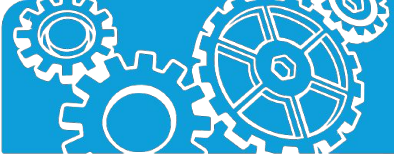




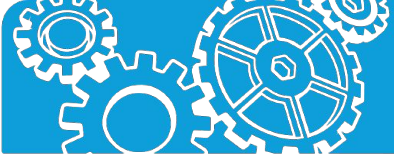
Lesson 1: Mechanical Engineering and Egg Drop

(Instruct/Play/Investigate/Test)



Vocabulary

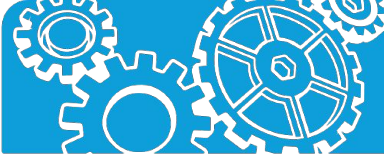
- ★ **Design Criteria:** the expectations for a engineering solution
- ★ **Force:** a push or a pull
- ★ **Kinetic Energy:** the energy of motion
- ★ **Mechanics:** the study of energy, forces, and motion
- ★ **Motion:** when an object moves
- ★ **Potential Energy:** stored energy



Welcome to engineering!

What is engineering? How do engineers use creativity and teamwork to solve problems? What types of problems do different engineers solve?

These are things you will learn about during Tech Week!

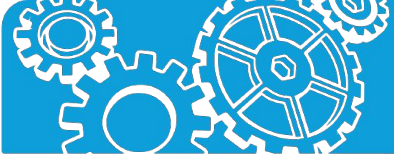


What is engineering?

Engineering is a branch of technology that involves designing things to solve problems. There are many different types of engineering. This includes mechanical, electrical, chemical, civil, and industrial. You'll learn about each of these types during Tech Week.



All engineers are creative problem-solvers. What problems have you solved in your life? Did you create or build something to solve the problem? If you did, then you have already done some engineering!

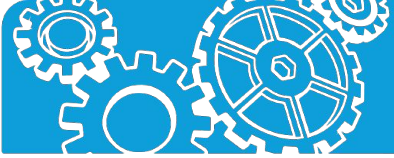


What is mechanical engineering?

Mechanical Engineering is a type of engineering that focuses on **mechanics**, or movement. **Mechanical** means “motion.” It also means “machines.”

Mechanical engineers use knowledge of motion, forces, and energy to design machines. For example, **mechanical engineers** might design and build different parts of a car, such as the engine or wheels.





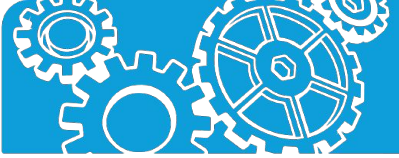
Mechanical Engineering in Action!

Mechanical engineers don't just design cars! They work in lots of other places, too.

A mechanical engineer might also design...

- airplanes
- rockets
- air conditioning units
- motors
- robots
- machines or processes to generate energy
- machines or processes for hospitals
- machines or processes for sports teams





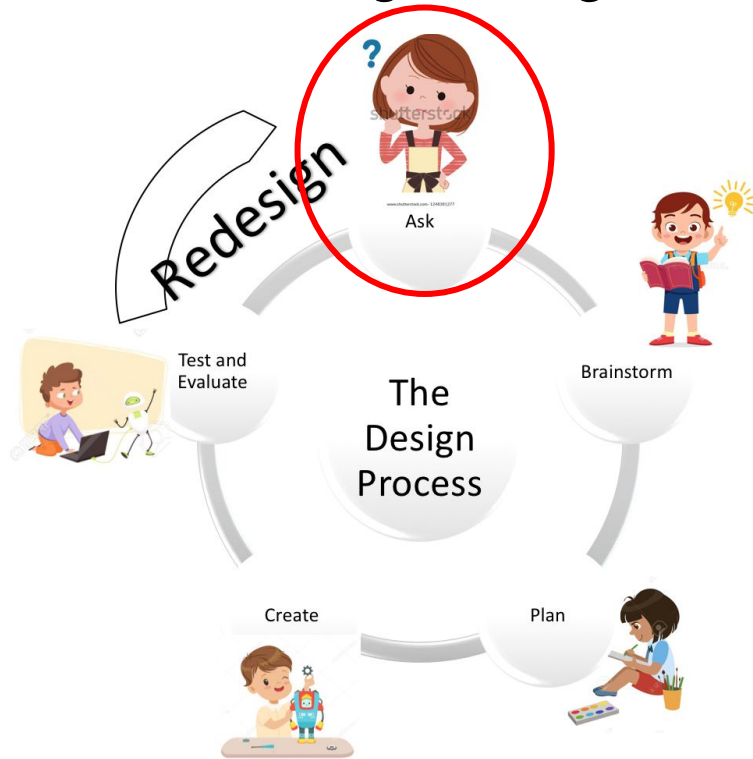
Mechanical Engineering in Action!

Ask yourself: How do you usually get from place to place? Do you take a car? Or a bike? Or a plane?

Who do you think designed and built all of these machines?

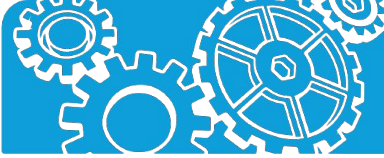


Mechanical Engineering in Action!

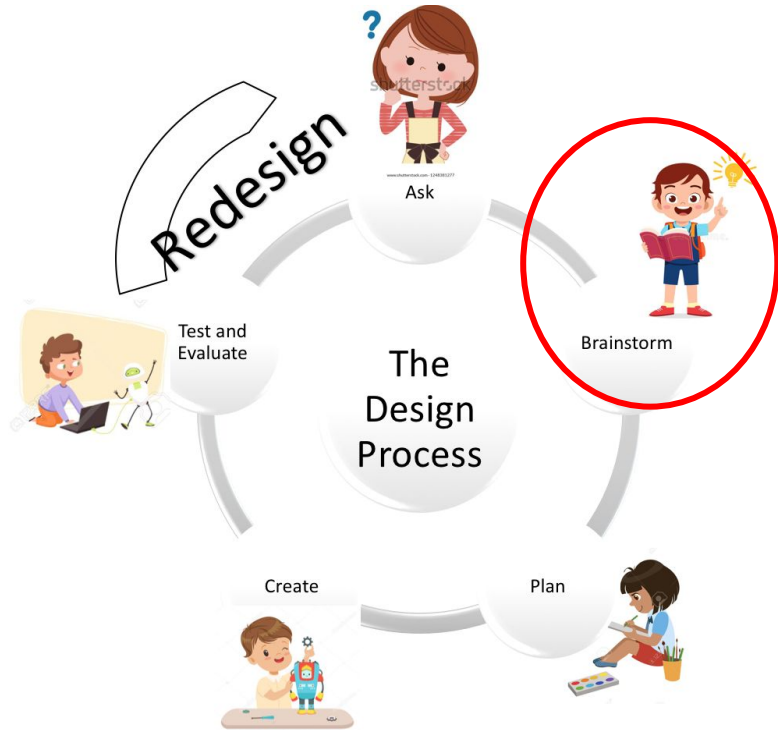


Asking a question is the first step of the Engineering Design Process. This process is the steps that engineers use to help them solve problems.



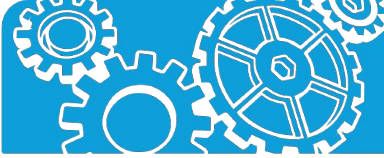


Mechanical Engineering in Action!

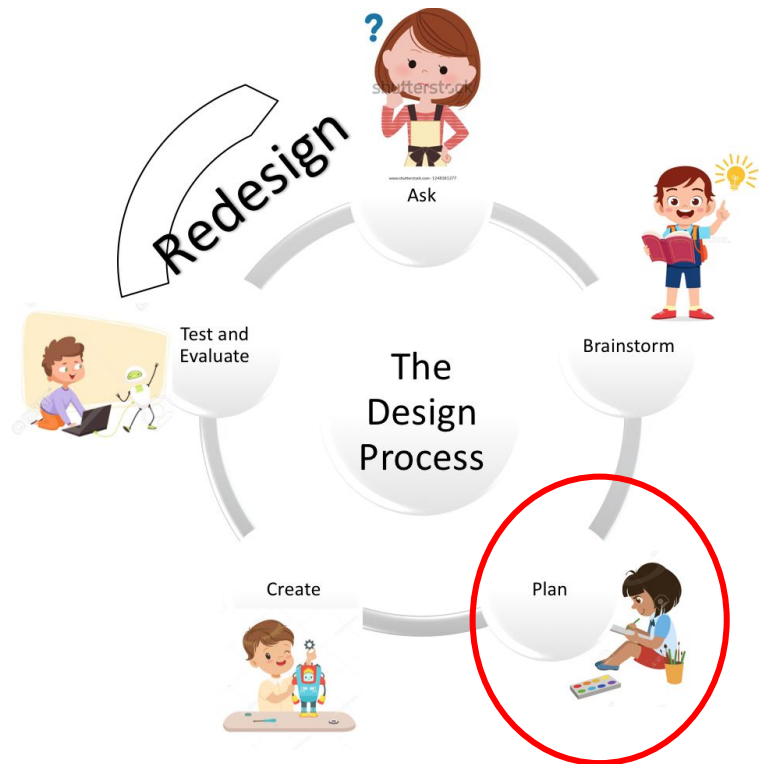


Next, **brainstorm** some different machines that could help you move from place to place.



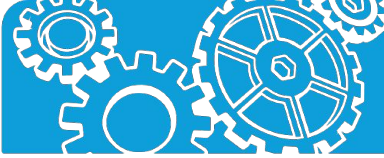


Mechanical Engineering in Action!

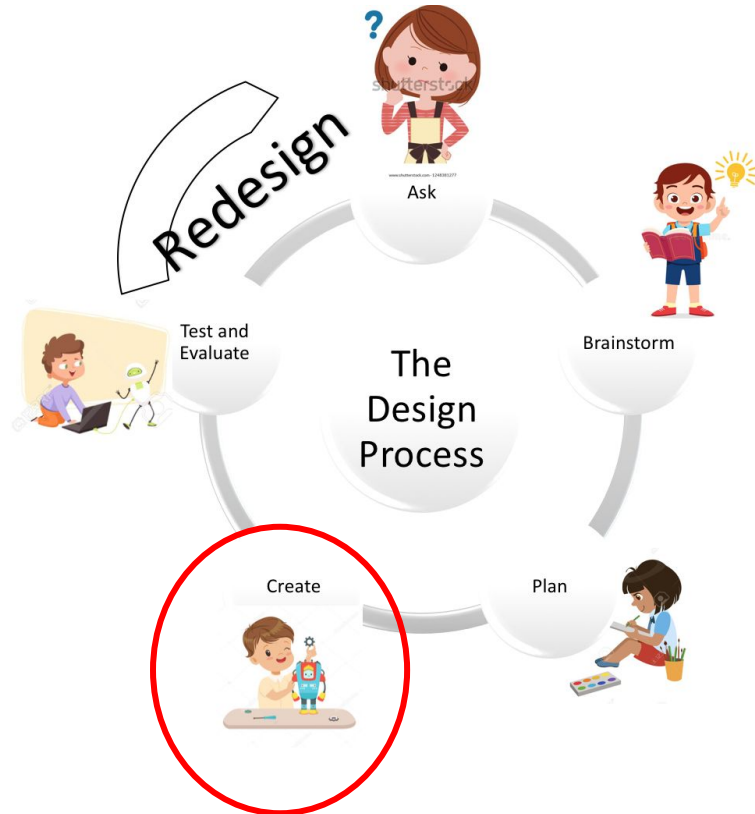


It's time to make a **plan**! Let's choose one of the ideas that we brainstormed. For now, we'll explore the bike.





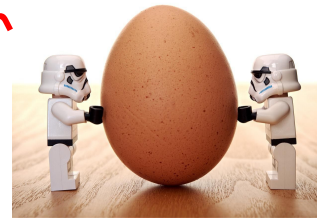
Mechanical Engineering in Action!



Mechanical engineers **create** the machines that they plan to build.

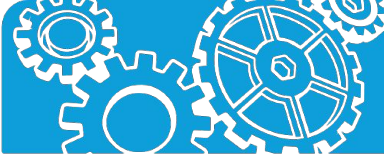
Mechanical engineers have to think about forces. A **force** is a push or a pull on an object. Some forces are contact (touching) forces. Such as a person pushing something across the floor. Some forces are non-contact (not touching) forces. Such as gravity pulling an object to the ground.

push

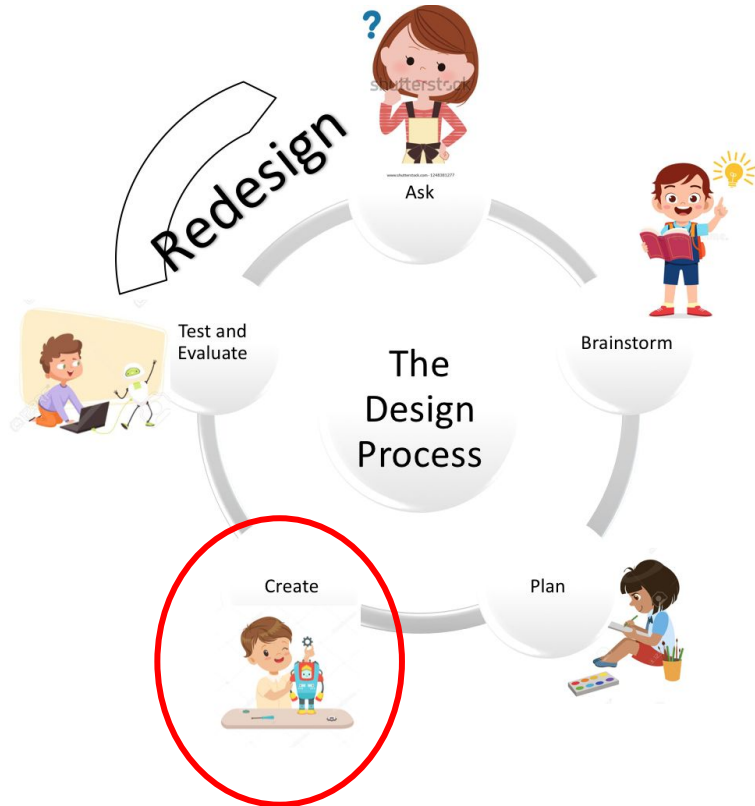


pull





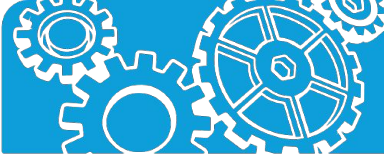
Mechanical Engineering in Action!



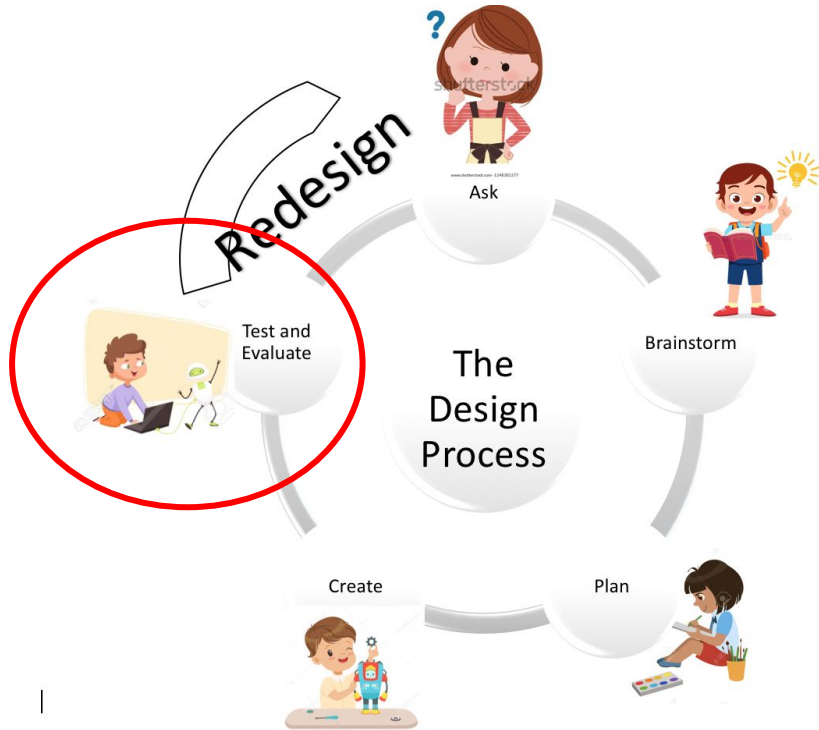
What are some forces on the bike?

A person **pushes** the pedals with their feet.
Gravity **pulls** the bike down the hill!





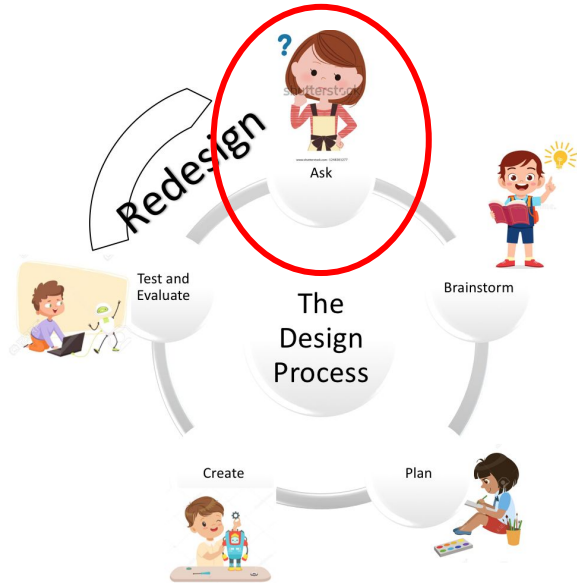
Mechanical Engineering in Action!



Now it's time to **test**, then **evaluate**, your design! Did your bike work? Did it help you get from place to place?



Activity



How can we save Humpty Dumpty from his great fall?

Have you ever heard the story of Humpty Dumpty? He's an egg who falls off a wall. Today, you're going to be a **mechanical engineer**. You will use your knowledge of **forces** and **energy** to save Humpty Dumpty!

Your job is to prevent an egg from being destroyed when it is dropped from a height of six feet. Use the activity template below. The template will help you use the **engineering design process** to solve our problem.

https://docs.google.com/presentation/d/1J-UUblci_4kQvmX3dgvfTIKGL3mO_XlqrNX5-hKdITw/edit?usp=sharing

What do I need to know to solve this problem?

Mechanical engineers use their knowledge of **forces** and **energy** to solve problems. You already know that a **force** is a push or a pull.

Energy makes things work. When you wake up in the morning, you probably eat some breakfast. The food from your breakfast gives you **energy**.

By the time you get to school, your body has enough **energy** to start your school work. Where did this energy come from? Well, the food had energy stored inside of it. This stored energy is called **potential energy**. It hasn't done anything yet, but it has the **potential** to make your body move and do things!

Once you get to school, you might go to gym class for a game of baseball. As you play, you are *moving*. This *movement*, and any other movement, is called **kinetic energy**.

Potential energy



You store energy in your body by eating food!

Kinetic energy



Your body uses the stored energy to move!

What do I need to know to solve this problem?

Let's look at another example of **potential** and **kinetic** energy.

When Humpty Dumpty is sitting on the wall, he has the **potential** of falling down. He hasn't fallen yet. However, he has energy stored inside of him. This stored energy could **potentially** make him fall.

What happens when Humpty Dumpty falls off the wall? Gravity will pull him to the ground. He'll move. Now, Humpty Dumpty has **kinetic** energy!

Potential energy

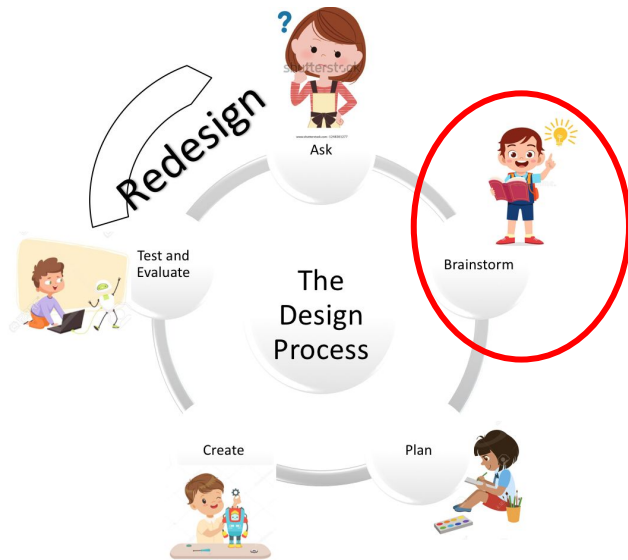


Kinetic energy



Egg Drop

Activity



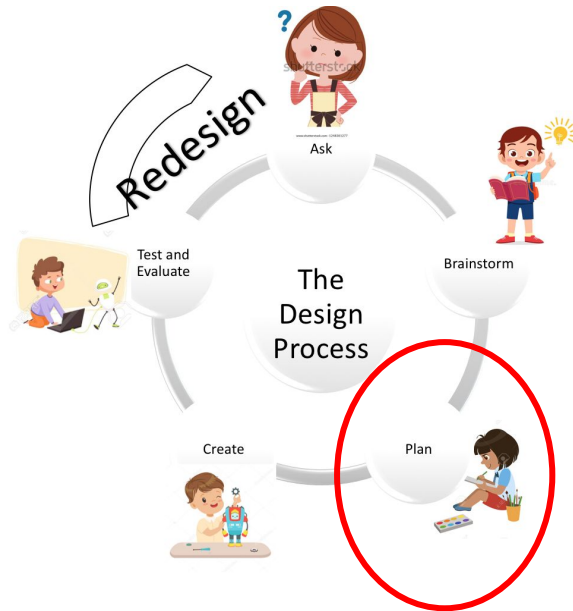
Brainstorm

Now that we know about **forces** and **energy**, let's brainstorm a way to help Humpty Dumpty!

Use this template to write down your ideas.

https://docs.google.com/presentation/d/1J-UUblci_4kQvmX3dggfTIKG_L3mO_XlqrNX5-hKdITw/edit?usp=sharing

Activity



Plan

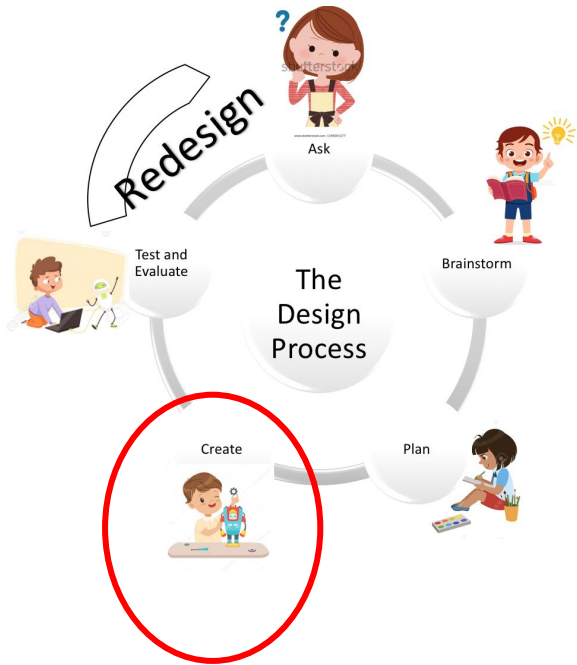
Now it's time to make a plan! Decide which of your ideas best meets these criteria and constraints.

Criteria	Constraints:
Drop your egg from six feet. Your design <u>must</u> protect the egg from breaking.	You only have 30 minutes to create your prototype.

Use this template to write down your ideas.

https://docs.google.com/presentation/d/1J-UUblci_4kQvmX3dgvfTIKG_L3mO_XlqrNX5-hKdITw/edit?usp=sharing

Activity



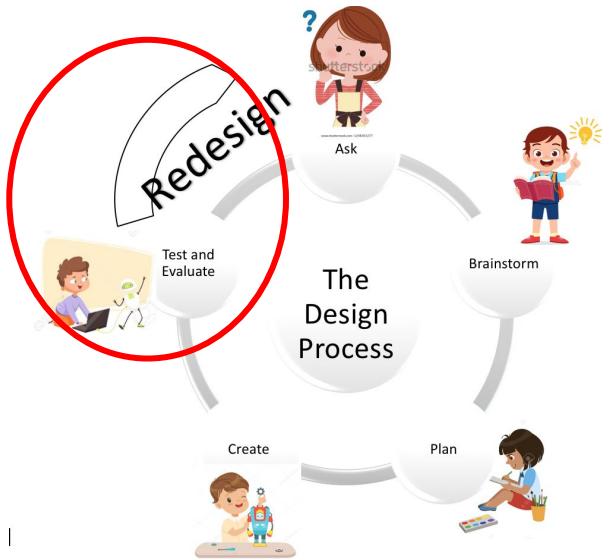
Create

Now, you can create!

Use this template to write down your ideas.

https://docs.google.com/presentation/d/1J-UUblci_4kQvmX3dgfvTIKG_L3mO_XlqrNX5-hKdITw/edit?usp=sharing

Activity



Test and Evaluate

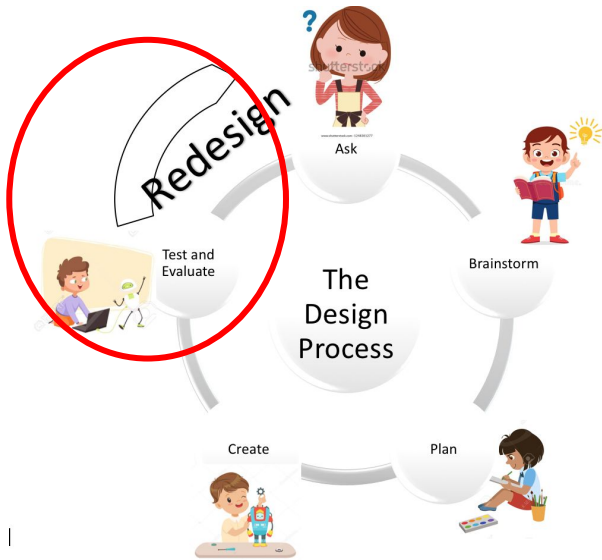
Test your design! Then, evaluate it! Did it meet the criteria and constraints?

Criteria	Constraints:
Drop your egg from six feet. Your design <u>must</u> protect the egg from breaking.	You only have 30 minutes to create your prototype.

Use this template to write down your ideas.

https://docs.google.com/presentation/d/1J-UUblci_4kQvmX3dgvfTIKG_L3mO_XlqrNX5-hKdITw/edit?usp=sharing

Activity



Improve

Are there any ways that you could improve or redesign? What would make your design even better?

Use this template to write down your ideas.

https://docs.google.com/presentation/d/1J-UUblci_4kQvmX3dggfTIKG_L3mO_XlqrNX5-hKdITw/edit?usp=sharing