K - 12 Science Curriculum Alignment

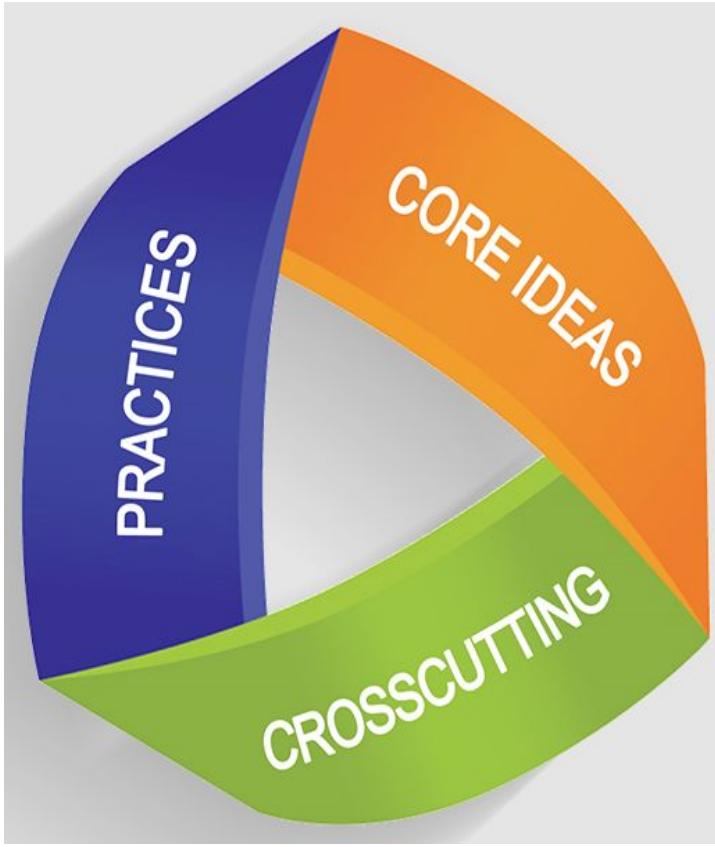
March 22, 2016

Agenda

1. Why Science? Next Generation Science Standards
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

Massachusetts Department of
ELEMENTARY & SECONDARY
EDUCATION

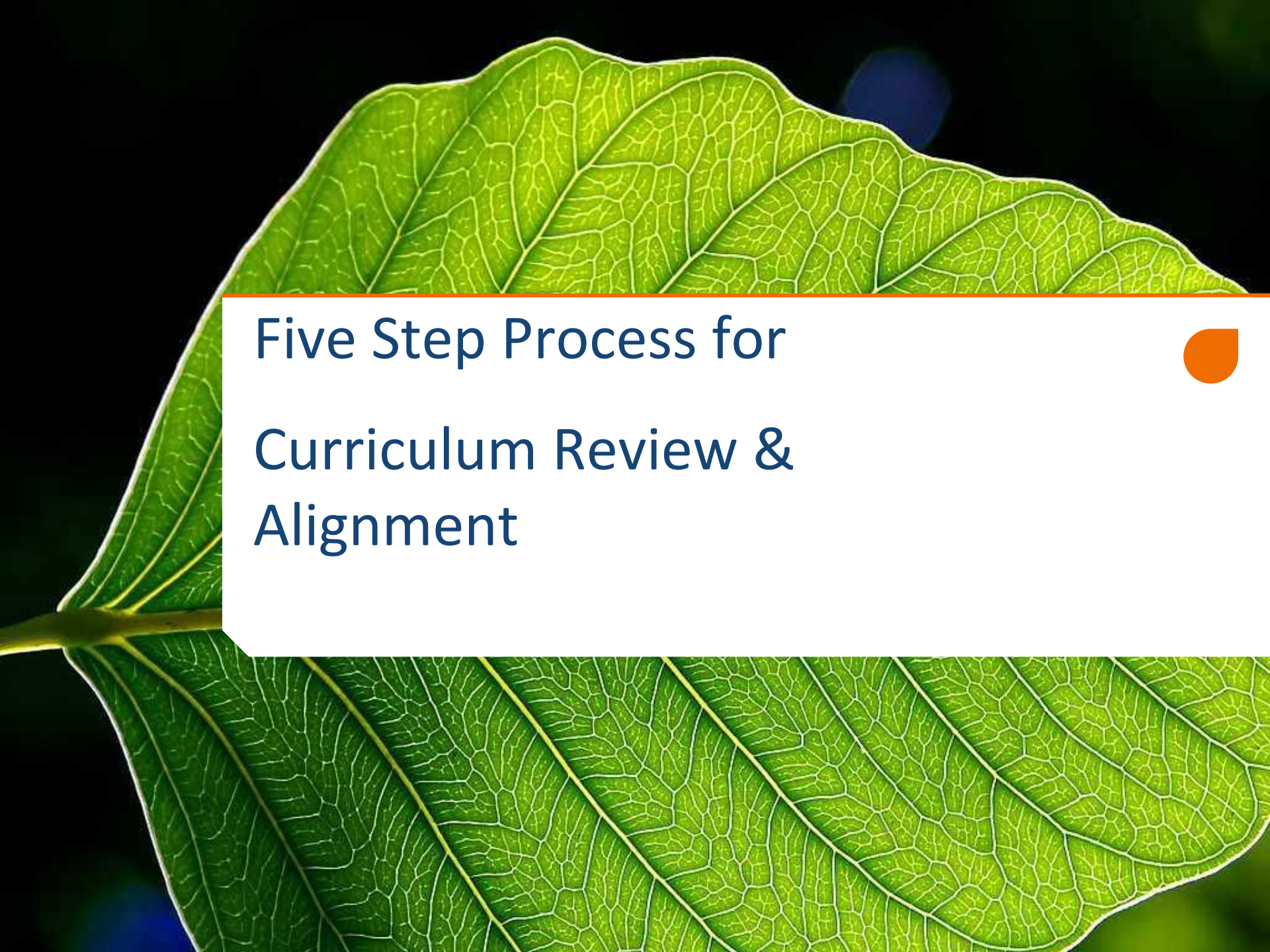
2016 Massachusetts Science and Technology/Engineering Standards

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



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);

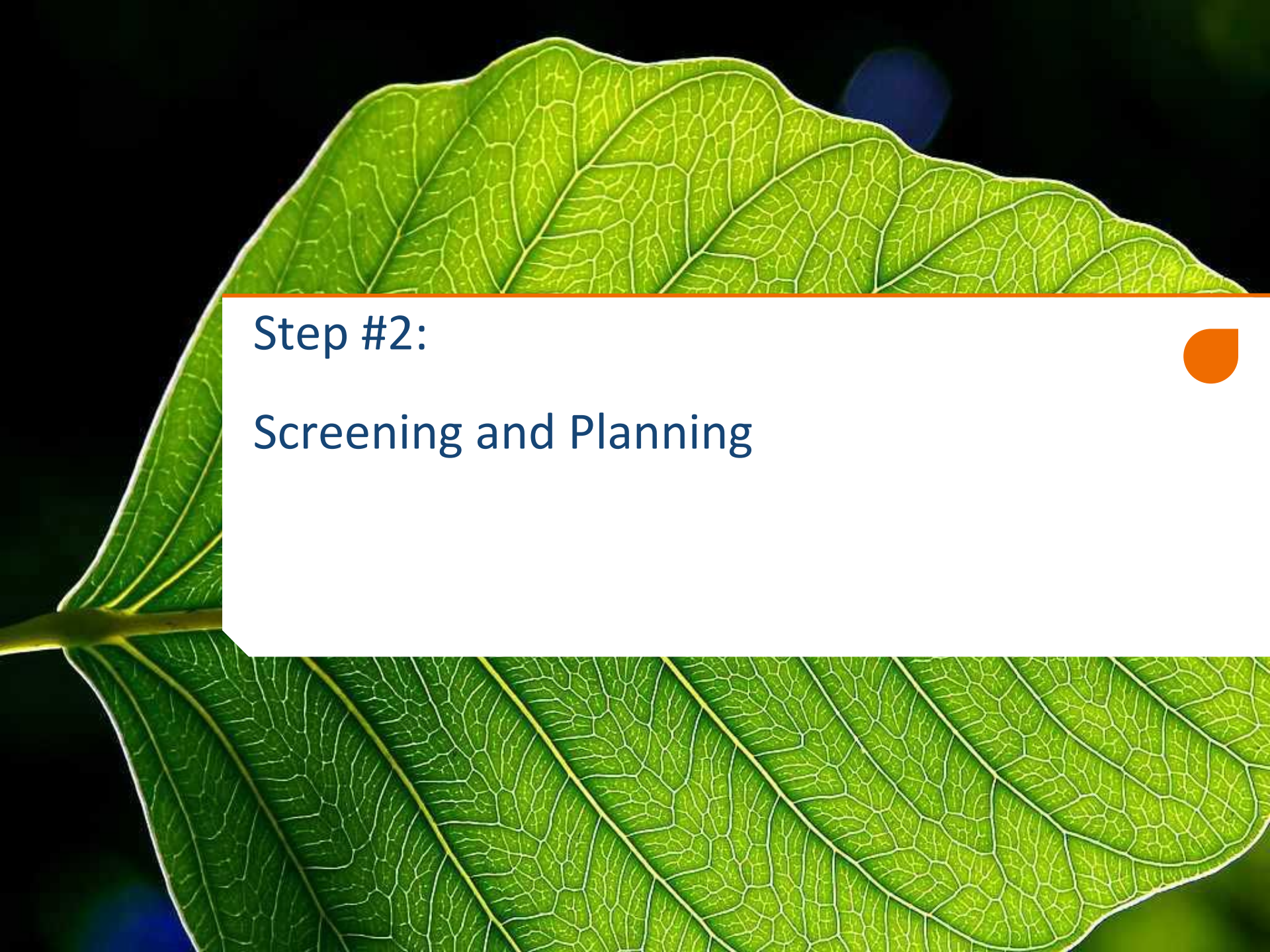
High School: Michael Vela (CCHS, chemistry and dept. chair); Theresa Ruggiero (CCHS, Earth Science); Nora Murphy (CCHS – Biology); and Kevin Pennucci (CCHS, phyics)

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:

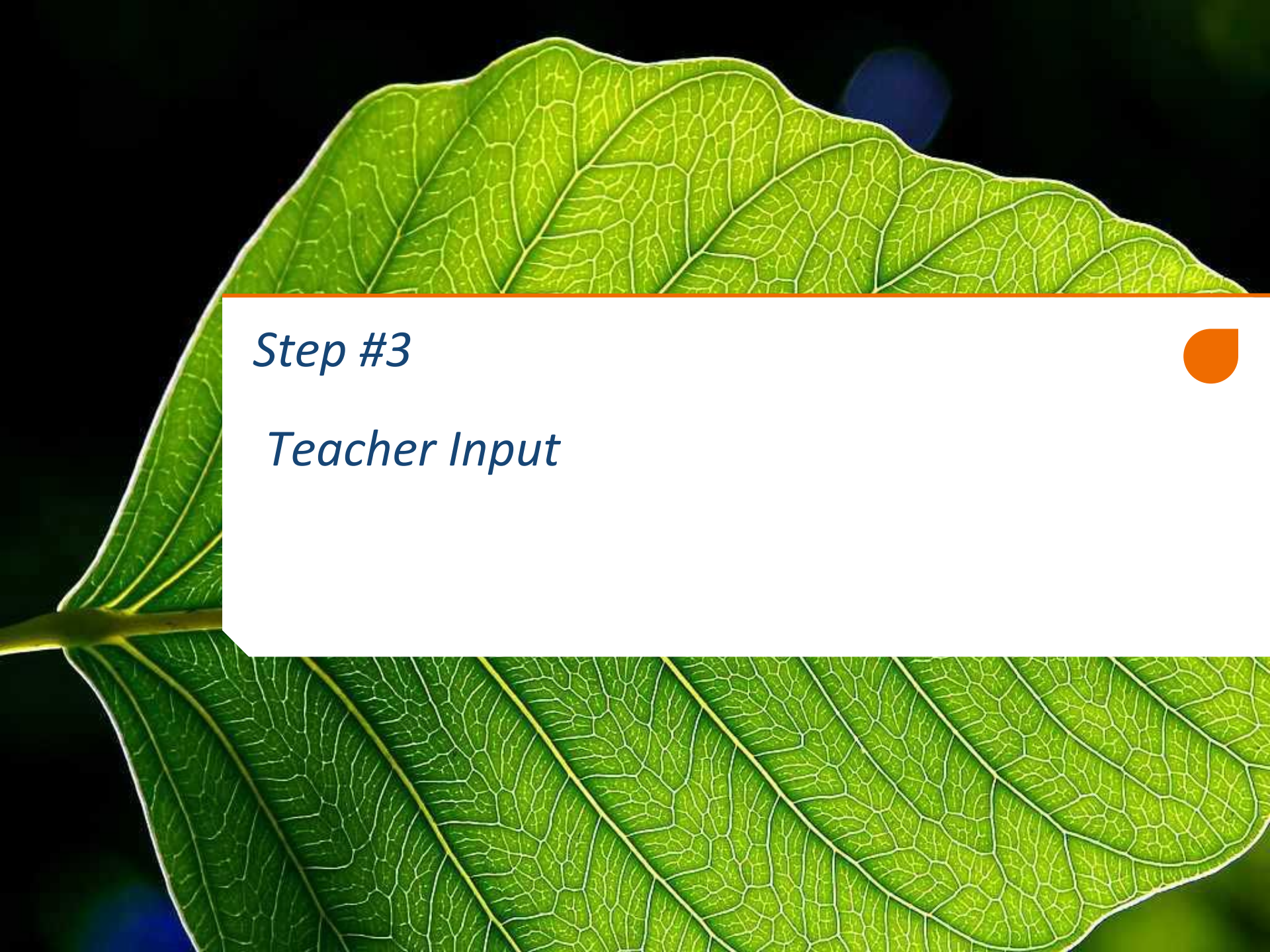
Screening and Planning

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

Rubicon Atlas

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

Kindergarten - Grade 2

Standards & Content Selected by Committee

	Life Science	Earth and Space Science	Physical Science	Engineering
K	K. Interdependent Relationships in Ecosystems:Animals, Plants, and Their Environment	K. Weather and Climate	K. Forces and Interactions: Pushes and Pulls	K-2 Engineering Design
1	1. Structure, Function, and Information Processing	1. Space Systems: Patterns and Cycles	1. Waves: Light and Sound	
2	2. Interdependent Relationships in Ecosystems	2. Earth's Systems: Processes That Shape the Earth	2. Structure and Properties of Matter	

Grades 3 - Grade 5

Standards & Content Selected by Committee

3	3. Interdependent Relationships in Ecosystems 3. Inheritance and Variation of Traits: Life Cycles and Traits	3. Weather and Climate	3. Forces and Interactions	3-5 Engineering
4	4. Structure, Function, and Information Processing	4. Earth's Systems: Processes that Shape the Earth	4. Energy 4. Waves: Waves and Information	
5	5. Matter and Energy in Organisms and Ecosystems	5. Earth's Systems 5. Space Systems: Stars and the Solar System	5. Structure and Properties of Matter	

Concord Middle School (Grades 6 - 8)

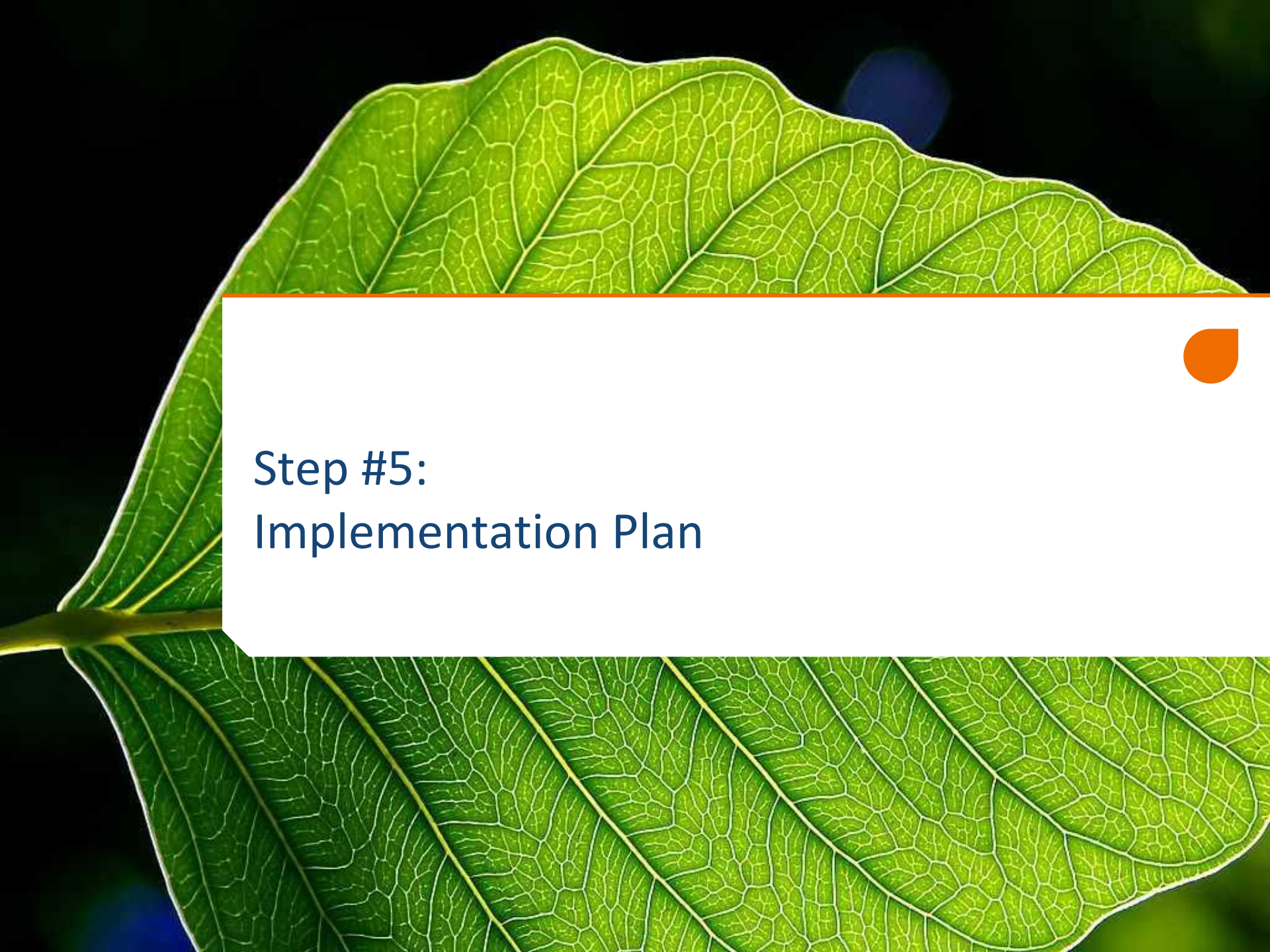
Standards & Content Selected by Committee

MS. Structure, Function, and Information Processing	MS. Space Systems	MS. Structure and Properties of Matter	MS Engineering Design
MS. Matter and Energy in Organisms and Ecosystems	MS History of Earth	MS. Chemical Reactions	
MS. Interdependent Relationships in Ecosystems	MS. Earth's Systems	MS. Forces and Interactions	
MS. Natural Selection and Adaptations	MS. Weather and Climate	MS. Energy	
MS. Growth, Development, and Reproduction of Organisms	MS. Human Impacts	MS. Waves and Electromagnetic Radiation	

Concord Carlisle High School (9-12)

Standards & Content Selected by Committee

			HS. Engineering Design
HS. Structure and Function	HS. Space Systems	HS. Structure and Properties of Matter	
HS. Inheritance and Variation of Traits	HS. History of Earth	MS. Chemical Reactions	
HS. Matter and Energy in Organisms and Ecosystems	HS. Earth's Systems	MS. Forces and Interactions	
	HS. Weather and Climate	MS. Energy	
HS. Interdependent Relationships in Ecosystems			
	HS. Human Sustanability		
HS. Natural Selection and Evolution		MS. Waves and Electromagnetic Radiation	



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)

2015 - 2016	Teachers voted on new Earth Science Unit in fall 2015; trained on this in the spring; teach new Earth Science Unit in 2016
2016-2017	Teachers voted on new Physical Science Unit in fall 2016; trained on this in the spring; teach new Physical Science Unit in 2017
2017-2018	Teachers voted on new Life Science Unit in fall 2017; trained on this in the spring; teach new Life Science Unit in 2018

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?