K - 12 Science Curriculum Alignment

March 22, 2016
Agenda

2. Five Step Process for Curriculum Review & Adoption
3. Preliminary Work
4. Screening and Planning
5. Teacher Input
6. Content Recommendation
7. Implementation Plan
Why Science?
NGSS and MA Framework
NGSS - Three Dimensions

- CROSSCUTTING CONCEPTS

- SCIENCE AND ENGINEERING PRACTICES
  Science and Engineering Practices describe what scientists do to investigate the natural world and what engineers do to design and build systems. The practices better explain and extend what is meant by “inquiry” in science and the range of cognitive, social, and physical practices that it requires. Students engage in practices to build, deepen, and apply their knowledge of core ideas and crosscutting concepts.

- DISCIPLINARY CORE IDEAS

MORE ABOUT 3D LEARNING
MA Science Framework

2016 Massachusetts Science and Technology/Engineering Standards

Pre-Kindergarten to Grade 8 and Introductory High School Courses

Adopted by the Massachusetts Board of Elementary and Secondary Education
January 26, 2016
How are New Standards Different?

- Integration of *disciplinary core ideas* (concepts) and *practices* (skills) that reflect the interconnected nature of science and engineering. Currently MA. STE standards focus primarily on content. The integration of rigorous concepts and practices reflects how science and engineering is applied and practiced everyday and is shown to enhance student learning of both.

- Preparation for post–secondary success in college and careers.

- Science and technology/engineering concepts and practices progress coherently from Pre-K to high school.

- Focus on deeper understanding and application of concepts.

- Each discipline is integrated in grade-by-grade *Performance Expectations* Pre-K to grade 8.

- *The STE standards are coordinated with the Commonwealth’s ELA and Mathematics standards.***

- [http://www.doe.mass.edu/stem/standards/StandardsDraft.pdf](http://www.doe.mass.edu/stem/standards/StandardsDraft.pdf)
Five Step Process for Curriculum Review & Alignment
Five Step Process for Curriculum Review & Adoption

1. Preliminary Work
2. Screening and Planning
3. Teacher Input
4. Content Recommendation
5. Implementation Plan
Process for Curriculum Review & Adoption

- Works for any subject area
- Would be adjusted depending on nature of subject area
- All subjects aligned with MA Frameworks
- Need to work with K - 12 subject area alignment
Step #1: Preliminary Work
Step 1: Goals

Align with the new Massachusetts Science Standards/NGSS

Articulate K – 12 vertical science alignment
Step 1: K - 12 Science Committee

**Elementary:** Diane Kablik (K – 5 Science Curriculum Specialist), Monica Woodman (Alcott, grade 1); Mary Gallagher (Thoreau, grade 3); Katie Lyons (Willard, grade 5);

**Middle School:** Sharon Moss (CMS, grade 6 and dept. chair); Tara Fernandez-Davila (CMS, grade 7); Carrie Bjerke (CMS, grade 8); Doug Shattuck (CMS – Applied Tech);

**High School:** Michael Vela (CCHS, chemistry and dept. chair); Theresa Ruggiero (CCHS, Earth Science); Nora Murphy (CCHS – Biology); and Kevin Pennucci (CCHS, physics)

**District:** Kristen Herbert (Director of Teaching and Learning)
Step 1: Meetings

Meeting Times:
Meeting 1 (Wed, April 8, 3 pm - 4 pm)
Meeting 2 (Wed, May 6, 3 - 4 pm)
Meeting 3 (Wed, July 1, 10 am - 2 pm)
Meeting 4 (Wed, July 8, 10 am - 2 pm)
Meeting 5 (Tues, October 27, 2015, 1 – 3:30)
Meeting 6 (Tues, January 26, 2016, 1 – 3:30)
Step #2:

Screening and Planning
Training on NGSS

Training by Dr. Mia Dubosarsky (WPI)

Training on Science Practices
Asking questions and defining problems;
Developing and using models;
Planning and carrying out investigations;
Analyzing and interpreting data
Using mathematics and computational thinking
Constructing explanations (for science) and designing solutions (for engineering)
Engaging in argument from evidence
Obtaining, evaluating, and communicating information
Step #3

Teacher Input
Getting Baseline of Content Taught

Introductory (Honors/College Prep) Biology Draft Sequence 2016-17

First Semester

Unit I: Defining Life
The Biology Subdepartment will meet in March to entirely revise Unit 1. It will be grounded in ecology and incorporate themes of homeostasis, with emphasis on collecting, organizing, analyzing data and writing detailed evidence-based explanations.

HS-LS2 - emphasis on topics that complement middle school Ecology topics
Review HS standards with MS faculty to identify these - also see Unit 12 at end.
 HS-LS1-3 homeostasis/feedback
 HS-LS1-6 atoms and bonds, organic macromolecules (possibly, as part of nutrient cycling)
Science Committee Discussions

- Comparing what is currently taught to the NGSS and the MA Framework
- Deciding what to keep, what to discard, and what to tweak
Step #4: Decision on Which Content to Recommend
<table>
<thead>
<tr>
<th>Grade</th>
<th>Life Science</th>
<th>Earth and Space Science</th>
<th>Physical Science</th>
<th>Engineering</th>
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</thead>
<tbody>
<tr>
<td>Grade</td>
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<td></td>
<td>3. Inheritance and Variation of Traits: Life Cycles and Traits</td>
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<td>4. Earth's Systems: Processes that Shape the Earth</td>
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<td>3-5 Engineering</td>
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<td>4. Energy and Waves: Waves and Information</td>
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<tr>
<td>5</td>
<td>5. Matter and Energy in Organisms and Ecosystems</td>
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### Concord Middle School (Grades 6 - 8)
Standards & Content Selected by Committee

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<tbody>
<tr>
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<td>MS History of Earth</td>
<td>MS. Chemical Reactions</td>
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<td>MS. Earth's Systems</td>
<td>MS. Forces and Interactions</td>
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<td>MS. Natural Selection and Adaptations</td>
<td>MS. Weather and Climate</td>
<td>MS. Energy</td>
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<td>MS. Growth, Development, and Reproduction of Organisms</td>
<td>MS. Human Impacts</td>
<td>MS. Waves and Electromagnetic Radiation</td>
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<td>Concord Carlisle High School (9-12) Standards &amp; Content Selected by Committee</td>
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<td><strong>HS. Structure and Function</strong></td>
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<td><strong>HS. Engineering Design</strong></td>
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<td><strong>HS. Natural Selection and Evolution</strong></td>
<td><strong>HS. Human Sustainability</strong></td>
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<td><strong>MS. Waves and Electromagnetic Radiation</strong></td>
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Step #5: Implementation Plan
Implementation Plan for 2016-2017 School Year
(Created January - August 2016)

+ Training plan
+ Purchase plan
+ Summer work plan
+ Plan for communication with parents
## Elementary Kindergarten - Grade 5
(Three year cycle)

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
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<tr>
<td>2015-2016</td>
<td>Teachers voted on new Earth Science Unit in fall 2015; trained on this in the spring; teach new Earth Science Unit in 2016</td>
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<tr>
<td>2016-2017</td>
<td>Teachers voted on new Physical Science Unit in fall 2016; trained on this in the spring; teach new Physical Science Unit in 2017</td>
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<td>2017-2018</td>
<td>Teachers voted on new Life Science Unit in fall 2017; trained on this in the spring; teach new Life Science Unit in 2018</td>
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Concord Middle School (Grades 6 - 8)
Standards & Content Selected by Committee

Choose model for three years of curriculum: layer cake (current model); spiral (Frameworks call for); “Spiral Cake”

Department chose spiral

Proceed with curriculum (text/digital) adoption

Training plan
Concord Carlisle High School (9-12)
Standards & Content Selected by Committee

Content revised by sub-departments

Biology - most changes

Earth - some changes

Physics and Chemistry - least amount of changes

Summer work and AP days

Training plan by department
Questions? Comments?