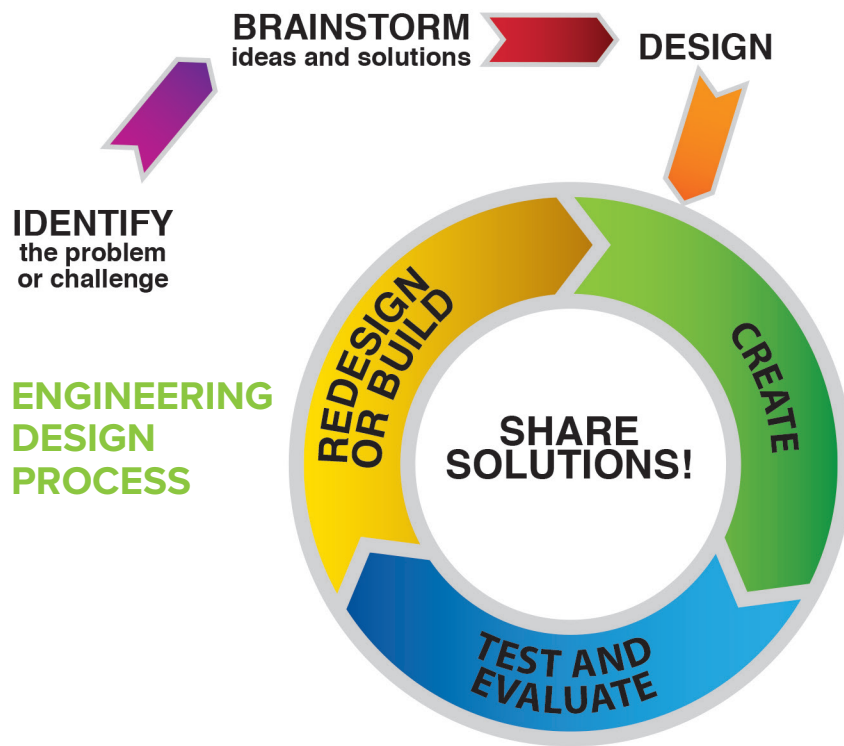


Can We Control What We See? Lab Worksheet

Engineering is about developing new solutions to problems and challenges in our world. The Texas A&M Transportation Institute works every day towards solutions in all aspects of transportation. They conduct over 700 research projects each year on the land, sea and in the air.



The engineering design process is fluid. It does not have to begin or end at a particular point. One important aspect of the process is to share solutions along the way with others. Engineering is the design and building of new ideas.

TEAM CHALLENGE:

Design and build a directional sign to achieve maximum retroreflection to the driver with headlights at night.



Materials:

- 12 marbles
- Clay or Play-Doh
- Rulers
- Aluminum foil
- 8"x 11" manila folder
- Construction paper
- Scissors
- Glue
- Clear tape

KEY VOCABULARY

As a class, define each of the following words and determine how they are important components of engineering.

Effective:

Criteria:

Can We Control What We See? Lab Worksheet

PART ONE: Define the problem or challenge

With your team, state your challenge. What is it that you are trying to accomplish? Decide this as a group.

Once you have defined the problem or challenge as a team, you will work **alone** on the next two steps.

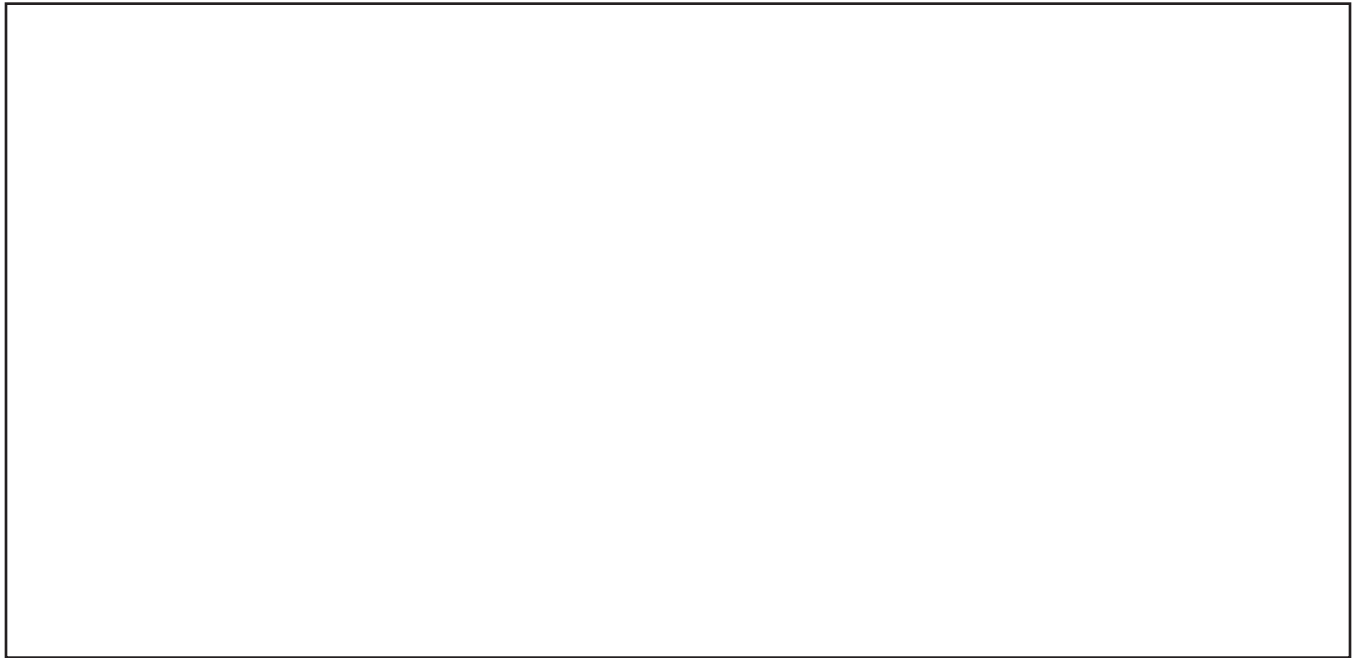
BRAINSTORM: ALL ideas are good ideas at this stage. Here is where creativity is needed and no reasonable idea is bad or wrong. This part of the process helps us use what we know and combine it with imagination. Did you ever hear the saying, “two heads are better than one?” Well here EACH team member should come up with their own idea or ideas to share with the group. **Work independently and write down all your ideas here.**

Can We Control What We See? Lab Worksheet

PART TWO: Design

INDIVIDUAL: Continue to work alone to complete your design. Now it is time to work through all of the pros and cons of each idea. Here you will design a sign that tells drivers to turn right. You can use pictures or words or both on your sign. Make sure your sign fulfills the criteria and uses only the materials allowed. This design is your very own idea that you will share with the group after completing your design and answering the first two questions below. Be creative.

YOUR PERSONAL IDEAS FOR THE SIGN:



What do you like best about your personal idea? Why?

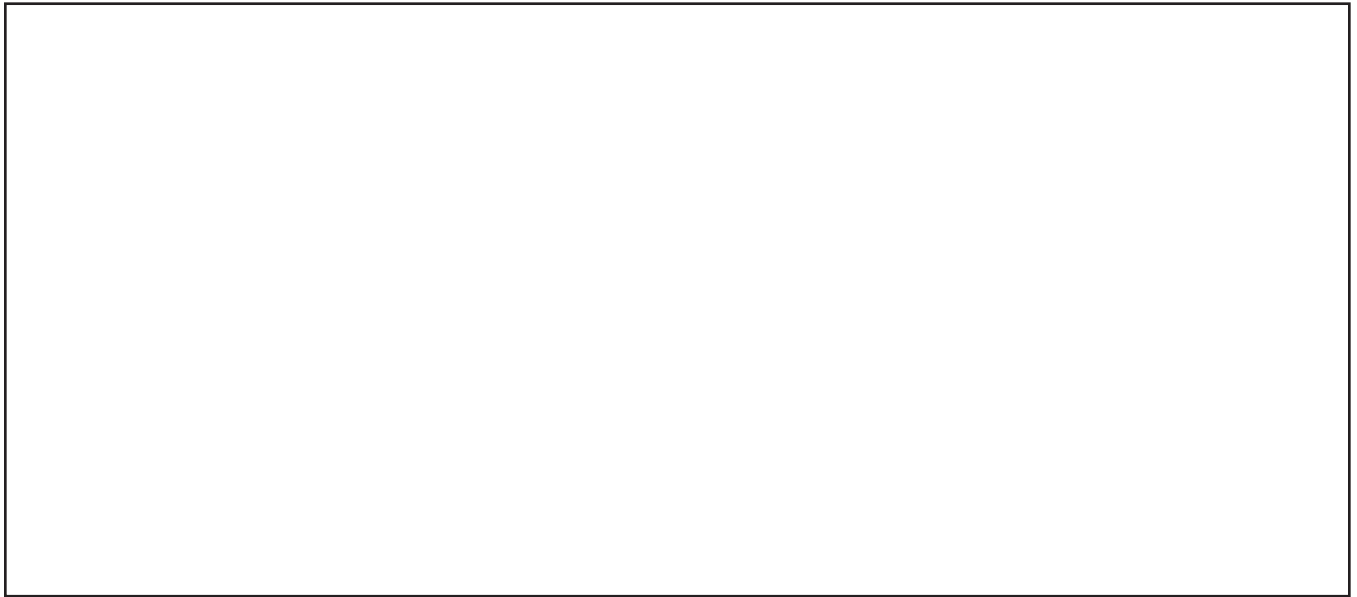
What do you have the most concern about your personal idea? Explain.

Can We Control What We See? Lab Worksheet

PART THREE: Team Design

With your team, design again. Combine each member's design into one so that you maximize your great ideas for a successful design that meets the criteria. Be very detailed in your drawing and label all items. While not every idea will be a part of the team sign, all ideas help generate solutions. Part of the engineering design process is working through ideas to find the best solutions to the problem. 3M Engineer Tim Hoopman said, "Be a risk taker. Let your failures be your education and your successes be your legacy."

TEAM SIGN DESIGN (everyone should have the same sign here)



MATERIALS LIST: Be very specific; example: 3 red marbles. Remember you can ONLY use materials from the original list.



CREATE: Make a sign using the team's best ideas.

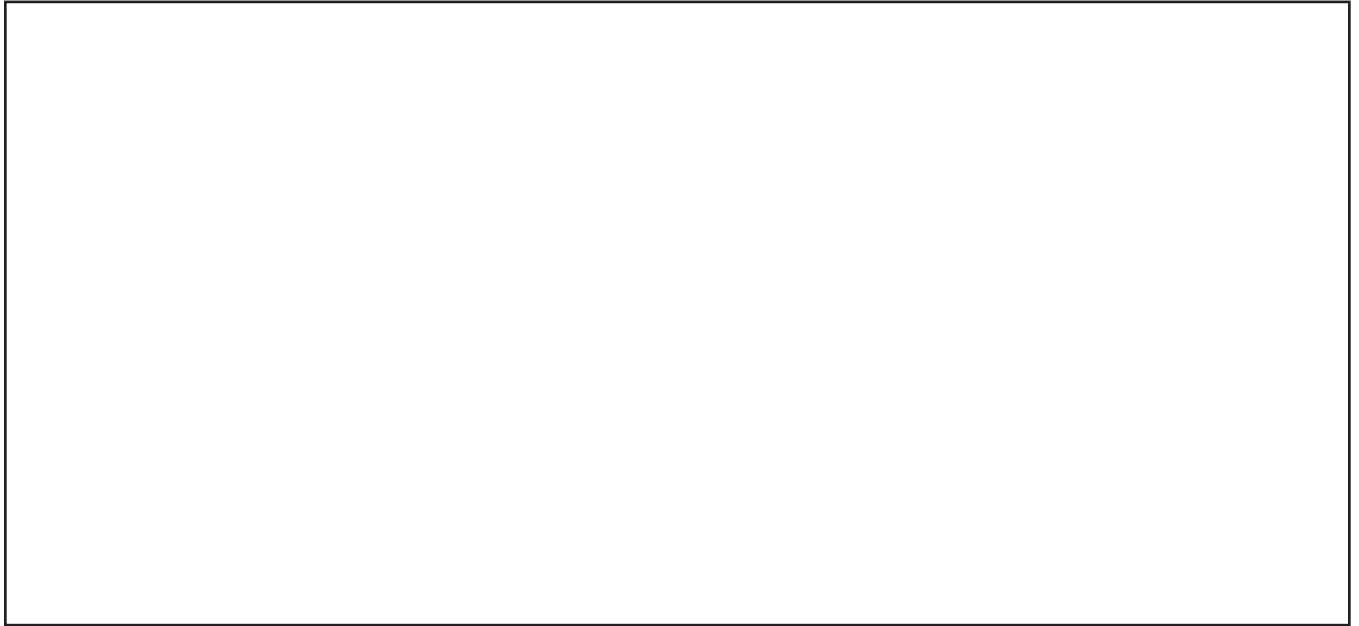
TEST & EVALUATE: Test out your sign and evaluate the results. Record all positive and negative results.



Can We Control What We See? Lab Worksheet

REDESIGN: Redesign to solve any problems with your sign. Document some things you might change to the design. Did you consider varying the depth of marbles, adjusting the spacing between marbles, or changing what is behind each marble or marbles?

FINAL TEAM SIGN DESIGN



SHARE SUCCESS:

Share successful solutions with the class, not only the finished product, but the steps you took along the way.

What are some features that successful projects have in common?

What was the best retroreflective feature on your project? Why?

What was the best retroreflective feature of another project? Why?

How could we combine all the team's best work for even better retroreflective results?

If you had more time, or other resources, how could you improve your sign?