Lincoln Public Schools

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To: School Committee
From: Mary Sterling
Re: Science and Engineering Standards and Curriculum: An Update
Date: April 8, 2014

One of the priorities in the Curriculum and Instruction strand of our Strategic Plan is:

> "Continue refining curriculum to align with new *Massachusetts Curriculum Frameworks* in ELA, math and science."

This report will clarify the expectations in Massachusetts for future alignment to new science and engineering standards, review the current state of our district K-8 science and engineering standards and curriculum, and describe some steps towards the change in standards. Our commitment, as always, is to maintain a coherent program while we strengthen the teaching and learning in science and engineering.

Massachusetts Plan for New Standards in Science and Engineering

In 2011, the National Research Council (NRC) released *A Framework for K-12 Science Education: Practices, Crosscutting concepts, and Core Ideas,* identifying key scientific concepts and practices all students need by the end of high school. This led to the Next Generation Science Standards (NGSS), released in 2013, a 'state-led' endeavor to develop new science standards based on the NRC *Framework*. Massachusetts was one of the original 26 lead states involved in the NGSS development. Currently, the Next Generation Science Standards have been formally adopted by 10 states, with numerous other states working on its adoption.

The current Massachusetts *Science and Technology (STE) Framework* was adopted in 1996 and revised in 2001. The current review process began in 2009, and in 2011, Massachusetts joined the NGSS development effort, releasing the revised draft MA Science and Technology/Engineering standards earlier this year. The current state timeline for implementation of the new STE standards is as follows:

- 2014-2015 revised draft publicly available;
- 2015-16: public comment and adoption process; and
- 2016 and beyond: multi-year implementation/transition phase, including revision of MCAS.

The aims of the new standards are to shape a more coherent progression of inquiry practices and science/ engineering concepts, with strong vertical alignment through the grades and preparation for post-secondary success. The new standards encompass some key shifts:

- a shift from teaching facts to explaining phenomena;
- more coherence, with content and inquiry practices building a storyline through the grades;
- moving from standards by grade span (K-2, 3-5, 6-8, 9-12) to specific standards by grade;
- greater inclusion of engineering and technology;
- creating explicit links to math and ELA standards; and
- a central role for set of eight science and engineering inquiry practices.

Lincoln Public Schools Science and Engineering Standards and Curriculum

The K-5 elementary science curriculum was revised in 2008 to align to state standards and to ensure a more consistent program on both campuses; it was fully implemented in the 2008-2009 school year. The Learning Expectations and curriculum materials support substantial units at each grade in three domains: life science, earth and space science, and physical science. At some elementary grades, a small amount of integration of engineering was included.

Grade	K	1	2	3	4	5
Earth & Space Science	Wind	Weather	Earth's Movement	Rocks & Minerals	Sun, Moon, & Stars	Meteorology, Weather Systems
Life Science	Five Senses	Habitats	Life Cycle: Butterflies	Marine Life: Whales	Life Cycles: Plants	Adaptations of Living things
Physical Science	Balance	Solids & Liquids	Simple Machines	Magnets	Sound	Electricity

The secondary science program, grades 6-8, was restructured in 2010-2011 to provide learning for students in every science domain, every year including a strong technology/engineering strand at each grade. Inquiry practices were articulated as one of the Learning Expectations. As with the elementary curriculum, attention was paid to fully align with *Massachusetts Curriculum Frameworks* and to ensure common expectations on both campuses. New equipment and materials were purchased to support the new structure. This revision resulted in a well-articulated, standards-based science curriculum with a strong hands-on emphasis that has served students well in the past few years.

Grade	6	7	8
Earth & Space Science	Astronomy	Earth's Changing Surface	Dynamic Earth
Life Science	Classification and Cell Structures	Ecology, Heredity	Systems of Living Things
Physical Science	Motions, Forces, and Energy	Heat Energy	Properties of Matter
Technology/ Engineering	Transportation, Construction Systems	Manufacturing, Construction Systems	Bioengineering Systems

Next steps in the District to Prepare for a Re-alignment of Standards

The Lincoln Public School district is undertaking steps towards transitioning to the new Science and Technology/Engineering standards. This year, the district has begun the process in a number of different ways:

- convene a core faculty group to examine the intersection between current Lincoln standards and the new draft STE standards, through a summer 2014 workshop. This group will work to identify content shifts at specific grade levels, new content in science and engineering, and areas of integration of engineering practices;
- begin to grow teacher understanding of the new inquiry practices in science/engineering by offering a summer course in July, 2014;
- identify and explore opportunities to link key ELA and math standards to science learning, through curriculum leaders; and
- continue integration of engineering into the elementary grades, through use of the Museum of Science, Engineering is Elementary (EiE) kits. Teacher professional development with these kits was provided in December 2013 and integration of the kits in elementary classrooms is being piloted this year.

The path ahead is promising in terms of greater learning for students in science and engineering. As we stay well informed about the evolution of the new state standards, we will continue to carry out our own strong curriculum, which is well aligned to current standards. In our steps to prepare for the new standards, we will be reflective about what adjustments will be most beneficial for student learning and engagement.