



# ENGINEERING THE K-2 CURRICULUM

# STEM CLARIFIED

- ▶ Engineering as a unifying concepts
- ▶ Science and math as concepts
- ▶ Technology as a tool
- ▶ All subjects integrated around the central theme and based on standards in each subject integrated in the unit

# STEM

# ENGINEERING COMPONENT

- ▶ Used to propose solutions to the problems linked to real world situations
- ▶ Ties together different subjects with interdisciplinary unit
- ▶ Within each unit there may be several smaller engineering projects that can be done in a period or two
- ▶ Or they may be a larger project that spans several days or longer
- ▶ Result can be PRODUCT or PROCESS (protocol) that is a feasible solution to the problem proposed
- ▶ Always operates under constraints
- ▶ To integrate engineering, students use set of steps that guide their thinking and actions

# BENEFITS OF ENGINEERING COMPONENT

- ▶ Allows students to apply content knowledge in new situations
- ▶ Students draw on knowledge and experiences to solve non-routine problems
- ▶ Allows differentiation – both by learning modality and by student's current level of understanding
- ▶ Allows students to learn from each other, explore, connect knowledge and connect ideas
- ▶ Allows multiple paths to knowledge, variety of possible solutions and justifications
- ▶ Addresses a common misconception that science is always studied through the scientific method

# BIG IDEAS

- ▶ There is no perfect solution; any solution is a result of balancing pros and cons
- ▶ Engineers ALWAYS operate under constraints
- ▶ Being right the first time around is not the point!



# PROBLEM SOLVING BEGINS!

Volcano is erupting! We need to stop it by stopping lava flow



With your collaborative partner list some steps that you will take to solve this real world problem . Also write a statement of how this problem will affect our environment and people if it is not solved.

Be ready to share your ideas with another team.

# The STEM Process

The way to solve all the problems of the world!!!

Ask ? and Research

Imagine

Plan

Create

Reflect and Modify

1. Create a step book
2. Write the steps of the STEM process on each step of your book.
3. As you gain knowledge of each step write your own description and illustrate that step.

# Challenge Scenario

The volcano right above your city is beginning its eruption. Geological Society in your city believes that if you can drop a ball with fire extinguishing foam inside the vent (crater), the lava flow will stop, saving the city!

Your team has been given a task of designing a method to deliver the ball of foam to the vent of the volcano!



# Constraints

- You must create a device that will transport a ball to the vent
- You may not use your hands (covered or uncovered) to touch the ball; the device must be the only thing in contact with the ball once you are ready for transport. You may only operate the device.
- You must operate the device from a standing position.
- You may not extend ANY part of your body over the volcano
- You may not break or in any way change the shape of the ball
- You may ONLY use materials provided to you



# Ask and Research

Ask and research your problem to gain background knowledge.

Consider resources that will be helpful in developing your solution.



IMAGINE

Brainstorm



# PLAN

- Make a list of the materials you will use.
- Draw a diagram or write out the steps you will follow while you create your solution.



# CREATE

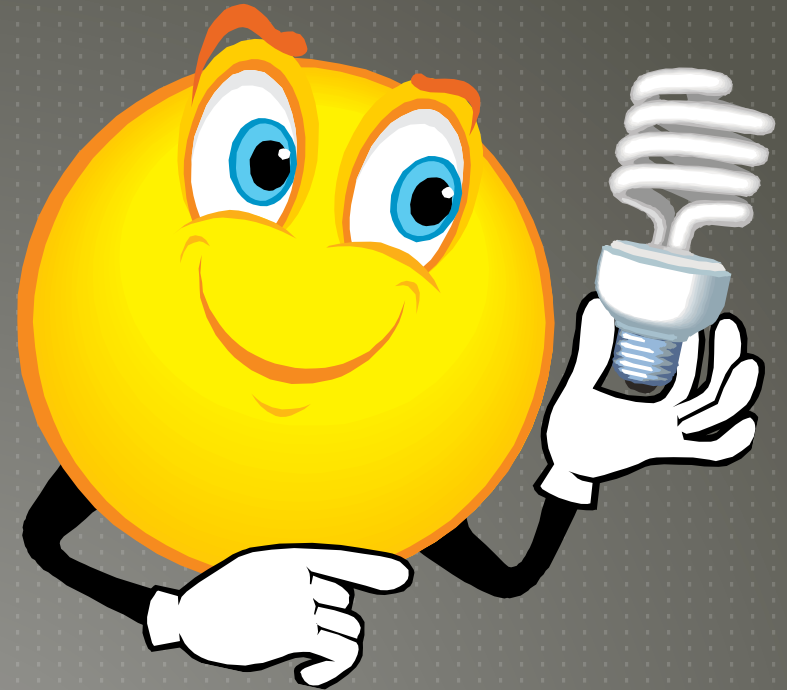
Work to actually create the device/solution to your problem.

Follow your plan

Modify plan if needed

TEST IT!!!!!!!

MAKE SURE YOU  
TEST IT!!!

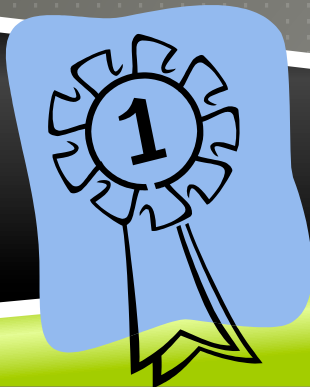




# REFLECT & MODIFY



Discuss the outcome of your test.  
Did your solution solve the problem?  
Did your team follow each constraint?  
What part of your design worked?  
What parts will you change?





# SUMMARIZE

Reflect on what we've learned about the STEM process.  
On your paper.

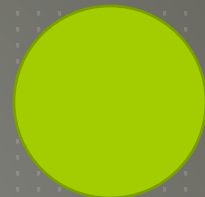
Write one thing that squared with your beliefs.



Write three points you want to remember.



Write questions still circling in your head.



# ASSESSMENT

- ▶ Ongoing formative assessment through questioning and discussion
- ▶ STEM journals
- ▶ Assessment focused on process not the final outcome
- ▶ Because we are assessing standards, assessment includes both traditional and alternative assessment
- ▶ Focused on improving student learning through ongoing feedback