Milton Public Schools K-12 Science/STEM

School Committee Presentation
November 5, 2014

Agenda

- **MCAS District-Wide Data Analysis**

- **STEM - Elementary (English Innovation Pathway), Middle, High**
  - Where are we now?
  - Where are we going?

- **General Science/STEM - Elementary, Middle, High**
  - Where are we now?
  - Where are we going?

Milton Public Schools
Science, Technology and Engineering (STE) MCAS Achievement

% Advanced/Proficient				
	2011	**2012**	**2013**	**2014**
Grade 5 STE	61%	64%	70%	64%
Grade 8 STE	43%	48%	42%	48%
Grade 10 STE	75%	82%	85%	94%
HS Biology (Gr. 9/10)	78%	82%	94%	89%

Elementary STEM (English Innovation Pathway)

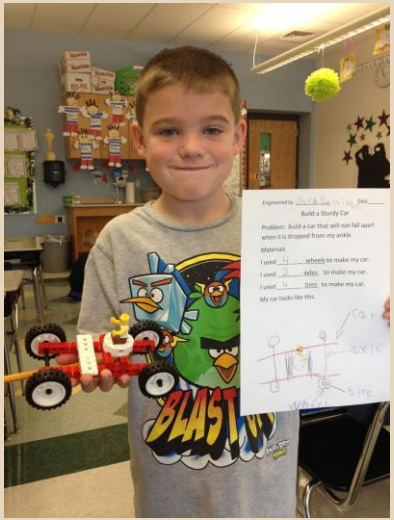
Where are we now?

- Implementation of LEGO Engineering Workshop Curriculum in Grade One (2012-2013)
- Implementation of LEGO WeDo Robotics Curriculum in Grade Two (2013-2014 Advancement Initiative)
- Implementation of Creative Computing Curriculum in Grade Three (2014-2015 Advancement Initiative)

Where are we going?

- Currently exploring options for Grade Four
  - Project Lead the Way Launch Program (Students use technology, robotics and everyday materials to explore topics aligned with Common Core and Next Generation Science Standards through engineering activities.)
  - Code.org (Elementary school curriculum that allows young students to explore computer programming.)
- STEM Professional Development

Elementary STEM Programs in Action



A first grader proudly shows off his re-designed car and writing.

Second graders build and program a robot through the LEGO WeDo Robotics Program.

Third graders engage in the Creative Computing Curriculum.

Middle School STEM

Where are we now?

- Intensive Studies in Science, Technology, Engineering and Math (ISSTEM) courses are offered at the Pierce Middle School.
- PASS Classes are offered to students after school including: engineering design, coding/programming, rocketry and robotics.
- A $10,000 grant from the Blue Hills Charitable Foundation will support fieldwork in environmental science for ISSTEM students beginning this year.
- LEGO Mindstorms materials were purchased with support from the Milton Foundation for Education to offer a summer content institute in robotics and support ongoing opportunities.
- Science Fair participation by ISSTEM students

Where are we going?

- Increase opportunities to enable all students to participate in a STEM elective
- Further develop ISSTEM courses
- Explore Project Lead the Way

STEM at the Pierce Middle School

ISSTEM students learning about the Cape Cod Canal

Students participating in a **PASS class** on design challenges.

Lego Mindstorm **Summer Content Institute** and PASS classes

High School STEM

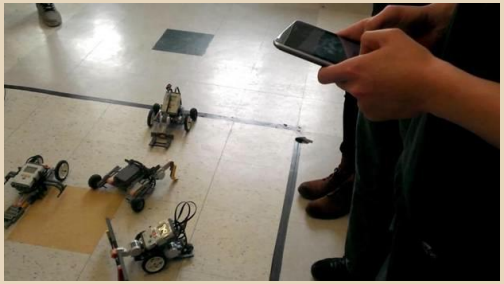
Where are we now?

- 2008 - 2009 school year:
  - Opening of the Biotechnology Lab
- Biotechnology course offerings have expanded to two options: 1-full year honors course and a semester college prep introductory course
- 2013 - 2015 school year:
  - 6 high school teachers (4 Science & 2 Math) enrolled in the STEM Certification Program through the Christa McAuliffe Center and Parametric Technology Corporation (PTC)
- Implementation of five Biograph computer simulations created by MIT and UPenn in all biology courses
- Laptops and probeware/sensors are being purchased to enhance the curriculum to incorporate STEM into the new Science, Technology and Engineering Frameworks (Advancement Initiative)

Where are we going?

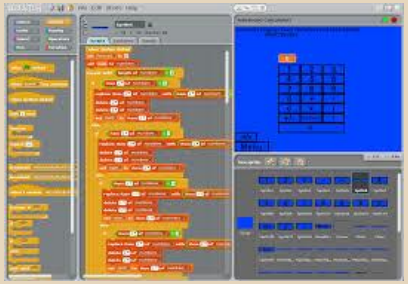
- 3 Year STEM Implementation Plan:
  - 2015 - 2016: Implement STEM activities authored through PTC STEM Certificate Program
  - 2016 - 2017: Creation of a STEM (Engineering of the Future) elective
  - 2017 - 2018: Creation of Competitive Robotics and Astronomy electives
    - Goal: Recognition as a PTC Academy School

STEM at Milton High School



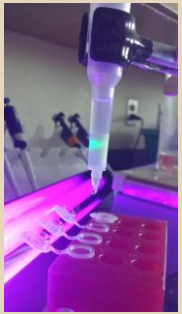
Robot competition among students enrolled in the HS Robotics elective course

Biotechnology students are preparing gels to analyze DNA



Students use coding to create biology simulations through Biograph activities

Computer Science students build materials with a 3D printer

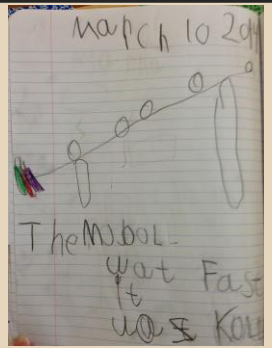


Elementary Science

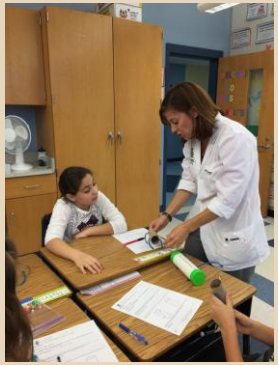
- **Where are we now?**
  - Addition of full time Elementary Science Coordinator (Advancement Initiative)
  - New, STE standard-aligned Full Option Science System (FOSS) curriculum for grades 3, 4, 5 (Advancement Initiative)
  - Professional Development in curriculum and instruction for FOSS (Advancement Initiative)
  - Development of science assessments
  - Science Notebooking focus in grades 3-5
  - Enrichment science materials funded through Milton Foundation for Education Sam's Fund and Blue Hills Grants
  - Successful science fairs at each school
  - Science from Scientists expansion to all four elementary schools in Grade Five classroom

- **Where are we going?**
  - Alignment and purchase of science curriculum for K, 1, and 2
  - Implementation of science notebooks in grades K, 1 and 2
  - Continuation of implementation plan for FOSS in grades 3, 4, and 5
  - Professional Development for grades K-5
  - Use of science assessments
  - STEAM enrichment opportunities through Milton Foundation for Education
  - Outdoor Classroom experiences for all elementary schools

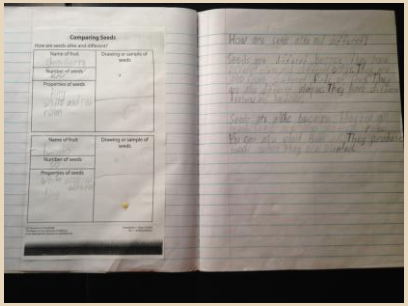
Elementary Science Programs in Action



Kindergarteners use the Discovery Ramps and explain their thinking.

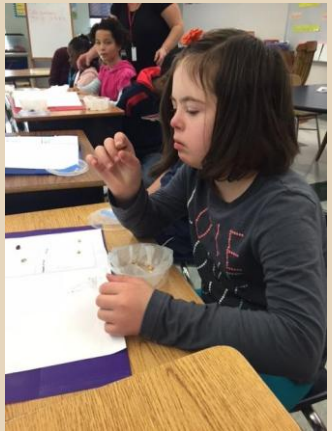


Science from Scientists



Excerpts from Science Notebooks.

First graders explore engineering concepts.



Students engage in FOSS lessons.

Middle School Science

Where are we now?

- Addition of a part time middle school science coordinator
- Implementation of three new science units in the 2013-2014 school year (Advancement Initiative)
- Implementation of three additional science units during the 2014-2015 school year (Advancement Initiative)
- Common end-of-unit assessments to be completed for all units
- Development and Pilot of District Determined Measures (DDM)
- Professional development to support the new curriculum and teacher goals around decreasing the proficiency gap (Advancement Initiative)

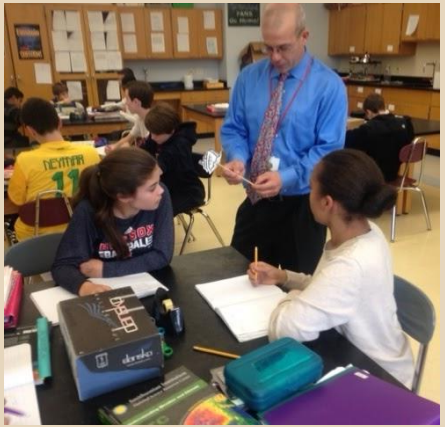
Where are we going?

- Continue to evaluate and adjust our program to address the new Science, Technology and Engineering standards.
- Develop a system for tracking and analyzing student data
- Continue to develop and increase participation in the science fair

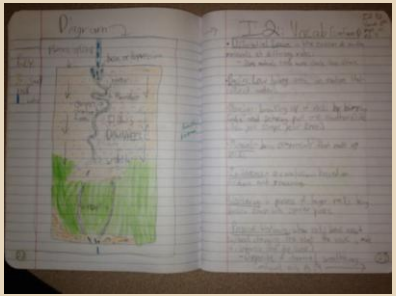
Science at the Pierce Middle School

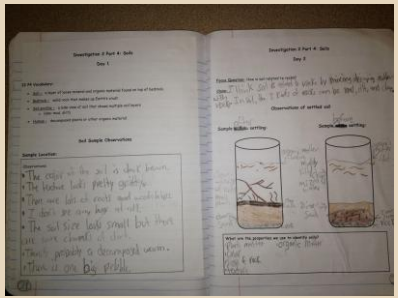
6th graders conducting an investigation from the **FOSS Earth History** curriculum.

Thanks to Advancement Initiative funding, the Pierce Middle School was able to purchase new science curriculum and provide professional development opportunities for teachers.



8th graders graphing ocean floor data as part of the **STC Weather and Climate** unit.





Examples of 6th grade science notebooks

7th grade students conducting a phase change investigation from the **FOSS Chemical Interactions** unit.

High School Science

Where are we now?

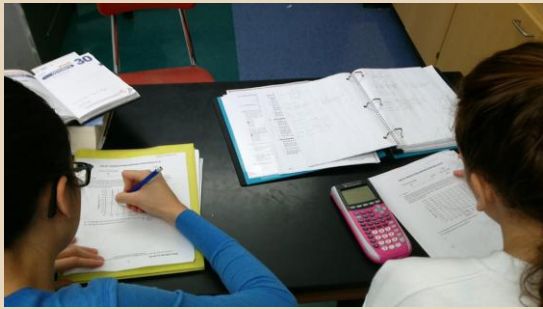
- All Advanced Placement Science curricula redesigned and all AP teachers trained
- Addition of a full time high school science coordinator
- Implementation of common end-of-unit assessments
- Development and pilot of District Determined Measures (DDM)
- Expansion of co-taught biology courses to two sections
- MCAS Prep reintroduced into schedule

Where are we going?

- Continue to evaluate and adjust our course curriculums to address the new Science, Technology and Engineering Frameworks
- Develop a system for tracking and analyzing student data
    - School-wide rubrics
    - Piloting Edwin and Galileo assessment software programs

Science at Milton High School

Chemistry students are working with chemical compounds to determine empirical formulas



AP Physics students work together to review AP writing practices

Introduction to Biology is a co-taught course at MHS

Zero Robotics at Milton High School

- First year of implementation
- International competition run through MIT and NASA
- Student Tasks:
  - Synchronize, Position, Hold, Engage, and Reorient Experimental Satellites (SPHERES) in zero gravity inside the International Space Station
- C++ program is used to program the SPHERES

FTC (FIRST Tech Challenge) Robotics

- 4th year of implementation at MHS
- Students design, build, and program a robot to complete specific challenge games that change annually
  - Use of sensors and autonomous programming are implemented so that the robot can run a pre-programmed code with no human assistance

MHS Robotics Team

MHS has hosted a qualifying meet for 20 different high schools teams at Cunningham/Collicot for the past two years

MHS won the Rockwell Collins innovation and design award for robot design in 2014

MHS will host this years qualifying meet at MHS on Sunday, February 8, 2015, in the Copeland Fieldhouse