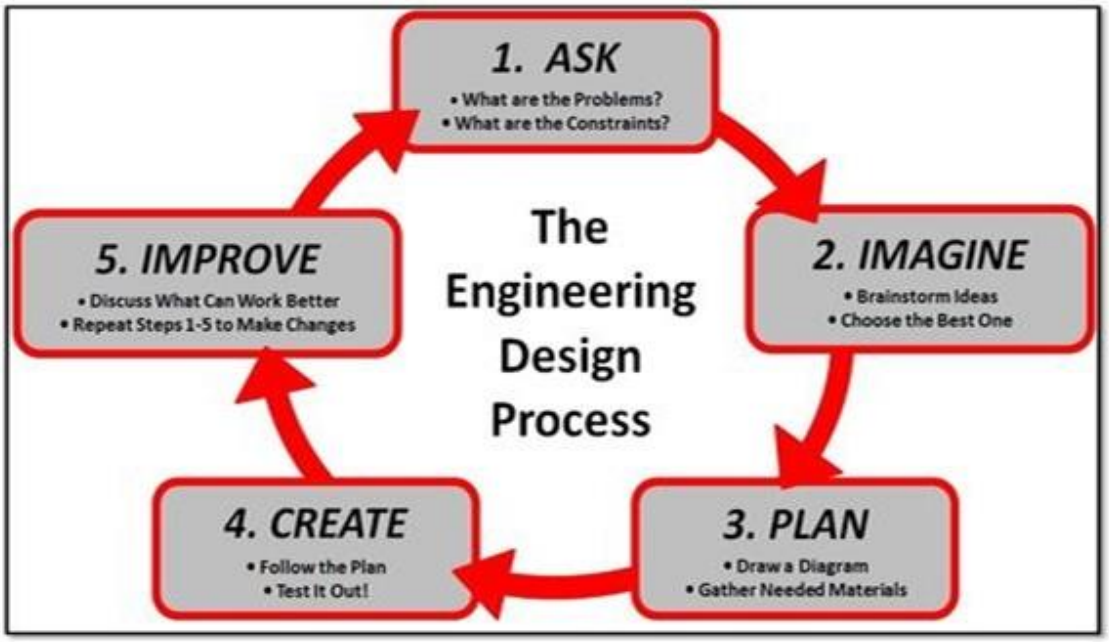
Name: ______________________________________

MacGyver Wind Lift Design Challenge
Student Datasheet

In this project, you will be an engineer. Engineers solve problems. They have a process that helps them do their work. This is their process.



Your challenge is to design a hand-held MacGyver Wind Lift that will capture wind from a fan to lift a cup of pennies.

Why is it called a MacGyver Wind Lift? MacGyver is a fictional TV character with an extraordinary knack for unconventional problem solving and an extensive bank of scientific knowledge. He would improvise to solve a problem with whatever items he might have in his pockets. Today it means to make or repair something "in an improvised or inventive way, making use of whatever items are at hand." That is what you will be doing, designing a wind turbine to lift as many pennies as possible using materials from your classroom, home or recycling container.

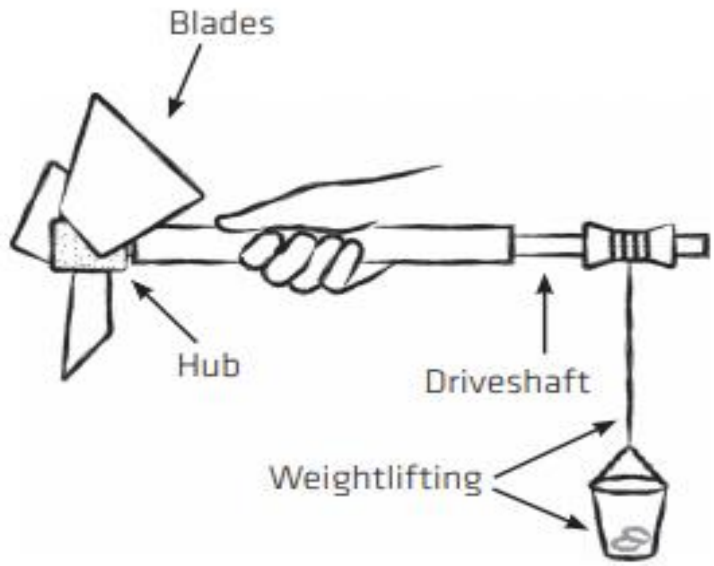
Materials:

Hub:
Pool noodle

Blades:
Bamboo sticks and material of your choice for blades

Driveshaft:
Dowel rod and plastic smoothie Straw

Lift:
String, cup, and wooden spool, Pennies for lift weight



ASK:

1. What is the problem?

   ____

2. What are you trying to do?

   ____

   ____

   ____

IMAGINE:

Brainstorm ideas for your wind turbine and blades. Think about the blades shape, size, length, number and pitch(angle of blades).

Number of blades:____

Shape of blades:____

Why are you considering this shape?_____________________________________

____

____

Size and length of blades (small, long, etc.): ___________________________

Why?________________________

____

Pitch/angle of blades:______________

What material(s) will you use to build your blades:______________________

____

Hypothesis: How many pennies do you think your turbine will lift?___________________________

Draw your blade design in the box.

CREATE:

Follow your plan to create your wind turbine. Test it out and record your results below.

To find the power of your wind machine, there are a few steps. The units are probably not familiar, but your teacher will help. Force is calculated by the number of pennies your device lifted. You will need the chart from your teacher to enter the force.

Trial	# of pennies	Force (newtons) copied from chart	X	Length of string (meters)	=	Work (joules)	÷	Time (seconds)	=	Power (watts)
Sample	**16**	**.4**	X	**.5**	=	**.2**	÷	**8**	=	**.025**
Design #1			X	.5	=		÷		=	

IMPROVE: Answer the questions below to reflect on your design process

1. What part of your turbine worked best in your first round of testing and why?

   ____

   ____

   ____

2. What was the most difficult part of the design process?

   ____

   ____

   ____

3. Where was there anything rubbing against your blades? Could you fix this?

   ____

   ____

4. How did you pitch or angle the blades?

   ____

   ____

Testing Round 2:

Modify your design to improve it. Draw your NEW ideas in the box.

Label the changes you made to your design

Now test your new design and record results below:

Trial	# of pennies	Force (newtons) Copied from chart	X	Length of string (meters)	=	Work (joules)	÷	Time (seconds)	=	Power (watts)
Design #2			X	.5	=		÷		=	

Testing Round 3:

Modify your design to improve it AGAIN. Draw your NEW ideas in the box.

Label the changes you made to your design

Test your last design and record results below:

Trial	# of pennies	Force (newtons) Copied from chart	X	Length of string (meters)	=	Work (joules)	÷	Time (seconds)	=	Power (watts)
Design #3			X	.5	=		÷		=	

Results:

Power for Design #1	
Power for Design #2	
Power for Design #3	

Out of your three designs, which had the most power and why?

____

____

____

CONCLUSION

1. Explain which design had the best results. Why do you think this design worked the best?

   ____

   ____

   ____

2. If you had to do it all over again, describe how you would change your design? Why?

   ____

   ____

   ____

3. How many blades worked the best for lifting weight? Did more blades mean you could lift more weight?

   ____

   ____

   ____

4. Was the best pitch closer to 0, 50 or 90 degrees?

   ____

   ____

5. Describe a challenge you faced in the engineering process. How did you problem solve to reach a solution?

   ____

   ____

   ____

   ____