Lexington Public Schools
146 Maple Street ❖ Lexington, Massachusetts 02420

To: Dr. Paul Ash
Members of the Lexington School Committee

From: Fran Ludwig, Chairperson
K-12 Science and Technology/Engineering Curriculum Review Committee

Re: **Executive Summary**:
Update on Year Two of the Science and Technology/Engineering Curriculum Review

Date: June 16, 2009

**A Statement of Purpose: Science and Technology/Engineering in the Lexington Public Schools**

*In the 21st century, educated citizens must have a comprehensive knowledge of science and its applications. Our students will be called upon in the future to make informed decisions that will have wide ranging effects on society and our planet.*

*In order to provide high quality science education in the Lexington Public Schools, the curriculum must meet the highest national standards in core scientific concepts in all disciplines: biology, chemistry, physics, earth and space science, and technology/engineering. Lexington students will be taught to apply methods that scientists use to investigate the natural world and that engineers use to create technologies to meet the needs of society. As their skills are developed and their knowledge base is expanded, students will demonstrate the scientific habits of mind: curiosity, open mindedness balanced with skepticism, respect for evidence, persistence, and a sense of environmental stewardship. They will gain both an understanding of science and the ability to apply scientific knowledge as a human enterprise.*

## I. Introduction

We are pleased to present a summary of the findings and accomplishments from Year Two of the Science and Technology/Engineering Curriculum Review of the Lexington Public Schools.

The Science and Technology/Engineering Curriculum Review Committee, with 30 members, consists of representative teachers from each grade level and discipline, Special Education teachers, and community members including scientists, engineers, science educators, and parents. Subgroups met during the year, and workshops were held during the summer 2008 to further the work of the committee in developing curriculum documents. The full Review Committee met for full-day sessions on October 1, 2008, January 21, 2009, and May 6, 2009.

Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been. President Barack Obama, April 2009

## II. Science and Technology/Engineering Curriculum Review Year 2:

Year 2 Goals:

- Develop comprehensive and coherent curriculum documents *(see Appendix A for draft versions of curriculum documents K-12)*
- Investigate resources for achieving technology/engineering standards
- Research strategies for addressing the achievement gap
- Integrate literacy and math skills within the science curriculum
- Develop and schedule time for professional development related to recommendations

## Accomplishments:

### Elementary

- Curriculum documents for K-5 Science and Technology/Engineering drafted, including state standards and Lexington standards. Essential vocabulary identified for each grade level. (see Appendix A)

- New curriculum units piloted to address missing component, or to replace unsatisfactory units (as judged by teacher survey in Year 1). New units improve alignment with state standards, provide greater teacher support, or are more effective:

    1. Grade 3: Water Cycle (Lexington-developed by Harold Wilde, Fiske, and Fran Ludwig)

    2. Grade 4: *Sun, Moon, and Stars* (commercial: FOSS) piloted at Estabrook, Bridge and Bowman. This pilot includes on-line teacher training videos. Based on this successful pilot, this unit and kit materials will be adopted in the Lexington Public Schools next year for all grade 4 teachers.

    3. Grade 5: *Simple Machines*: (Lexington-developed by Kristina Lieberman and Ellen Silberman, Estabrook and Fran Ludwig). Improvements were made in the *Simple Machines* kit materials as well. A mini-unit on Weather was drafted in Summer 2008 and was piloted at Bridge, during the 2008 – 2009 school year.

- Developed a Technology/Engineering strand for each grade level. Identified existing Engineering/Technology lessons to reduce the need for additional teaching time. Piloted additional Engineering/Technology activities in grades 2 and 3 that link to existing units.

    1. K-5 Science Coordinator attended the Massachusetts Association of Science Teachers (MAST) Conference and Science, Technology, Engineering and Mathematics (STEM) summit, and the National Science Teachers Association National Conference. These provided information on resources and best practices in the teaching of technology and engineering in K-5.

2. An introduction to technology and engineering design for 128 K-5 teachers was provided through an after school workshop. K-5 Review Team members facilitated the workshop.

3. The K-5 Review Team developed a template for writing engineering challenges based on the Engineering Design Process promoted by the Museum of Science's Engineering is Elementary program, and design briefs written by the Virginia's Children's Engineering Council.

4. A collaboration between Lexington Public Schools and local MIT alumni volunteers was fostered by Kathy Vandiver, review committee member, former Diamond science teacher and currently outreach director of the MIT Center for Environmental Health Sciences.

A workshop for 11 Lexington grade 3 teachers and 14 MIT alumni who volunteered to help in classrooms, was led by the Museum of Science *Engineering is Elementary* staff developers. The $500 workshop fee was provided courtesy of MIT Alumni and the MIT Edgerton Center. Participating grade 3 teachers are piloting the mini-unit on water filtration with the classroom support of MIT alumni. Several Museum of Science kits were purchased for this successful pilot of a unit to support our new technology/engineering strand. In addition, grade 5 teachers have expressed interest in having MIT engineers come to their classroom to share the story of how they came to be engineers. Note: A recurring expense of about $120 in consumable materials per elementary school will result from the adoption of this Engineering is Elementary unit. This will come from the science materials budget. A new vendor has helped us to cut costs and accommodate this increase.

5. Other *Engineering is Elementary* units are being piloted in grade 2 and grade 5. In grade 2, students are using earth materials from their Soils unit to make the best mortar to hold stones together in a wall. Grade 5 is considering a mini-unit on making an electrical alarm or constructing a windmill.

6. An Engineering Fair for Teachers took place on May 11, 2009. All K-5 teachers were able to see examples of student engineering projects that colleagues had developed for their grade level. Teachers then brainstormed engineering design challenges that could be incorporated into science, mathematics, language arts, and social studies lessons.

- Planned and scheduled professional development to update teachers on curriculum changes and to develop competency in content knowledge.

  Three 1 ¼ hour professional development sessions took place for all K-5 teachers. Two were related to technology/engineering, as noted above. One provided time to identify essential vocabulary for the curriculum document.

- Organized collaboration between classroom teachers, the K-5 science coordinator and reading specialists to develop reading lessons using non-fiction books from the classroom science libraries. Linked literacy skills of reading, writing and discourse to science learning to provide for maximum impact in minimum time, thus helping to address the time issue. Researched non-fiction titles appropriate for a variety of reading levels and the science unit topics.

    1. Provided Summer workshop time for teachers in Grades 1, 2, 4, 5, and reading specialists to select science unit related non-fiction books at a variety of reading levels. Guided reading lessons were written and posted on grade level First Class conferences for use of all elementary school teachers and literacy specialists. (see Appendix B for sample lesson) Each school received sets of the selected books with 8 copies per title, for each grade level. These were purchased with review funds.

    2. Conducted research-informed workshop designed to integrate student learning in science and literacy. The Science Notebooks workshops (one day long workshop and one after school session) were attended by 13 participants from Lexington including K-5 teachers, a literacy specialist, and a principal.

    3. Essential science and technology/engineering vocabulary is being identified for each grade level and this document will be shared with the ELL and SPED department.

## Middle School

- Revised and updated the middle school science curriculum.

    1. Curriculum documents for grades 6-8 have been completed for life science, physical science and earth science strands. This document includes state and local science standards, as well as student objectives to meet those standards. In addition, Lexington standards have been integrated into this document. The topics of forthcoming standards are climate change, energy conservation, and technology/engineering. Key scientific vocabulary has been identified for life science, earth science and physical science to be used throughout the district at each level.

    2. A rough draft of the technology and engineering objectives has been developed and will be further worked on this summer. The objectives that are most appropriate for science classes and those more appropriate for a Technology/Engineering Program will be discussed and added to the corresponding curriculum document.

- Integrated objectives that formally address reading and writing in science are integrated into the curriculum

    1. A sub-group with representatives from both middle schools, developed a common

template for writing laboratory reports in order to unify scientific writing across the district.

2. Work focused on teaching scientific writing skills that are needed to answer and improve open-response type answers on MCAS. Rubrics are being developed to assist students with the scientific writing process.

- Developed remedial interventions in science to close the achievement gap.

  The personal response system has been introduced in science classrooms to assist in formative and summative student assessment. This is a new technology that is being used in both the middle and high schools. Science teachers are using the electronic "clickers" to administer quizzes, tests, as well as gather information on student learning during classroom discussions. The hand-held devices allow teachers to elicit responses from all students at one time and provide a quick assessment as to which concepts student grasp and which they are still working to understand. The device also alerts teachers when a student is having difficulty understanding a concept and informs the instructor when it is appropriate to re-teach the information immediately.

- Investigated and developed the most appropriate and effective way to address state Technology/Engineering standards.

  1. Several programs have been tested this year that are under consideration for adoption. Diamond teachers, Valerie Franks and Susan Kirkland are piloting Museum of Science engineering lessons that are currently being developed at the museum. These lessons are the middle school counterpart of *Engineering is Elementary* currently being used at the elementary schools. Collaboration with the Museum is planned for additional units. The Lawrence Hall of Science GEMS program on Seasons and Space Science is being used at both middle schools and the Acid Rain program is being piloted at Diamond at the seventh grade level. A World in Motion program, sponsored by the Society for Automotive Engineers, has two modules that are currently being piloted at Diamond--the Hydrogen Fuel Cell and the Gravity Cruiser. These have both been tested by Richard Comeau at the sixth grade level as possible components of our engineering curriculum.

  2. Representatives from the K-12 review committee have attended several conferences and workshops to determine best practices. They have focused on climate change and technology/engineering instruction such as: State-sponsored STEM Summit, STEM initiative courses, Gateway presentations at the Concord Middle School, and Museum of Science, Massachusetts Association of Science Teachers Conference, and NEOSEC (New England Ocean Science Education Collaborative Ocean Literacy Conference).

  3. Connections were made with teachers and other professionals who are involved with best practices for addressing MA technology and engineering standards.

Science and Technology/Engineering Review Committee members Kathy Vandiver of MIT and Charles Martin, retired engineer, and a Diamond science teacher Donald Brennan attended a year-end update session of the Gateway Project at the National Center for Technological Literacy at the Museum of Science. The Gateway Project aims to help Massachusetts school districts align their curriculum, teacher education, and assessment systems with the state technology/engineering curriculum standards. As a result, the middle school Review Committee members were able to connect with colleagues in surrounding towns to discuss and determine the most appropriate methods for delivering the technology engineering standards.

4. Because of discussions with colleagues in surrounding towns, the committee determined that a dedicated technology/engineering program is necessary to deliver the technology engineering standards in a way that will meet the high standards of public education in Lexington. A technology/engineering program proposal was written and submitted to the administration. It was determined that a technology/education program will be developed in 2009 and piloted in 2010. This program will:

a) Support the science program in addressing Lexington's technology & engineering standards.
b) Be staffed by a certified engineering or technology educator if possible.
c) Begin with a pilot in grade 6, in the spring of 2010. This will be followed by a second session at the end of grade 7, or the start of grade 8.
d) Be supported by activities in other classes, as we continue to integrate and develop the K – 12 Science, Technology & Engineering curriculum in Lexington.

5. Continued evaluation of programs, curricula, and materials for achieving the technology/engineering objectives are being explored. A summer 2009 workshop is planned for further development in this area.

- Recommended a budget for purchasing new texts, science reference materials, technology hardware and software, in-service time and training along with new innovations for teaching Science, Technology and Engineering.

1. Textbooks for each grade level were evaluated by a sub-committee. Current texts are approximately 7-9 years old. Recommendations for appropriate materials, by grade level, are close to being finalized, and purchases will need to take place at the conclusion of this review.

2. Vernier probeware and Lab Quests were purchased. Vernier Software and Technology makes several different systems for data collection. The systems include electronic probes for measuring temperature, pH, pressure, voltage, dissolved oxygen and many more types of data. Data is then downloaded and can be displayed on a computer monitor. Appropriate training is needed in this area.

3. Climate Backpacks containing materials for teachers and students to investigate the science of climate change were purchased from the Northeast Science Center Collaborative. Teacher training will take place prior to distribution.

4. Pilot programs and instructional materials are necessary for the development of the new technology/engineering program that will begin in the spring of 2010. Additional funding will be needed each year after the pilot year to fund technology/engineering consumable materials.

- Scheduled time on the district calendar to meet with elementary, middle, and high school coordinators to articulate the K-12 science program.

  High school and middle school science teachers attended a joint department meeting to share and discuss the grades 6 -8 curriculum document draft. Lexington High School teachers made recommendations to further connect the middle school with the high school Science, Technology, and Engineering curriculum in the use of electronic probes and software.

## High School

- Reviewed 2008 Biology MCAS data. Took steps to address concerns.

  1. Members of the high school committee met with Charlie Caliri, LHS Dean. He demonstrated the use of TestWiz to analyze results using specific criteria. For example, MCAS scores from grades 8 and 10 were reviewed to see if there is a relationship between students' science performance in grades 8 and 10. Since we did see a positive correlation, this also allowed us to identify which students performed poorly on the 8$^{th}$ grade science MCAS. These students were then targeted for the after school review classes at LHS.

  2. Teachers have used MCAS analysis to make changes in the delivery of the curriculum. Since both the multiple choice and open response MCAS questions can be wordy and difficult to understand, Biology teachers have included more MCAS-type questions in their lessons. This gives the students more practice at reading and interpreting questions of this nature.

  3. A packet of MCAS review materials has been distributed to all Level 1 and 2 biology students, and is being used to support classroom review sessions. This packet includes a 60 page compilation of content review and practice questions from previous Grade 10 MCAS tests. The booklet also includes a section on types of questions and test taking strategies.

  4. As a response to MCAS data analysis that emphasized ecology, earth science teachers began to teach lessons in this area in the spring term. Ecology lends itself to more hands-on, inquiry-based activities rather than the astronomy unit that was previously taught. The earth science teachers are working closely with the biology

teachers to help prepare students for this high-stakes test, as it is now a graduation requirement. Using review funds, ecology texts for grade 9 were purchased.

5. Resource materials for helping teachers develop open-ended questions and inquiry-based activities have been identified, purchased, and have been placed in a Teacher Resource Library. A "book club" workshop is being held each week in June to review the resource materials and discuss their content.

- Explored available research on the correlation between math skills and performance in science.

  A curriculum team consisting of one teacher from each department, earth science, biology, chemistry, and physics was formed. Each discipline was asked to consider taking one or two important math skills and making sure that they were incorporated into their course. Teachers of each discipline are preparing documents that summarize the math skills for student notebooks. This work will continue in Year 3 of the Science, Technology/Engineering Curriculum Review process.

- Continued discussions within Science Department about activities/courses that would provide students with more exposure to Engineering/Technology concepts and skills.

  1. Sensors were purchased for the Robotics course that allowed for technical design and advanced programming.

  2. Discussed possible Technology electives that will address the Massachusetts Technology/Engineering standards

  3. Reinstatement of Astronomy elective course (will address several of the Technology/Engineering standards). This course was offered previously but had not been offered for the last two years. This has been accomplished with no increase in staffing.

- Examined and refined Level 2 Biology to improve student participation and knowledge by increasing formative assessment and using a personal response system.

  A personal response system (see description in middle school section) was purchased (department funds) and training was done in June 2008 and over the summer of 2008. Level 2 teachers at Lexington High School are currently using the system to enhance and increase formative assessment in science classrooms.

- Explored ways to provide more open-ended projects/activities for each discipline (excluding science fair) and formed a committee of teachers (one from each discipline), to investigate the feasibility of introducing more open-ended activities into the curricula.

1. Members of the team explored ways to provide more inquiry based/open-ended activities, including several systems for data collection that involve the use of technology. A decision was made to adopt the Vernier system. (See description of Vernier probes in middle school section). We have purchased the LabQuest system. This will allow for rapid and accurate data collection. The Vernier probeware will be integrated into lab activities for all disciplines at Lexington High School. A workshop in using the Vernier products will take place in June 2009. Sixteen Lexington High School teachers and 4 middle school teachers will learn how to use a variety of probes and gain experience in troubleshooting potential problems.

2. Several earth science, biology, and chemistry labs were redesigned to allow for more a more inquiry-oriented approach. One of the concerns identified by the review committee was that our labs were still too teacher-directed. In some labs students follow "cookbook" style procedures that result in known outcomes. By using the Vernier probeware (see #1 above), the amount of time needed to collect data should be shortened. With reduced time for data collection it should be possible to give students more time to ask their own questions and design a procedure to find the answers. This is an example of an inquiry-based focus.

3. Purchased reference books for the Lexington High School science teaching library. The books all address teaching strategies and skills. There are books about different types of assessments, inquiry-based labs, addressing student misconceptions in science, differentiated learning, and increasing the math and literacy components in science classes.

**Year 3 Goals**

**Elementary:**

a. Complete curriculum document (materials alignment, vocabulary, common assessments).
b. Revise science section of K-5 report cards, to follow a standards-based reporting format.
c. Fully implement new units in grade 3, Water Cycle in Massachusetts, grade 4, Sun, Moon and Stars, and grade 5 Weather and Climate. Provide professional development, as necessary.
d. Offer Science Notebooks workshops for all K-5 classroom teachers and literacy specialists.
e. Provide a selection of technology/engineering design challenges for each grade level K-5, including Engineering is Elementary units (at least 1 per year required). Include lessons on the application of technologies such as recycling and energy conservation.

**Middle School:**

a. Complete curriculum documents: Include activities associated with standards, develop common assessments, develop climate change strand, and develop activities for using the Vernier Probeware System.
b. Evaluate and choose textbooks and student reference materials

c. Collaborate with Review Team members to develop Technology/Engineering program. This involves identifying student objectives that will enable the achievement of state standards in technology/engineering. In addition activities and materials need to be chosen and the sequence of offerings planned and piloted.
d. Continue to look at common vocabulary to coordinate with common assessments using the CPS personal response system
e. Workshops offered to ensure all teachers are trained to use new equipment.

**Lexington High School:**

a. Reformat curriculum documents using NEASC work as a base, include vocabulary.
b. Implement new curriculum/labs using the Vernier Probeware System and collect data (student assessments) to compare student achievement before and after implementation.
c. Collect and review data about the impact of the new ecology unit in the Earth Science course.
d. Offer professional development workshops for teachers to address ways to help and encourage struggling and underperforming students. Design and implement workshops to bring teachers of Level 2 classes together to discuss best practices.
e. Review MA Technology/Engineering standards and identify the essential standards. Examine current LHS science courses for areas where these essential technology/engineering standards can be integrated into the current curriculum. (Rationale: There are five sets of science/engineering standards for high school. It is not feasible to teach full-year courses for all five. By adding some technology/engineering standards to the four comprehensive courses, Earth Science, Biology, Chemistry and Physics, all students will be exposed to the essential technology /engineering standards.)
f. Identify opportunities for students to learn additional technology/engineering skills through after-school programs, electives and courses taught in other departments.

K-12
Schedule time on the district calendar to meet with elementary, middle, and high school coordinators to articulate the K-12 science program.

Think about new and creative ways to engage young people in science and engineering, (ways) that encourage young people to create, build, and invent – to be makers of things.

**President Barack Obama at National Academy of Sciences April, 2009**

**Budget Implications Year 3:**

**Elementary:**

One time expenses:

Science Notebook Workshops (substitute teachers, books) K-5*
Astronomy kits (grade 4) and teacher guides*
Engineering is Elementary teacher guides (grade 3)*
Weather kits (Grade 5)*

*Will be funded with Curriculum Review Allocation

**Middle School:**

One time expenses:

Textbooks for all grades, 6-8*
Materials, curriculum development for technology/engineering*
Workshops for using new technology and materials*
Support for several teachers to attend STEM initiatives through Boston University and Northeastern University (offer courses in best practices for technology/ engineering instruction)*

*Will be funded with Curriculum Review Allocation

**High School:**

**One-time expenses:**

Workshops on strategies for reaching struggling and underperforming science students *
Additional Vernier workshops and equipment to facilitate the use of this new probe technology with existing lab activities*
Purchase of additional Vernier equipment*
Textbooks*
Non-consumable supplies for Astronomy course*
Workshop to identify essential technology/engineering standards and to develop lessons to address them within the core science courses.*
Materials to support technology/engineering instruction within the core science courses*

*Will be funded with Curriculum Review Allocation

**APPENDIX A**

Curriculum Documents K-12

**APPENDIX B**

K-12 Science and Technology/Engineering Review Committee Meeting Agendas

**APPENDIX C**

K-5:
Sample reading lesson; list of reading books purchased
Technology/Engineering Workshop Materials December 15 and May 6
Vocabulary Workshop Materials

**APPENDIX D**

Middle:
The Integration of Science, Technology and Engineering Learning Standards at Clarke and

Diamond Middle School

**APPENDIX E**
LHS:
List of books from Professional Collection

**APPENDIX F**
Curriculum Review Committee List

# Lexington Public Schools
# Science and Technology/Engineering
# K-12

Year Two Curriculum Review

June 16, 2009

# Goals Year 2: K-12

- Develop comprehensive and coherent curriculum documents
- Investigate resources for achieving technology/ engineering standards
- Research strategies for addressing the achievement gap
- Integrate literacy and math skills within the science curriculum
- Develop and schedule time for professional development related to recommendations

# Year 2 Work Accomplished to Date

## K-12

- Drafted K-12 curriculum documents, including state and Lexington standards, materials alignment, common assessments and essential vocabulary

- Attended conferences, including Mass. Association of Science Teachers (MAST) , MA Science Technology Engineering and Mathematics (STEM) Summit, National Science Teachers Association National Conference (NSTA), Ocean Literacy Conference, Gateway Project at the National Center for Technological Literacy

# Accomplishments K-5

- New curriculum units piloted:
  - Grade 3 - Water Cycle, Grade 4 - Sun, Moon, and Stars, Grade 5 -Simple Machines

- Science and Literacy connection established
  - Collaborated with classroom teachers, literacy specialist, and K-5 coordinator to choose and develop reading lessons to integrate with the science curriculum

  - Offered workshop on the use of Science Notebooks. Eleven K-5 teachers, 1 literacy specialist and 1 principal participated. Participants will serve as resource teachers for Year 3 workshop for all K-5 teachers and literacy specialists

# K-5 Accomplishments cont.

- Development of Technology/Engineering Strand
  - Introduced technology and engineering design process to 130 K-5 teachers
  - Established collaboration between Lexington Public Schools & MIT alumni. MIT alums assisted 11 grade 3 teachers in piloting Engineering is Elementary unit on water filtration
  - Drafted template for grade level engineering challenges
  - Offered Engineering Fair for K-5 teachers to see examples of student engineering projects

# 6-8 Accomplishments

- Integrated objectives that address reading and writing in science
  - Developed a common template for lab reports
  - Taught scientific writing skills needed to appropriately answer open-response MCAS type questions
- Developed remedial interventions to close the achievement gap
  - Introduced the Personal Response System

# 6-8 Accomplishments cont.

- Investigated and developed the most appropriate and effective way to address state Technology/ Engineering standards
  - Piloted programs from the Museum of Science, Lawrence Hall of Science, and Society for Automotive Engineers
  - Purchased Vernier probeware and Lab Quest
  - Evaluated programs, curricula, and materials for new Technology/Engineering program
  - Proposed plan for new Technology/Engineering Program
  - Planned 2009 summer workshop for further development.

# Proposed Grades 6-8 Technology/Engineering Program

This program will:

- Support the current science program in addressing Lexington's technology & engineering standards
- Be staffed by a certified engineering or technology educator if possible
- Begin as a pilot in grade 6 in the spring of 2010, followed by a second session at the end of grade 7, or the start of grade 8
- Be supported by activities in other disciplines, as we continue to integrate and develop the K – 12 Science, Technology & Engineering curriculum

# 9-12 Accomplishments

- Reviewed 2008 MCAS data, and took steps to address concerns
  - Analyzed data to determine possible correlation between grade 8 and 10 scores in science
  - Prepared MCAS review packet: Introduced MCAS-like questions into regular class work
  - Introduced ecology as part of Earth Science in grade 9
- Explored available research on the correlation between math skills and performance in science: Identified math skills needed in each discipline for student notebook
- Improved student participation and knowledge in Level 2 Biology by increasing formative assessment and using a personal response system

# 9-12 Accomplishments cont.

- Explored ways to offer more inquiry-based & open-ended activities

  • Adopted Vernier probeware to collect and display data quickly, using up-to-date technology. These devices speed the collection & display of data to give more time for students to conduct experiments

  • Redesigned several earth science, biology, and chemistry labs to implement a more inquiry-oriented approach

  •Purchased reference books for Lexington High School science teaching library: Books address teaching strategies and skills

# 9-12 Accomplishments cont.

- Continued discussions within Science Department about activities/courses that would provide students with more exposure to Engineering/Technology concepts and skills.
  - 1. Sensors were purchased for the Robotics course that allowed for technical design and advanced programming.
  - 2. Discussed possible technology electives that will address the Massachusetts Technology/Engineering standards
  - 3. Reinstatement of Astronomy elective course (will address several of the Technology/Engineering standards). This course was offered previously but had not been offered for the last two years. This has been accomplished with no increase in staffing.

# Year 3 Goals

- **K-12:**
  - Complete curriculum documents
- **Elementary:**
  - Revise science section of K-5 report cards, to follow a standards-based reporting format
  - Fully implement piloted units. Provide professional development, as necessary
  - Offer Science Notebooks workshops for all K-5 classroom teachers and literacy specialists
  - Provide a selection of technology/engineering design challenges for each grade level K-5

# Year 3 Goals cont.

- **Middle School:**
  - Evaluate and choose textbooks for grades 6-8
  - Collaborate with Review Team members to develop and pilot Technology/Engineering Program
  - Continue to identify common vocabulary, and develop common sequence to align with common assessments in grades 6-8
  - Provide workshops to ensure that all teachers are proficient in using Vernier probes and software

# Year 3 Goals cont.

- **Lexington High School:**
  - Implement new curriculum/labs using the Vernier Probeware System, and collect data to assess student achievement before and after implementation
  - Collect and analyze data about the addition of the ecology unit to the Earth Science course
  - Review MA Technology/Engineering standards and identify the essential standards. Examine current LHS science courses for areas where these essential technology/engineering standards can be integrated into the current curriculum.
  - Offer professional development workshops for teachers to address ways to encourage struggling and underperforming students

# Budget Implications

- K-12
  - Support completion of curriculum documents*
  - Enable attendance at conferences and professional meetings*
- K-5
  - Fund materials and teacher guides to fully implement new units*
  - Support Science Notebooks workshops (subs) and books*
- 6-8
  - Purchase replacement science textbooks in grades 6-8*
  - Develop and purchase materials for new Technology/Engineering Program*
  - Support attendance of several teachers at STEM curriculum development program at Boston University or Northeastern*

***Funded with Curriculum Review allocation**

# Budget Implications cont.

- High School
  - Fund PD to address ways to support under-achieving and struggling students
  - Fund additional Vernier workshops and equipment to facilitate the use of this new probe technology with existing lab activities*
  - Purchase textbooks*
  - Provide non-consumable supplies for Astronomy course*
  - Fund workshop to identify essential technology/engineering standards, and develop lessons for core science courses*
  - Provide technology/engineering materials for core science courses*

***Funded with Curriculum Review allocation**

# QUESTIONS?