples of powers of 10 (e.g., 853 as 8 hundreds + 5 tens + 3 ones).

**Number and Operations and Algebra:** Developing quick recall of addition facts and related subtraction facts and fluency with multidigit addition and subtraction

Children use their understanding of addition to develop quick recall of basic addition facts and related subtraction facts. They solve arithmetic problems by applying their understanding of models of addition and subtraction (such as combining or separating sets or using number lines), relationships and properties of number (such as place value), and properties of addition (commutativity and associativity). Children develop, discuss, and use efficient, accurate, and generalizable methods to add and subtract multidigit whole numbers. They select and apply appropriate methods to estimate sums and differences or calculate them mentally, depending on the context and numbers involved. They develop fluency with efficient procedures, including standard algorithms, for adding and subtracting whole numbers, understand why the procedures work (on the basis of place value and properties of operations), and use them to solve problems.

**Measurement:** Developing an understanding of linear measurement and facility in measuring lengths

Children develop an understanding of the meaning and processes of measurement, including such underlying concepts as partitioning (the mental activity of slicing the length of an object into equal-sized units) and transitivity (e.g., if object A is longer than object B and object B is longer than object C, then object A is longer than object C). They understand linear measure as an iteration of units and use rulers and other measurement tools with that understanding. They understand the need for equal-length units, the use of standard units of measure (centimeter and inch), and the inverse relationship between the size of a unit and the number of units used in a particular measurement (i.e., children recognize that the smaller the unit, the more iterations they need to cover a given length).
Core math content “should be addressed by students in the context of the mathematical processes of problem solving, reasoning and proof, communication, connections, and representation. Without facility with these critical processes, a student’s mathematical knowledge is likely to be fragile and limited in its usefulness.”

--NCTM Standards for School Mathematics, 2012
Stage 2 - Defining Toolkit

• 3 pronged approach
• Focus on the early grades
  – Number and Operations
  – Geometry
  – Measurement
• Building math knowledge through activities and discussion
Numeracy Boost is...?

Students in grades 1 and 2

Teachers in 15 schools

The entire community!
Part 15: Measurement & Time

Say: Here are four sticks (give the four sticks to the child). I'm going to ask you some questions about them.

Note: A check is any method where the child checked the length of the stick against another stick or another object to measure the stick.

15.1 Which stick is the shortest? (student demonstrated a check ___)
15.2 Which stick is the longest? (student demonstrated a check ____)
15.3 This is the longest stick. Can you guess how long it is in centimeters?
15.4 Can you measure how long the longest stick is in centimeters? (student correctly used the ruler ____)

Grade 2

Counting, one to one correspondence, operations, word problems, identifying shapes, measurement

‘Authentic’ assessment section

Electronic
Teacher Training

“This training has helped me to open up to using a variety of methods in which we can illustrate and explain concepts.”

– MoE Math Trainer, TOT in Malawi
“Children need both explicit and direct instruction as well as time to explore, play and connect math to the real world.”

(Ginsberg, Lee and Boyd, 2008)
Some conclusions

- All children have an innate ability to count, classify and make connections
- Teachers are critical in supporting this development
- Math learning can be facilitated by well trained teachers
- Allowing students to create their own math knowledge is crucial
Moving forward

Testing implementation model

Developing modules for upper grades

Developing additional community action materials

Working and engaging with MoE
Thank you!

For questions please contact: slutfeali@savechildren.org