

# Milton Public Schools 2012 STEM Initiative



**September 5, 2012**

# A Summer Vacation







Let's bring 100 books and 1000 songs



# Time for some picture taking



# What would it look like?

- Think back 10 years
  - How did you plan and take a vacation then?
- Think about our 1<sup>st</sup> graders
  - When they are adults, how will they plan and take a vacation?

# STEM Rationale



- Science, Technology, Engineering and Mathematics (STEM) is an important component of the state and national science standards
  - Early involvement in STEM has a strong influence on students' later study in the STEM disciplines
  - Early engagement in STEM is particularly important for students who do not have a parent or other role model who work in STEM fields
  - STEM Occupations are a high growth sector of the Massachusetts economy





## About the STEM Expo

### ENERGIZING STUDENT INTEREST IN SCIENCE, TECHNOLOGY, ENGINEERING & MATH (STEM)

Imagine a group of students on an interactive journey using a flight simulator – watch as they create a battery using lemons – join as they build an underwater remotely operated vehicle (ROV) – observe as they use statistics to create the best offensive unit of a new NFL team – assist as they learn to check and record the vital signs of a newborn.

These are just a few of the activities to take place at the 2012 STEM Expo, *Envision Your Future*. 500 students, grades five through eight, are expected to participate. The Expo aims to get Southeastern MA students excited about pursuing education and careers in the fields of Science, Technology, Engineering, & Math (STEM).



## Sample Activities by STEM Majors in Science, Technology, Engineering & Math

**AGRICULTURE & NATURAL RESOURCES:** Cleaning Up an Oil Spill; Identifying Native Turtles

**ARCHITECTURE & DESIGN:** Designing and Constructing Sustainable Structures

**BIOLOGICAL & BIOMEDICAL SCIENCE:** DNA Enzymes - Reagents; Making Silly Putty

**COMPUTER & INFORMATION SCIENCE:** Black Boxes; Creating Math Games with SCRATCH

**ENGINEERING & TECHNOLOGY:** Engineering Is Elementary; Create a Lemon Battery; LEGO NXT Mindstorm Robotics; LEGO League; FIRST; Underwater ROV; Marine Science Careers

**HEALTH PROFESSIONALS & CLINICAL SERVICES:** ECGs and Spirometry; Medically Examine Stranded Sea Turtles; Well-Baby Check-ups

**MATHEMATICS & STATISTICS:** Build an NFL Football Team; Who Wants to Be a Money-Smart Millionaire?; Be Your Own Boss

**PHYSICAL SCIENCES:** Earth View; Rocket Balloons; Lighting & Energy Show; Flight Simulation; Balsa Airplane Making

**OTHER STEM MAJORS:** Solar-Generated Electricity; Fueling Your Future



### WHO SHOULD ATTEND?

#### STUDENT GROUPS:

500 Southeastern Massachusetts students in grades five through eight.

#### SCHOOL DISTRICT

#### COMMUNITY TEAMS:

School administrators, guidance professionals, school committee members, STEM and Non-STEM teachers and other representatives from communities such as: early childhood educators, local business leaders, after-school program providers, and local, state, or federal representatives.

### Contact Us:

For additional information or to participate in the STEM Expo, contact STEM Coordinator Katherine Honey, [khoney@comcast.net](mailto:khoney@comcast.net), 508.316.1480.







## OUTREACH

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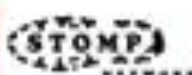
[CEEO partners with  
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New Programs

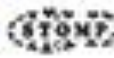
[New Masters of Arts  
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Our Sites:



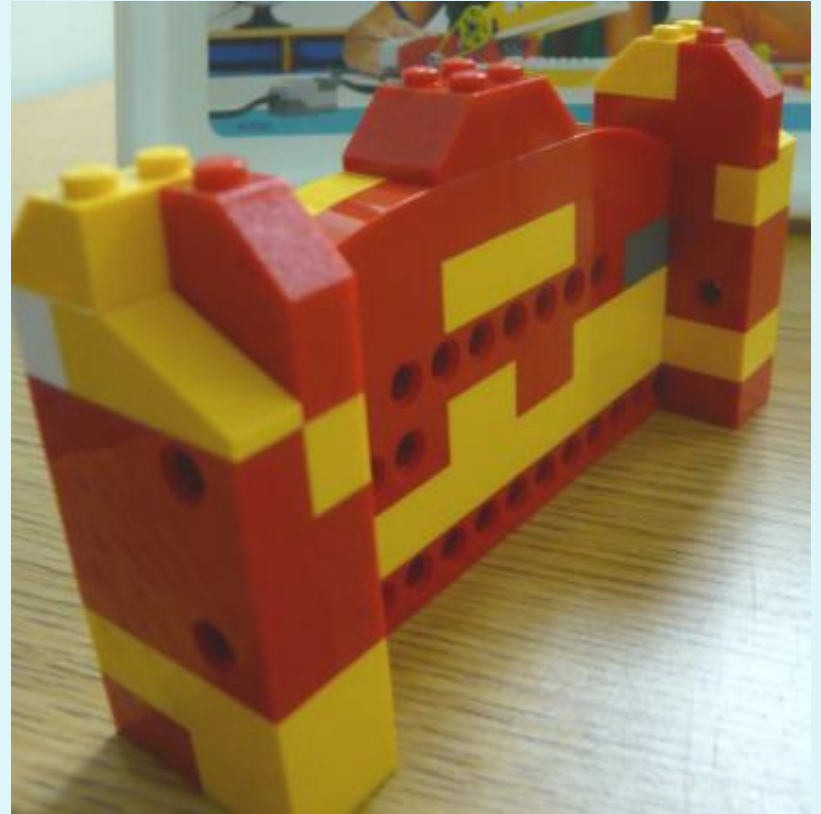
Tufts

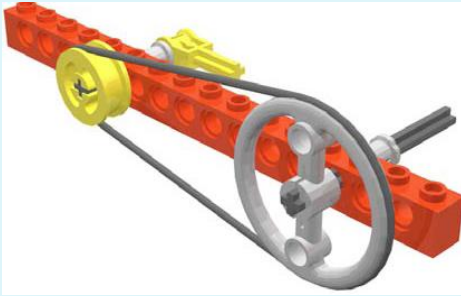


# What Does STEM look like at 1<sup>st</sup> Grade?

Open ended problems  
with many solutions

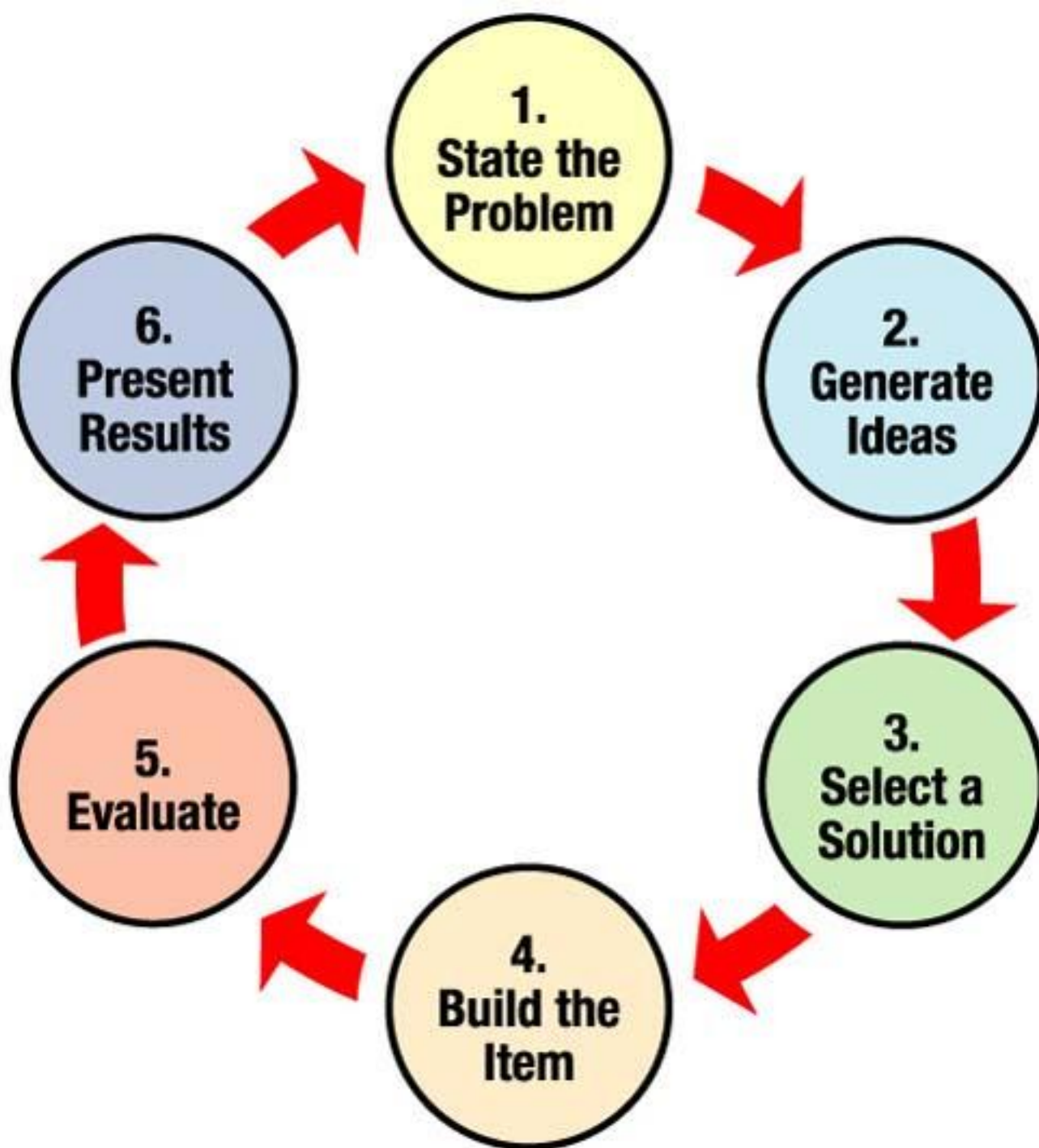
- Use an engineering design process
- Relate to other curriculum areas
- Use science and math knowledge to solve a problem
- Team work
- Creativity





- Early in the year
  - Build a sturdy wall
  - Explore pulleys and gears
  - Build a Tower
- Later in the year
  - Use computer to program motors, sensors, etc.





## Lesson: Snow! Snow! Snow!



### Procedure:

- Talk about the new engineering challenge

Identify Problem	Problem: The town's people need a vehicle that can drive around and clear the roads of snow so that cars can drive.
Research	Let's think about vehicles we've seen that clear the road of snow. (Have students look at Snow Research Pictures)
Brainstorm	<i>Brainstorm as a class how you might build some of the ideas in research out of LEGO materials</i>

**Choose  
& Plan**


**Create**

*"You and your partner will need to agree on what you will build..."*

Engineer: \_\_\_\_\_

**Engineer's Planning Sheet**

Draw what you think you are going to make below:



What did you draw?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

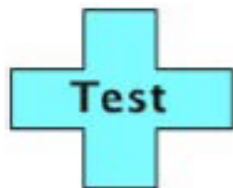
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Model filling out the planning sheet for the students. Ask them to have each partner circle the part they will build.

- Have the students build a snow removal vehicle
- Help students solve design challenges





Explain to the students their design will need to pass # tests

10. **Pick-Up Test:** Students must be able to pick up their design and have it stay together

11. **Snow Test:**

- a. **Light Snow** - Your vehicle must be able to clear a path in light snow (cotton craft puffs)  
*all vehicles must complete this test*
- b. **Medium Snow** - Your vehicle must be able to clear a path in medium snow (LEGO Bricks)  
*this is a bonus test*
- c. **Heavy Snow** - Your vehicle must be able to clear a path in heavy snow (Wet paper towels)  
*this is a bonus test*



Talk to the students about:

- How to look for problems - *"If one piece keeps falling off should you put it back on the same way? Think about how to make it sturdier, connect with more pieces etc..."*
- 



Students should fill out an Engineer's Final Report...

# Implementation Plan

Implement program in grade 1 English Classes during the 2012-13 school year

- Professional development provided by the Tufts University Center for Engineering Education and Outreach (CEEEO)
- Ongoing in-district professional development with pilot teachers to assess
  - ✧ What went well
  - ✧ What needs to be improved
- Program will be expanded in subsequent years to include grades 1-5

# STEM Schedule

Teachers will participate in a professional learning community. Sessions will be led by Marilyn Decker or Holly Concannon. They will meet monthly to:

- Observe a model lesson
- Attend professional development
- Discuss the previous month's activities, share lesson plans and plan for the next month.

Unit	September	October	November	December
Air	Air Takes Up Space	Hot Air, Cold Air	Air Pushes Things	Using Air to Move Things
LEGO WeDo	Learning to build with LEGO Vocabulary  Investigating What makes a structure strong?	The Engineering process What makes a fair test?  Using an Engineer's notebook  Designing & testing a sturdy chair for Mr. Bear	Designing a fast car What variables influence speed? Designing cars for different uses. Using a Motor to make a car move- introduction to Gears and Pulleys	Designing a Car that moves with the Wind Snow Plow Design Challenge Introduction to programming Gearing up and gearing down



# STEM Schedule

January	February	March	April	May	June
Parachutes and Air Planes					
Getting your Programmers License	Activating robots using the tilt sensor and motion sensor	Dancing Birds Designing using pulleys	Building a Sturdy House  Testing structures	Hungry Alligator  Designing using light sensors , gears and music	Building an Animal Zoo  Looking at animal structure and function
	What is an Organism?	Mealworms Life Cycle	Building a Habitat	Observing Plants, Earthworms, Toads	Animal and Plant Adaptations

# SCIENTIFIC AND ENGINEERING PRACTICES



1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information