A Resource to Help Educators Understand and Implement Each of the Math Common Core Instructional Shifts

One Shift at a Time

Created by the Jefferson-Lewis-Hamilton-Herkimer-Oneida BOCES Race to the Top Network Team
How To Read This Resource:

There is one page for each of the six Common Core Instructional Shifts in Math. There is also a page containing Resources to help you infuse these shifts. Each page is organized similarly.

On each page you will find:

- The Instructional Shift explained in official, NYS language.
- A two-columned chart containing, specifically, what the student does to address the shift and what the teacher does.
- On either side of the chart, my notes. These contain additional comments and/or information to explain or elaborate upon what is contained within the chart.
- Below the chart, diagrams, tables, key points, and other information illustrative of the shift.
- Toward the bottom of each page, the steps to take in order to infuse this shift.

Please contact me with any questions or comments

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## Steps Toward Infusing Shift 1

### Task 1: Cross-reference High Leverage Concepts in grade level standards and Math Content Emphases

1. Locate in your curriculum where each standard is taught. Label in the curriculum the standard and priority level; label in the standards where it is found in the curriculum.
2. All lessons that don’t tie to a standard: cross out.
3. All standards that don’t tie to a lesson: begin preparing lessons.

### Task 2: Excise and Label

- **What the Student Does...**
  - Spend more time thinking and working on fewer concepts.
  - Being able to understand concepts as well as processes (algorithms).
- **What the Teacher Does...**
  - Make conscious decisions about what to excise from the curriculum and what to focus.
  - Pay more attention to high leverage content and invest the appropriate time for all students to learn before moving onto the next topic.
  - Think about how the concepts connect to one another.
  - Build knowledge, fluency and understanding of why and how we do certain math concepts.

### Shift 1: Focus

<table>
<thead>
<tr>
<th>Shift 1</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teachers use the power of the eraser and significantly narrow and deepen the scope of how time and energy is spent in the math classroom. They do so in order to focus deeply on only the concepts that are prioritized in the standards so that students reach strong foundational knowledge and deep conceptual understanding and are able to transfer mathematical skills and understanding across concepts and grades.</td>
</tr>
</tbody>
</table>

### K-2: +/−; 3-5: ×/÷, fractions...

**Processes come after conceptual understanding**

**Cross out non-core material**

**Refer to Math Emphases to prioritize**

**How can less-prioritized material connect to priorities?**

**Keep learning!!**

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As a first step in implementing the Common Core Standards for Mathematics, focus strongly where the standards focus.

**Where To Focus: Math Shifts, Key Fluencies, and Major Work of Grade.**
Mathematics consists of pieces that make sense; they are not just independent manipulation/skills to be practiced and memorized – as perceived by many students. These individual pieces progress through different grades (in organized structures we called “flows”) and can/should be unified together into a coherent whole.

- Jason Zimba, Bill McCallum

### Steps Toward Infusing Shift 2

1. **Vertically align standards** – consider referencing Jason Zimba’s Wiring Program, as it connects the standards through the grade levels: [http://commoncoretools.me/2012/06/09/jason-zimbas-wiring-diagram/](http://commoncoretools.me/2012/06/09/jason-zimbas-wiring-diagram/)

2. Consider how material is taught the year before and the year after, ensuring tricks students learn aren’t going to lead to misconceptions later on (e.g. “always subtract the smaller number from the larger number”, and “when you multiply, you always get a bigger number.”)

3. **Study the Progressions Documents for the Common Core Math Standards:** [http://ime.math.arizona.edu/progressions/](http://ime.math.arizona.edu/progressions/)
Students are expected to have speed and accuracy with simple calculations; teachers structure class time and/or homework time for students to memorize, through repetition, core functions (found in the attached list of fluencies) such as multiplication tables so that they are more able to understand and manipulate more complex concepts.

### Steps Toward Infusing Shift 3

1. Develop mental strategies first that encourage flexible thinking:
   a. Prepare opportunities for students to create and use invented strategies for computation through tasks and questioning
   b. Prepare opportunities for students to learn derived fact strategies for fact knowledge from which to transition
   c. Determining your in-class and out-of-class structure for “time spent practicing” for students
   d. Assess student fluency with timed assessments every 2-3 weeks

### Math Common Core Learning Standards – Infusing Shift 3

<table>
<thead>
<tr>
<th>Grade</th>
<th>Required Fluency</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>Add/subtract within 5</td>
</tr>
<tr>
<td>1</td>
<td>Add/subtract within 10</td>
</tr>
<tr>
<td>2</td>
<td>Add/subtract within 20</td>
</tr>
<tr>
<td></td>
<td>Add/subtract within 100 (pencil and paper)</td>
</tr>
<tr>
<td>3</td>
<td>Multiply/divide within 100</td>
</tr>
<tr>
<td>4</td>
<td>Add/subtract within 1,000,000</td>
</tr>
<tr>
<td>5</td>
<td>Multi-digit multiplication</td>
</tr>
<tr>
<td>6</td>
<td>Multi-digit division</td>
</tr>
<tr>
<td>7</td>
<td>Multi-digit decimal operations</td>
</tr>
<tr>
<td>8</td>
<td>Solve $px + q = r$, $p(x + q) = r$</td>
</tr>
<tr>
<td></td>
<td>Solve simple $2 \times 2$ systems by inspection</td>
</tr>
</tbody>
</table>

The Standards call for speed and accuracy in calculation. Teachers structure class time and/or homework time for students to practice core functions such as single-digit multiplication so that students have access to more complex concepts and procedures.
Math Common Core Learning Standards – Infusing Shift 4

<table>
<thead>
<tr>
<th>Shift 4</th>
<th>Deep Understanding</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Teachers teach more than “how to get the answer” and instead support students’ ability to access concepts from a number of perspectives so that students are able to see math as more than a set of mnemonics or discrete procedures. Students demonstrate deep conceptual understanding of core math concepts by applying them to new situations, as well as writing and speaking about their understanding.</td>
</tr>
</tbody>
</table>

**Steps Toward Infusing Shift 4**

1. Become fluent with the **Standards of Mathematical Practice** – these should be addressed **DAILY**.

2. Review Progressions Documents [http://ime.math.arizona.edu/progressions/](http://ime.math.arizona.edu/progressions/)

3. Incorporate more problem-based, student centered activities (see right)
   a. Do my students know enough math to address the standard from which I chose this math objective?
      a. **BRIDGE THIS GAP** with other learning experiences as necessary
   b. Once task is chosen, how will my students approach this problem? (Do they have enough life experiences to address this? Have they built up their endurance to stick with the task?)

Adapted from *Teaching Student Centered Mathematics Grades K-3*, Van de Walle & Lovin, 2006

The Standards call for conceptual understanding of key concepts, such as place value and ratios. Teachers support students’ ability to access concepts from a number of perspectives so that students are able to see math as more than a set of mnemonics or discrete procedures.
**Math Common Core Learning Standards – Infusing Shift 5**

<table>
<thead>
<tr>
<th>Shift 5</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Students are expected to use math and choose the appropriate concept for application even when they are not prompted to do so. Teachers provide opportunities at all grade levels for students to apply math concepts in “real world” situations. Teachers in content areas outside of math, particularly science, ensure that students are using math – at all grade levels – to make meaning of and access content.</td>
</tr>
</tbody>
</table>

**Steps Toward Infusing Shift 5**

1. **Incorporate more student-centered problems into class time (see right).**

   **Note:** A problem is defined… as any task for which the students have no prescribed or memorized rules or methods, nor is there a perception by students that there is a specific correct solution method (Hiebert et al., 1997).

2. **Start with tasks that will take less time and build their “math task endurance” throughout the year.**

   Check out illustrativemathematics.org for task ideas by standard.

**What the Student Does…**

- Apply math in other content areas and situations, as relevant
- Choose the right math concept to solve a problem when not necessarily prompted to do so

**What the Teacher Does…**

- Apply math including areas where its not directly required (i.e. in science)
- Provide students with real world experiences and opportunities to apply what they have learned

**Before**

- Getting Ready
  - Get students mentally ready to work on the task.
  - Be sure all expectations for products are clear.

**During**

- Students Work
  - Let go!
  - Listen carefully.
  - Provide hints.
  - Observe and assess.

**After**

- Class Discourse
  - Accept student solutions without evaluation
  - Conduct discussion as students justify and evaluate results and methods.

The single most important principle for improving the teaching of mathematics is to **allow the subject of mathematics to be problematic for students** (Hiebert et al., 1996.)

The Standards call for students to use math flexibly for applications. Teachers provide opportunities for students to apply math in context. Teachers in content areas outside of math, particularly science, ensure that students are using math to make meaning of and access content.
Steps Toward Infusing Shift 6

1. Determine the most important procedures (i.e. fluency standards) and concepts
2. Adjust your lesson planning as needed to ensure you…
   a. address procedures daily through flexible number work and practice with procedures
   b. address concepts daily through problem solving/application:

   In major topics, pursue a rigorous level of **conceptual understanding**, procedural skill and **fluency**, and **application** with equal intensity.
Resources to Help Infuse the Common Core Shifts

Collections For All Shifts
• EngageNY’s video series
  • Shift 1: http://engageny.org/resource/common-core-in-mathematics-shift-1-
    %E2%80%93-focus/
• EngageNY’s Math Toolkit http://engageny.org/resource/math-toolkit/
• Tools for the Common Core Standards http://commoncoretools.me/
• The Hunt Institute
  • Video guide http://www.hunt-
  • Videos http://www.youtube.com/user/TheHuntInstitute

Shift 1 – Focus
• Math Content Emphases: http://engageny.org/wp-content/uploads/2012/03/nys-math-
    emphases-k-hs.pdf

Shift 2 – Coherence
• Jason Zimba’s Wiring Program: http://commoncoretools.me/2012/06/09/jason-
    zimbas-wiring-diagram/
• Progressions Documents for the Common Core Math Standards:
  http://ime.math.arizona.edu/progressions/

Shift 3 – Fluency
• Math Fact Fluency: How and Why We Teach for Flexible Thinking, Sam Strother

Shift 4 – Deep Understanding
• Progressions Documents for the Common Core Math Standards:
  http://ime.math.arizona.edu/progressions/
• The Van de Walle Professional Mathematics Series (Teaching Student Centered
  Mathematics, John A. Van de Walle, LouAnn H. Lovin)

Shift 5 – Application
• Illustrative Mathematics http://Illustrativemathematics.org
• Improving Mathematical Problem Solving in Grades 4 Through 8

Shift 6 – Dual Intensity
• See “Collections For All Shifts” at the top of this page

“With...clear and consistent academic standards, our nation is one step closer
to supporting effective teaching in every classroom, charting a path to
college and careers for all students, and developing the tools to help all
children stay motivated and engaged in their own education.”
- Bill Gates, Co-Chair, The Bill & Melinda Gates Foundation Foundation
INFUSING THE SHIFTS--

MATH

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