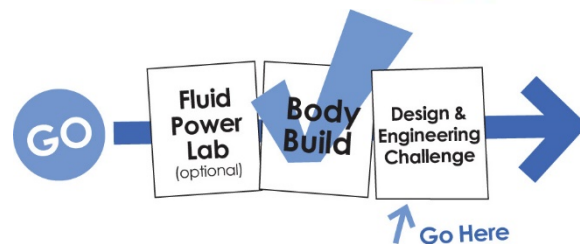# ENGINEERING CHALLENGE FOR HYDRAULIC CLAW
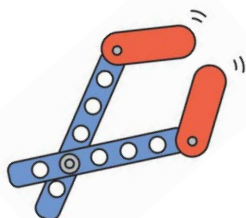
TeacherGeek

The Challenge

Engineer your **Hydraulic Claw** to grip and sort objects accurately.

GO → Fluid Power Lab (optional) → Body Build → Design & Engineering Challenge →

Go Here

Before You Start... Make sure you have built a **Hydraulic Claw** for use on this challenge.

Let's Create an End Effector: this is your "**claw**".
Which design would best grip a ball? The most pieces of candy?

Constraints: (rules and limits for your design)

- Only use your **Hydraulic Claw** to dig or grab objects.
- Objects may be picked up from the surface, not your hand.
- You may change the **End Effector** shape and material.
- The Hydraulic System **must not** be altered, but you may create new **Claw Designs**. (Look for examples in the **Hydraulic Claw** *Build Guide*).
- You may bring in materials for your **Hydraulic Claw**, if the materials are:
  - o Teacher Approved
  - o Non-Hazardous (no sharp edges, harmful chemicals, etc.)
- You will have _____ to complete the challenge.
  Fill in how much time you have

Challenge Supplies:

Hydraulic Claw, material for **End Effector** (cardboard, recycled packaging), objects to grab and sort (candy, pretzels, balls, plastic cups) tape, ruler, scissors, Philips screw driver, *Engineering Notebook* pages.

## The Engineering Design Process:

You will be using the **Engineering Design Process**. What does that mean? Your design is never finished (it can always be improved). There is no such thing as a perfect design. Fill out a new *Engineering Notebook* page each time you design/redesign your **End Effector**.

ASK → IMAGINE → PLAN → CREATE → IMPROVE → **DESIGN PROCESS**

TeacherGeek
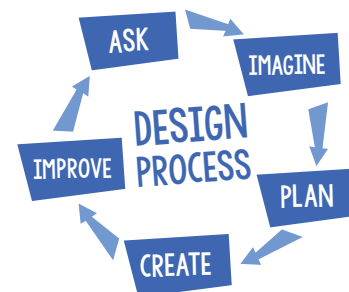
Challenge Ideas

A Claw Soccer

Find a flat surface or open floor, and set two goals – can be **cups** or marked with **tape**. Each team can only pick up or move the ball with their **Hydraulic Claw**. Every three steps they must drop or pass the ball to a teammate, or lose possession. First team to five points, wins!
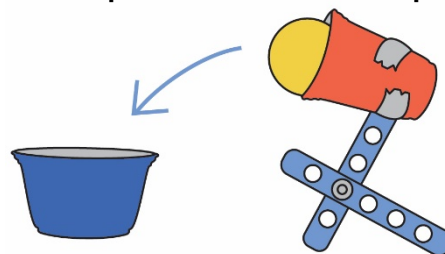
*Which claw design moved the ball the best?*

B Out of Sorts

Lay out two or more types of objects (candy, pretzels, balls) on a flat surface or open floor. Using only your **Hydraulic Claw**, grab, grip, pinch and scoop the objects into two piles or containers. Aim to be as **accurate** as possible – mark off when the wrong items are in the wrong containers, and record on the class data sheet which **End Effector** designs worked the best and quickest for individual items.

C Carry that Weight

How much weight can your **Hydraulic Claw** lift?
Find objects to use as weight (books, pencil boxes, rolls of tape).
Record your **Hypothesis** – a prediction of what you think your design will do in an experiment (e.g. two books? Four books?).

Try to keep the **unit** (object or measure) of weight **standard** across teams (e.g. use the same books for each attempt). Use a belt, string or tape to craft a handle to grip and lift the objects. Record your results, and compare against your hypothesis.
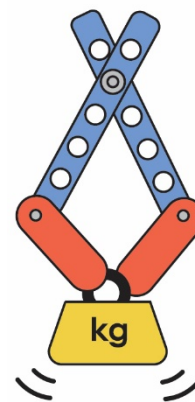
Did the results fit your prediction?
What materials could you add or change, to make your claw design stronger?

MARIANA TRENCH DIVE

CAPTAIN'S LOG

Plants and animals that survive in the **Mariana Trench** could help us learn how to live in space - and just how life on earth began!

MISSION NOTES

Design a remotely-operated claw to collect organic and inorganic specimens more than **7 miles** below sea level.

CLAW MUST INCLUDE:

△ End Effector
△ Light Source
△ Fluid Power Source
△ Team Name/Logo

DEEPSEA CHALLENGER ROV

ORGANIC = LIVING
(ANIMALS, PLANTS, FUNGI, BACTERIA)

INORGANIC = NOT LIVING
(ROCKS, MINERALS, METAL, PLASTIC)
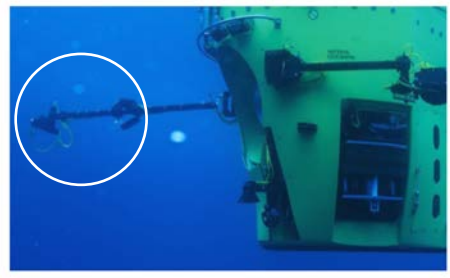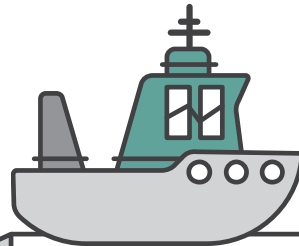
PROCEDURE

△ Only your hydraulic claw may "dive" into the *Mariana Trench*

△ Your hands remain on the "**boat deck**" to remotely operate the claw's descent

15 INCHES DEEP

FOR A MORE IN-DEPTH MARIANA TRENCH DIVE, DOWNLOAD THE FREE, IMMERSIVE POWERPOINT PRESENTATIONS AT *TEACHERGEEK.COM/LEARN*

ANGLERFISH

ENGINEERING CHALLENGE FOR HYDRAULIC CLAW

Class Data

Class: _____

Set: _____   Challenge: _____

Record the results of your challenges. Print more sheets if necessary.

Group Name	Design #1	Design #2	Design #3	Design #4	Design #5	Design #6	Design #7	Design #8	Design #9	Design #10

ENGINEERING CHALLENGE FOR
HYDRAULIC CLAW

TeacherGeek

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TeacherGeek
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MARIANA TRENCH DIVE

Certificate of Completion

is awarded to

Your Name Here

- -

for the succesful and creative
completion of the TeacherGeek
Hydraulic Claw Deep Dive Challenges

Receive this award after successfully finishing both
Mariana Trench Dive Missions – *congratulations*!
You are now a true Ocean-engineer Emeritus.