

Dear Teachers,

I created these lessons for you as a tool to help you begin creating a STEM environment in your classroom. The mini lessons can be modified and adapted to fit the needs and grade levels of your students. Feel free to ask questions or borrow materials from either of the STEM labs (Room 203 or 219). I also have 3-4 copies of most of the books that I have included in the lessons. Please let me know if you have any questions. Thank you!

Tina Rodger

## STEM Ritual and Routine Lessons

### Lesson #1: What is science?

Ask students what they think science is and record their answers on chart paper. Read the book What is Science? By Rebecca Kai Dotlich. After the reading students will have many new ideas to share. Record their new responses on a new piece of chart paper. Post your anchor chart for students to refer back to.

### Lesson #2: What is a scientist?

Discuss with students what they think a scientist is? What does a scientist look like? What do scientists do? What kinds of tools does a scientist use? Record the students responses on chart paper. Read What is a Scientist by Barbara Lehn. Add new thinking to the web following reading the book. I have provided a sample anchor chart that you may want to use in your classroom for the purpose of common language. \*\*The lesson on setting up your STEM notebook begins in lesson 4. Feel free to change the order of the lessons and do what works for your class. In the table of contents record what is a scientist and insert **attachment C** into notebooks.



### Lesson #3: What is STEM?

Discuss with students that STEM stands for Science, Technology, Engineering, and Math. What do the S.T.E.M represent? Create an anchor chart for students to refer back to.

### Lesson #4: How do we set up and use our STEM science notebook?

#### What are the expectations of our STEM notebook?

The purpose of a notebook is to provide students with a means to process and reflect on learning through various modes-writing, drawing, making tables and diagrams,collecting data and conferencing with teachers.

\*The first 5 pages in the notebook should be lettered A, B, C, D, E. These pages are reserved for the table of contents (**see attachment A**) The following pages can be numbered 1-25 etc. I recommend not numbering the backs of pages.

\*The last several pages should be used as a glossary-as students learn new vocabulary terms they can be added with definitions in the glossary.

\*Teacher may want to tab the sections in the STEM notebook for students to reference more easily.

Hand out the **STEM notebook expectations (See attachment B)**. Explain to the students that these are very special notebooks that will help us ask questions about science, make predictions, record observations and record data about investigations; and explain their thinking about what they have learned. The notebooks are evidence of student learning. In the Table of Contents write STEM notebook expectations and the page number. Show the students how to glue the expectations into their notebooks-focusing on how to turn one page at a time and how to use glue appropriately and neatly.

\*\*Remind students that pages should not be removed from the notebook and the notebook should not be used for anything else.

\*\*Loose items should be taped or glued to pages in the STEM notebook.

#### **Lesson #5: What are the ABCD's of science drawings?**

Create an anchor chart labeled the ABCD's of Scientific Drawing.

A: Accurate

B: Big

C: Colorful

D: Detailed



Model what each part would look like and have students practice by choosing something to draw in their science notebooks that is accurate, big, colorful and detailed.

[ABCD's of Drawing](#)

#### **Lesson #6: How do we make an entry into our STEM notebooks?**

Ask the students to think about what they have learned so far about science and being a scientist.

Explain that today you want them to think about what kind of scientist they would like to be and draw a picture in their STEM notebooks. Model for the students. In the table of contents record I am a Scientist and the page number that they will be doing their work on. Show them how to find the page and write the date at the top of the page so they have a record of when they did this work.

Encourage students to use the anchor charts created in previous lessons to help them with the drawing. Students should add details to their pictures, including the things scientists study and the tools they use.

#### **Lesson #7: What does it mean to notice and wonder?**

Scientists notice and wonder all the time. Throughout our FOSS investigations the students will be noticing and wondering. When we notice things we are discovering new things. For example, "I notice our classroom has a sink in it." When we wonder we are curious about something and we

want to learn more about it. For example, “I wonder what science investigations we will do this year.” Introduce students to the website wonderopolis. <http://wonderopolis.org/> Give students time to explore through the site. An idea might be to include a “Wonder of the Day” into your morning work/bellwork time using the website.

In the table of contents input “I notice, I wonder.” Teacher tells students now it’s their turn to practice noticing and wondering. Give each student 2 sticky notes. Give them 3 minutes to think. Encourage them to look around the classroom. Have students record one “I notice....” on one sticky note one I wonder.... on the other. Give them 2 minutes to write down one notice and one wonder on the sticky notes. Students can share with the person next to them what they noticed and wonder about. Place these sticky notes on the next page of their STEM notebooks for students to refer back to or stick all noticings and wonderings on an anchor chart.

### **Lesson #8: Scientists Ask Questions**

Read the book Scientists Ask Questions by Ginger Garret pages 3-18. Discuss why scientists ask so many questions and how they use their senses to find answers to their questions. Create an anchor chart based on what process the character goes through in the book as he is acting like a scientist (ask questions, experiments using their senses to find the answer, change a variable, write steps, write what happened, draw, share the results, use tools to find answers. **See Attachment D.** Record Scientists ask Questions into the table of contents and attach and complete attachment into the STEM notebook.

**Lesson #9: What tools do scientists use? How do we use tools safely?** Ask the students if anyone knows some tools that scientists use. Read the remainder of Scientists Ask Questions and Science Tools or Tools by Susan Canizares .Create an anchor chart on how to use science tools safely. Hand out science safety contracts (**See Attachment F. There are several attachments for this part. Use all or some of what works best for your class.**) Discuss contract- sign and glue into STEM notebooks. <http://crisscrossapplesauce.typepad.com/files/science-safety-contract.pdf> Set up stations with different science tools (magnifying glasses (hand lens), magnets, measuring cups and bowls (and something to put in them like beans or rice), tweezers, beakers, balance scale, tape measures, and droppers. Give the students time to explore and observe the different science tools. Create an I notice/I wonder chart after exploring either as a whole group or individually in science notebooks. Come back together and share discoveries.

<http://crisscrossapplesauce.typepad.com/files/vocabulary-science-tools.pdf>

\*\*Have students cut out and glue the pictures of the science tools into their STEM notebooks. (This will help students learn the appropriate science vocabulary.)

### **Lesson #10: What is an engineer?**

Watch the youtube video as a class. [http://www.youtube.com/watch?v=wE-z\\_TJyzil](http://www.youtube.com/watch?v=wE-z_TJyzil) Create an anchor chart “What is an engineer?” Explain that an engineer is someone who designs and builds things we use everyday. Have students share what they learned from the video and write ideas on chart paper....Lead them in a specific order: ask, imagine, plan, create, improve. **See Attachment H** to make an anchor chart of the engineering design process.

Practice Task: In groups of 3 give students a ziploc bag with 20 mini marshmallows, 24 toothpicks and 1 index card. The students task is to build the tallest structure possible that can hold 80 grams

of weight. The index card should be on top of the structure and used to hold the gram weights. Modify for your grade level.

Notebook: Draw and label a sketch of what you engineered in your notebook.

Teacher Role: Encourage students to work through the design process.

**Lesson #11: What are the science practices?** The list below was taken from the NGSS (Next Generation Science Standards)

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

Scientists use all or some of these practices when they do tests and investigations. Make an anchor chart of the 8 science practices. Teachers have the option to do a mini lesson with each practice.

**Lesson #12: How do we make observations?**

**Lesson: Science Mystery Bags**

<http://www.scholastic.com/teachers/top-teaching/2014/01/mystery-bags-develop-observation-and-inf-erence-skills> (Link to the full lesson)

<http://video.scholastic.com/services/player/bcpid2727792767001?bckey=AQ~~.AAAAFv844g~.BASb5BU03X-DrGv5AhG6m2DIgA4HQAmE&bctid=3023031200001> (Video link that explains lesson)

**See Attachment G (optional-lesson provides a recording sheet)**



Sample Anchor Chart

### Lesson #13: How do we work in cooperative groups?

\*\*Some classes may need several days of practice working in cooperative groups.

Discuss with students your expectations for working in groups? What does it mean to cooperate?

Video link below on teamwork

<https://www.youtube.com/watch?v=TZqFYtWCWXg> Appropriate for K-3

Teamwork Quotes about teamwork Grades 4-8 analyze in small groups and share out prior to creating charts.

Create an anchor chart for working in cooperative groups

#### Looks Like

- \*Using materials appropriately
- \*All students participating
- \*Students stay on task
- \*Students recording in STEM notebooks

#### Sounds Like

- \*Using level 1 voices
- \*Listen to each other talk
- \*Give each other feedback

**Lesson #14: Science Investigation (Optional) Let's practice everything we have learned so far!!**

Today you will be making **Milk Rainbows!** It's a fun activity that serves 3 purposes:

1. It gives kids a chance to practice safety expectations.
2. It gives them a chance to practice the role of a scientist.
3. It gives kids a chance to practice recording observations in their science notebooks.

Making the rainbows is easy. Here's a video to show you.....

<https://www.youtube.com/watch?v=7FjF1MR86cQ>

You will need:

1. a pie plate
2. whole milk
3. food coloring
4. dawn dish soap (I put a small amount in little cups)
5. q-tips (1 for each student)

Break the students up into groups of 5 ( I model each step before I let them try):

Scientist #1: carefully pour milk in the plate..covering the bottom surface of the plate

Scientist #2: squeeze 3 drops of red food coloring in the center of the milk

Scientist #3: squeeze 3 drops of yellow food coloring next to the red

Scientist #4: squeeze 3 drops of blue food coloring next to the yellow

Scientist #5: squeeze 3 drops of green food coloring next to the blue

Stop here and ask the students to make predictions about what is going to happen when we put the soap in the milk. Then.....

Scientist #1: Dip your qtip in the dish soap and CAREFULLY press it into the food coloring and hold it down.







The kids will LOVE this part!!!!

\*\*Repeat the last step until all scientists have had the chance to press a qtip into the milk.

After the kids observe the rainbow for several minutes, instruct them to draw what happened in their STEM notebooks. Talk about what a good recording would include....the plate, the milk, the colors (labeling the pics). Discuss how important it is for scientists to record observations as accurately as they can. Provide examples and models and lots of positive feedback!



Attachment B: STEM Notebook Expectations

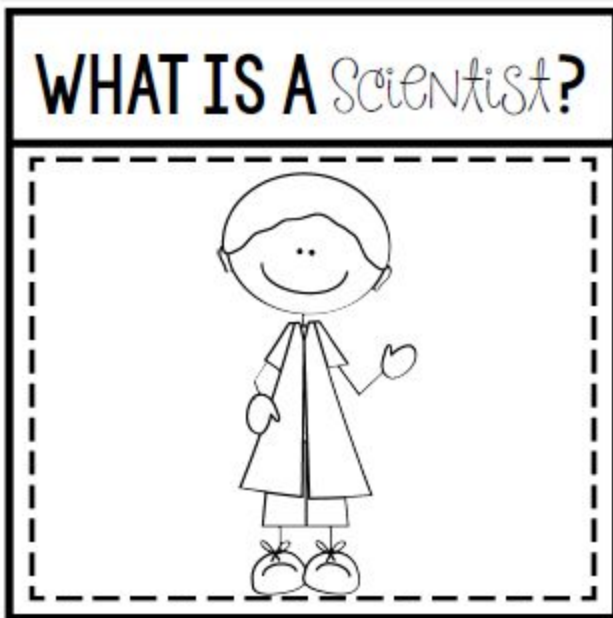
 <h2>Science Notebook Expectations</h2>  <ol style="list-style-type: none"><li>1. I will think and make predictions.</li><li>2. I will think and ask questions.</li><li>3. I will use my 5 senses to investigate problems.</li><li>4. I will record observations with pictures and words.</li><li>5. I will support my claims with evidence.</li><li>6. I will be ready to explain my thinking.</li><li>7. I will be neat and organized.</li><li>8. I will do my very best!</li><li>9. I will follow all of our Science Safety rules.</li></ol> 	 <h2>Science Notebook Expectations</h2>  <ol style="list-style-type: none"><li>1. I will think and make predictions.</li><li>2. I will think and ask questions.</li><li>3. I will use my 5 senses to investigate problems.</li><li>4. I will record my observations with pictures and words.</li><li>5. I will support my claims with evidence.</li><li>6. I will be ready to explain my thinking.</li><li>7. I will be neat and organized.</li><li>8. I will do my very best!</li><li>9. I will follow all of our Science Safety rules.</li></ol> 
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Attachment C:

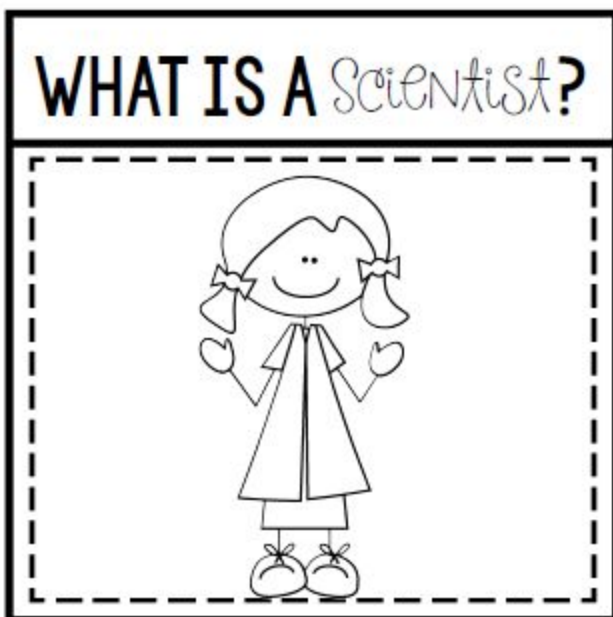
Directions:

Color and cut out the interactive notebook page. Under the flap write or draw what you think a scientist is.



Directions:

Color and cut out the interactive notebook page. Under the flap write or draw what you think a scientist is.



Directions:

Color and cut out the interactive notebook page. Under the flap paste the definition of a scientist.

## WHAT IS A Scientist?



A scientist is a person who observes the world around them and asks questions about it. Scientists find different ways to answer the questions they ask.

Attachment D: Scientists Ask Questions


Scientists use their 5 senses to answer questions and solve problems.

I use **MY 5 Senses**

Hearing 
Sight 
Smell 
Taste 
Touch 

Directions:  
Color and cut the interactive page. Paste the page onto your science notebook. Under each flap write or draw some things you can do with each sense.

I can observe the world around me.




## Science Safety Contract

1. I will listen carefully and follow all teacher directions..
2. I will ask questions if I do not understand.
3. I will NOT touch anything without my teacher's permission.
4. I will never eat or smell anything unless my teacher tells me to do so.
5. I will work hard to keep myself safe.
6. I will work hard to keep my friends safe.
7. I will tell my teacher if someone is being unsafe.
8. I will let my teacher know of any accidents or injuries.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_



## Science Safety Contract

1. I will listen carefully and follow all teacher directions..
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5. I will work hard to keep myself safe.
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7. I will tell my teacher if someone is being unsafe.
8. I will let my teacher know of any accidents or injuries.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

# SCIENCE Tools

goggles



magnet



magnifying lens



microscope



pin



test tube

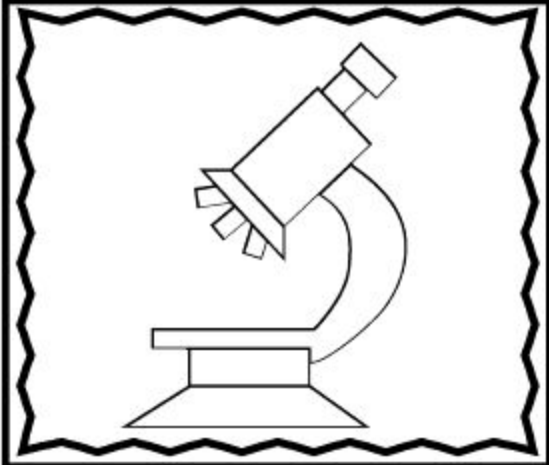


Directions:

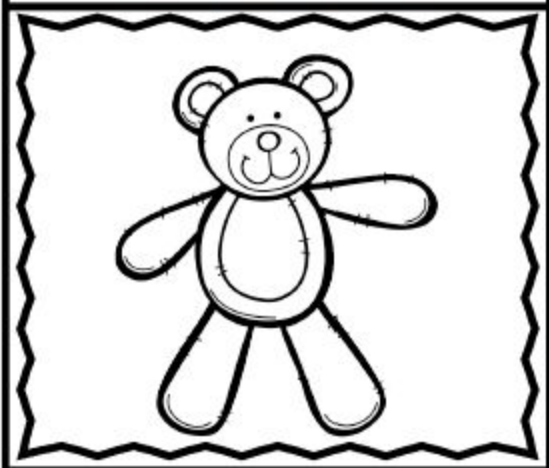
Color, cut, and paste the interactive page.

Under the flap write one use for that science tool.

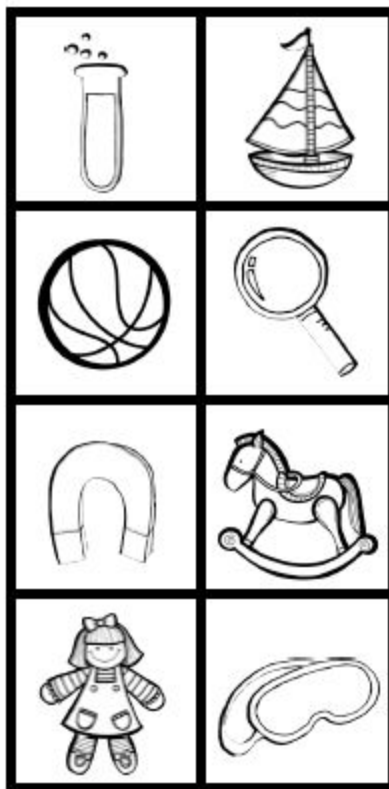
# Science TOOLS



# TOYS

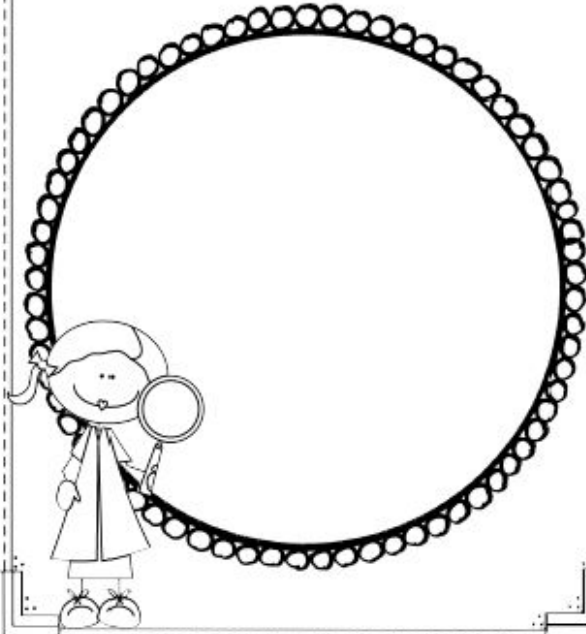


Directions:  
Color, cut, and paste the  
interactive page.  
Sort the science tools  
and toys under the  
correct flap.



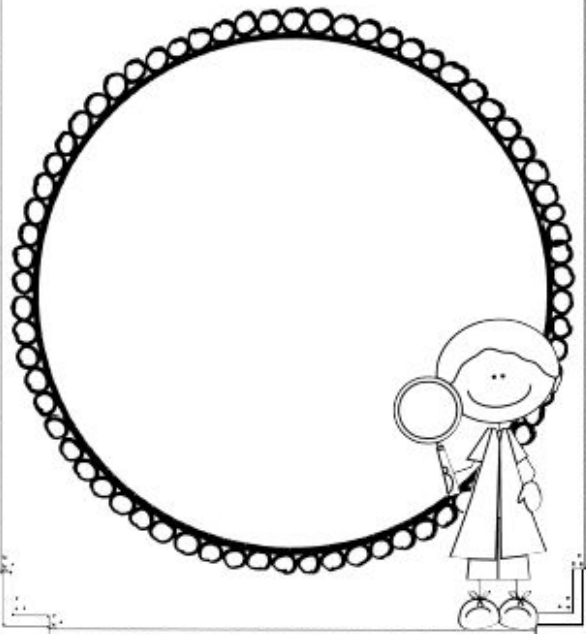
Scientists select and use appropriate tools.

Draw some science tools you know how to use.



Scientists select and use appropriate tools.

Draw some science tools you know how to use.





Directions:

Color, cut, and paste the interactive page onto your notebook.

Paste the definition under the correct vocabulary word.

Science Vocabulary	balance
	data
	emergency
	experiment
	hand lens
	hypothesis

Information collected during an experiment.
A test that is planned carefully and uses science to answer questions.
An instrument that shows how heavy something is.
A tool that helps you to see tiny objects.
A smart guess you can test.
An event that needs immediate action or assistance.

Directions:

Color, cut, and paste the interactive page onto your notebook.

Paste the definition under the correct vocabulary word.

Science Vocabulary	investigate
	non-standard
	observe
	problem
	safety
	safety goggles

A unit of measure that uses everyday objects.
Something that needs an answer.
To look for an answer.
To see.
Keeps you from getting hurt.
Glasses that keep your eyes safe.

Directions:

Color, cut, and paste the interactive page onto your notebook.

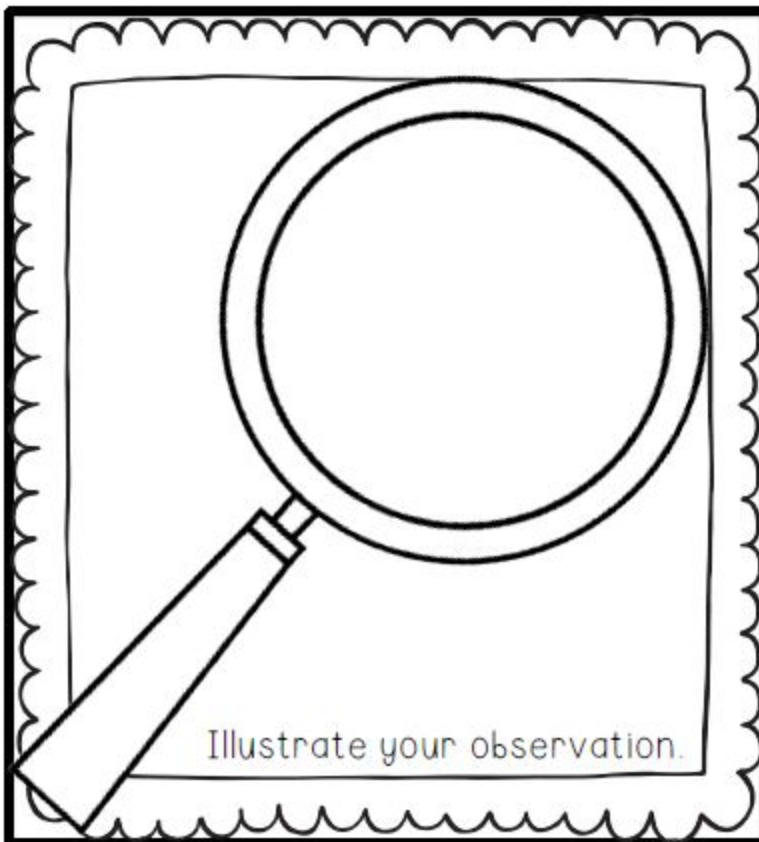
Paste the definition under the correct vocabulary word.

science vocabulary	scientist
	solution
	thermometer
	tool

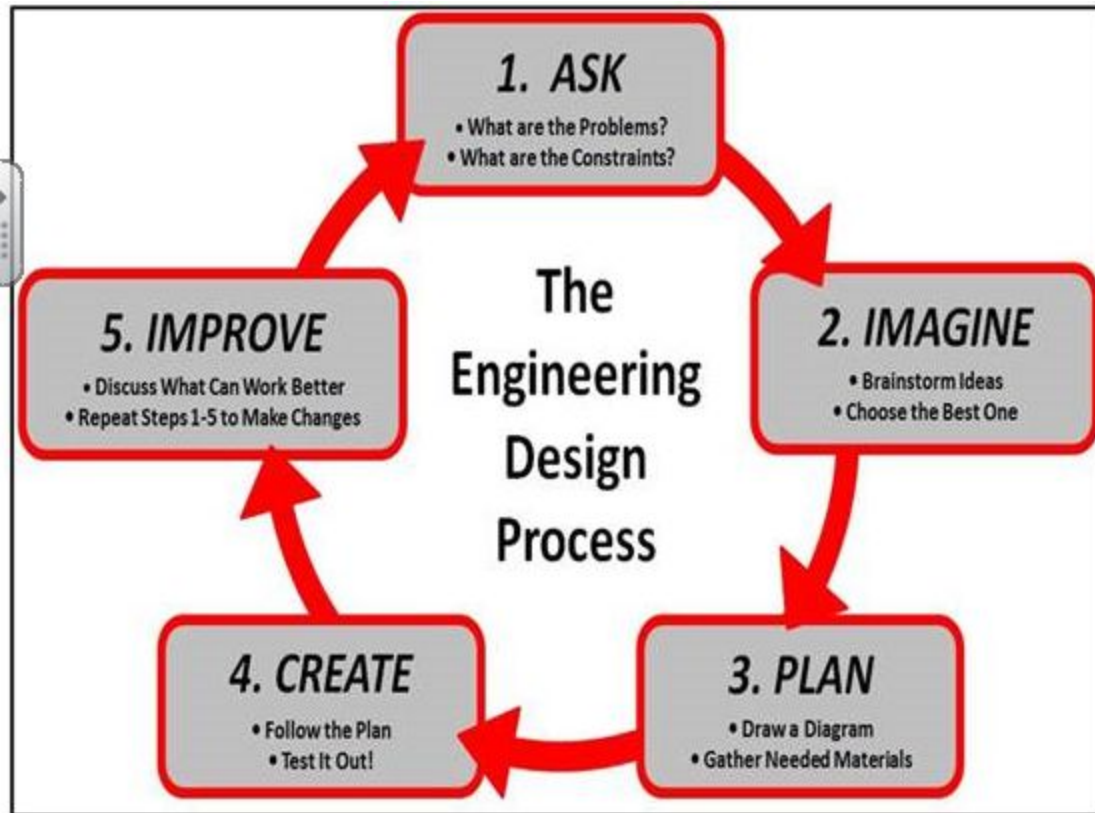
The answer to a problem.
A science tool used to measure temperature.
Someone that uses science to answer questions.
An object that helps you do work.

Attachment G: Making Observations

Scientists make  
good observations.



Attachment H: Engineering Design Process



Created by Tina Rodger