Montessori Schools of Massachusetts
January 10, 2015

Taking another Look at Montessori Math. Are We Living Up To Expectations?

Cialluz's Story

My personal story about Mathematics and Montessori

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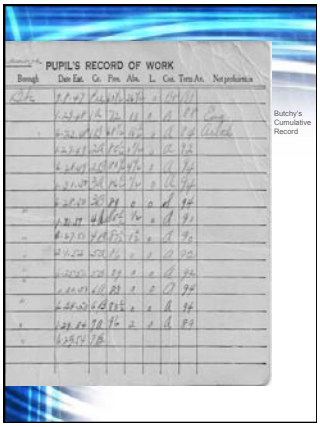
Brooklyn and Mathematics Learning

"Butchy" boy in Brooklyn

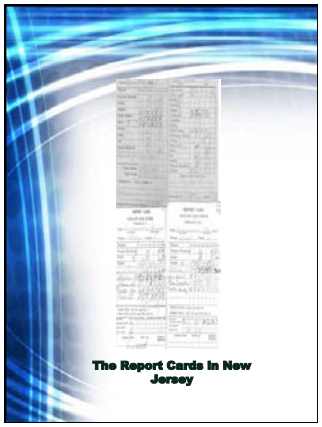
Brooklyn 1946

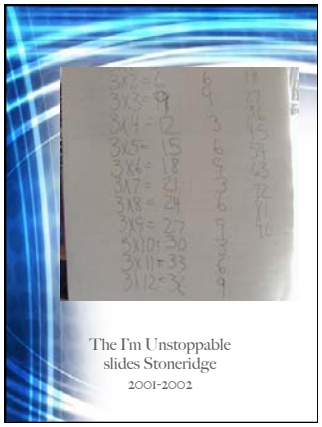
Butchy
Cool Dude
in Brooklyn

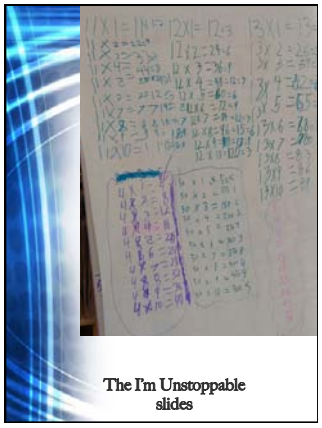


Butchy's
Cumulative
Record

Charley in Vineland NJ


The Report Cards in New Jersey


The I'm Unstoppable slides Stoneridge
2001-2002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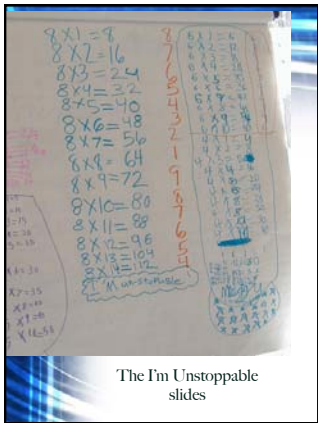

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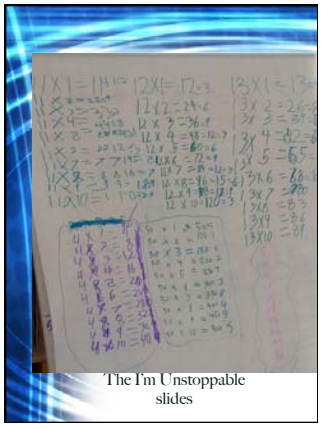
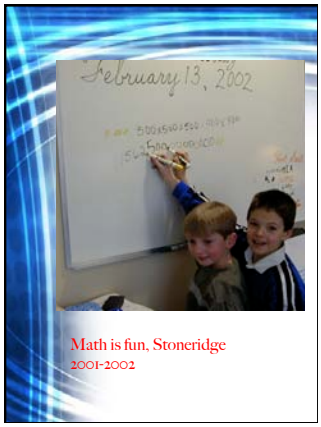


The I'm Unstoppable slides

SO, WHAT HAPPENED?

The students began to choose math that was more and more difficult. On the last day of school in June 2002, Meg insisted that I show her how to transition from division with racks and tubes to abstract division with standard notation.



Math is fun, Stoneridge
2001-2002

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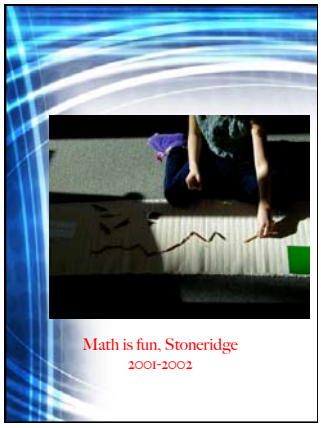

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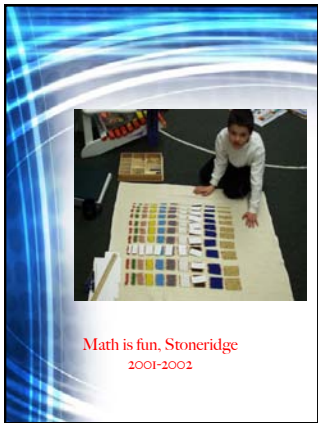
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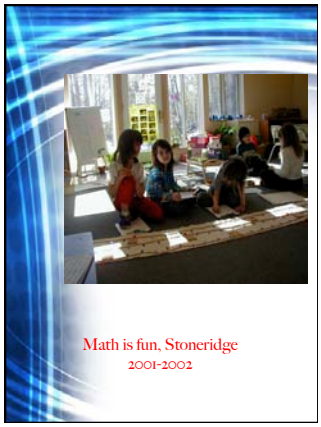
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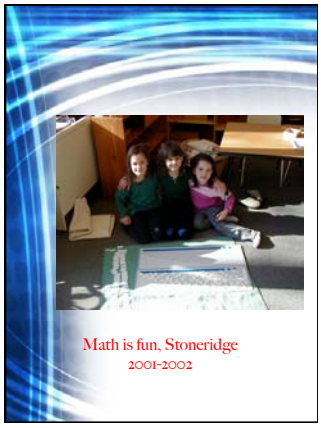
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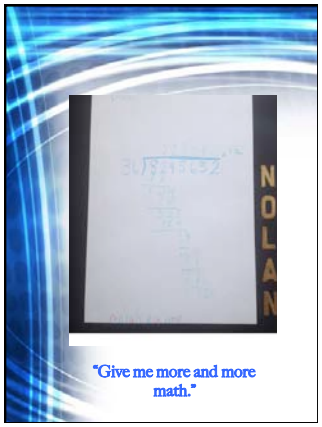
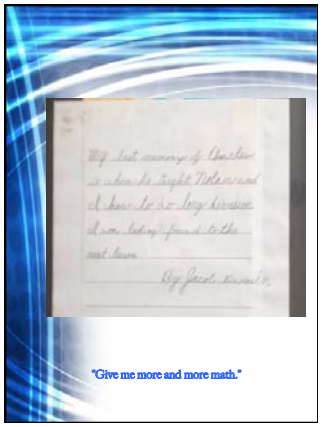
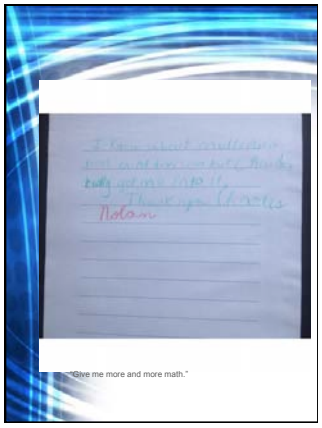

NOLAN
"Give me more and more math."


"Give me more and more math."


Nolan
"Give me more and more math."

WHAT DID I LEARN FROM THIS?

Are we demanding enough of ourselves in helping children establish a fundamental orientation toward mathematics? What did Maria Montessori expect?

I began to look for more options to include with the Montessori approach to Mathematics.

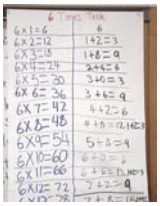
THIS IS, AMONG OTHER THINGS, WHAT I DISCOVERED.

1. June Cotter-Variations and Extensions junecotter@alabacus.com
2. The Numbers Guy-Mathematical Mind Research
3. Marilyn Burns-Thinking Creatively about Math
4. Cathy O'Connor-"Classroom Discussion"
5. Elham Kazemi-Discourse That Promotes Conceptual Understanding
6. Greg Tang http://gregtangmath.com/play?game=breakapart

The Years at Tobin Montessori School

- Accountable Talk
- Common Core-Standard mathema Practice
- Professi Developr
- Coachir

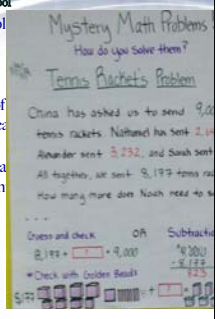
Child Experimenting With Math



5 Year Old Child Explains Math Thinking

The Years at Tobin Montessori School

- Accountable Talk
- Common Core- Standards of Mathematical Practice
- Professional Development
- Coaching



Common Core Standards of Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Other Discoveries

- The Equal Sign
- Cardinality
- Properties
- Composing and Decomposing
- Unknowns

The Equal Sign

In Teachable Moments in Math the author suggests a classroom exchange that is typical. "Express the number 12 in a variety of ways."

One child says 6 + 6

One says 10 + 2

One says 2+2+2+2+2+2

Another says 5+5−2

Yet another says 11+1

- The next day she writes 12 = ___+___. The children display confusion, with most children asking her to put the 12 on the other side.

The Equal Sign

- Most students interpret the + sign to mean "the answer is"
- 5+6= ____.
- However the meaning is much more robust: it means "it is the same as" and expresses a numerical relationship. When students who recognize the = sign
- As a relational sign, it lays the foundation for future mathematical learning. With this understanding, statements like 8=3+ ___ and 4+2=5 + ___ and later x + 5= 11 – x make sense and open the door to new strategies for solving complex problems.

• Cardinality

Cardinality

Understanding the the relationship between numbers and quantities; connecting counting to cardinality.
K.C.C.B.4

- Children can "count" objects by mimicking the counting actions they've seen others doing long before they understand that counting tells us important information. We don't know that they have achieved understanding counting until we can hear them say after counting seven objects and responding to a prompt, "how many objects are there," and they respond "seven" that they understand counting.

• Properties

Properties

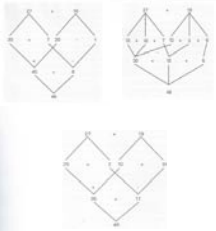
Apply properties of operations as strategies to add and subtract. This skill appears in several 1st and 2nd grade standards.

- Using the commutative and associative laws , young children can make insightful calculation decisions that will simplify computation and reduce errors.
- For example, when a student is faced with a problem like 6 + 7 + 4 = ___ , a clever calculation move would be to rearrange the numbers by applying the commutative property (7 + 6 + 4)
- And regroup by applying the associative property (7 +(6 + 4)) to create a new problem that's much easier to solve.
- However, teachers need to emphasize the concepts, not the terminology

Composing and Decomposing

- To compose means to "create or build" and to decompose means "to break down." The fact that these two verbs occur in six of the Common Core standards and across *three* mathematical domains in the K-2 standards is a strong indications of their importance
- Consider the problem 27 + 19 = ___. A student who can compose and decompose numbers could solve this problem by breaking the numbers apart and putting them back together in convenient and clever ways.

Composing and Decomposing Numbers

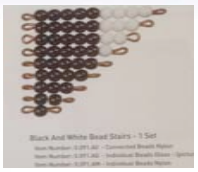


Unknowns

Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions...

- Unknowns
  - Traditionally, the term unknowns is associated with variables in algebra, but that's not the intent of this standard. The point here is to endure that students go beyond solving the traditional, straightforward word problems so often found in text books.
  - For example: Consider this problem:
  - Dina had 12 marbles. She gave her cousin 7 marbles. How many marbles does Dina Have left?
  - Shift 1:Dina had 12 marbles. She gave her cousin some marbles. Now Dina has 5 marbles. How many marbles did Dina give her cousin?
  - Shift 2: Dina had some marbles. She gave her cousin 7 marbles. Now Dina has 5 marbles left in her bag. How many marbles did Dina have at the start?

Subitizing



What is Subitizing? It is "instantly seeing how many." From a Latin word meaning suddenly, subitizing is the direct apprehension of the numerosity of a group.