

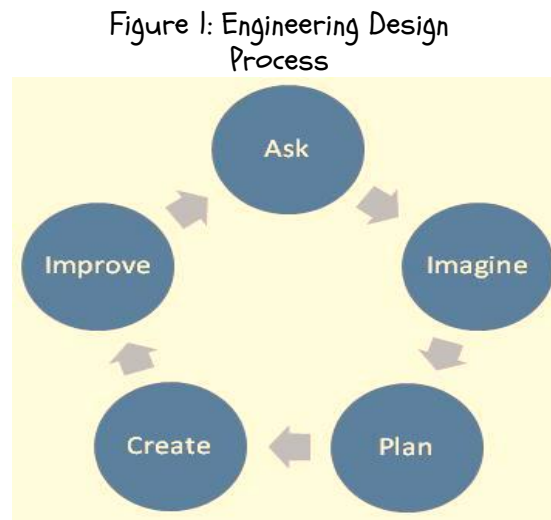
# Tiny Stitches: Engineering Design Process

Your team of engineers will design a surgical instrument that can safely remove an unwanted object from a goat's stomach. You cannot hurt the goat or damage the object. The dominoes will represent the goat's stomach, so be careful not to hurt the goat by knocking over the dominoes. The materials you can use are pictured below.

				
Craft Sticks	Rubber Bands	String	Masking Tape	Straws
				
Cups	Pipe Cleaners	Paper Clips	Clothes Pins	
				
Plastic Forks	Plastic Spoons	Binder Clips	Pencils	

1) Notice that the word Ask is in one of the circles in Figure 1. Ask yourself: What materials would I like to use to design a surgical instrument that can safely remove an unwanted object from a goat's stomach? Write these materials on your STEM Challenge handout.

2) Notice that the word Imagine is in one of the circles in Figure 1. Imagine what your device will look like. Draw a picture of your device on your STEM Challenge handout.



3) It is time to share your ideas with your team! Put on your listening ears, and, one at a time, share your ideas!

4) Notice that the word Plan is in one of the circles in Figure 1. Plan what your surgical instrument will look like. You can use one of your teammates' ideas or a combination of the teams' ideas. But remember, you must create your design, a surgical instrument, together as a team!

5) Draw a picture of your surgical instrument on your STEM Challenge handout.

## Tiny Stitches: Buying Time!

You will buy items to design a surgical instrument that can safely remove an unwanted object from a goat's stomach. Remember that you cannot hurt the goat or damage the object. The dominoes will represent the goat's stomach, so be careful not to hurt the goat by knocking over the dominoes. You have \$4.00 to spend. The items and their prices are shown below.

Material	Cost per one item	Number of items your team would like to purchase	Total cost of the items your team would like to purchase
Craft stick	\$0.25		
Rubber band	\$0.15		
Two feet of string	\$0.75		
One foot of masking tape	\$0.50		
Straw	\$0.15		
Cup	\$0.25		
Pipe cleaner	\$0.25		
Paper clip	\$0.15		
Clothes pin	\$0.25		
Plastic fork	\$0.25		
Plastic spoon	\$0.25		
Binder clip	\$0.25		
Pencil	\$0.15		
		Total Cost:	

Show your work here or on the back of this handout:

# Tiny Stitches: Test and Improve Your Device

It is finally time to test your device.

- 1) Did your device or surgical instrument safely remove an unwanted object from a goat's stomach without hurting the goat — knocking down the dominoes — or damaging the object? Write a sentence or two about why your device did or did not safely remove an unwanted object from a goat's stomach.

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- 2) Write a sentence or two about how you will improve your device.

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# Tiny Stitches: Investigation!

Use the Internet to research the following information.

1) What is the average size of a baby's heart? Draw a picture to represent the actual size and shape of a baby's heart.

2) What is the average size of a baby's artery? Draw a picture to represent the actual size and shape of a baby artery on the heart you drew in #1.

3) Dr. Vivien Thomas made tiny stitches. Draw these stitches on the picture of the artery to represent the actual size of the stitches.

4) What is the average size of a child's heart?

5) What is the average size of an adult's heart?

6) What was the size of the needle Dr. Vivien Thomas created to make the tiny stitches?

7) In the 1940s, what was the size of a needle used to draw blood? Compare the size of the needle used to make the tiny stitches to the needle used to draw blood.