Monster Mouths

Air-powered monsters with mouths that chomp.

GRADES K THROUGH 5 | AGES 5 TO 10 | ABOUT 45 MIN

These are the standards listed in the Monster Mouths educator guide. Under each one is where you will see it in the activity.

Next Generation Science Standards (NGSS)

CODE	WHAT IT COVERS
K-PS2-1	Motion and Stability: Forces and Interactions
WHERE YOU'LL SEE IT (GRADES K-2): Learners **explore how pushing and pulling one piston causes the other piston to move** in the opposite direction, observing firsthand that forces (pushes and pulls) can change the motion of objects - and feeling the resistance when they try to push both pistons in at the same time.	
K-2-ETS1-2	Engineering Design: Develop a simple sketch, drawing, or physical model
WHERE YOU'LL SEE IT (GRADES K-2): Learners **sketch their monster face design with pencil on the cardboard before committing with markers**, planning where the mouth line will go so the face separates into two pieces that align with the piston-and-cylinder system - iterating on their design when the first attempt doesn't work.	
3-PS2-1	Forces and Interactions: Cause and Effect
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **investigate how the force of pushing air through the tube causes the Monster Mouth to open**, testing different push strengths to observe how harder pushes create wider mouth openings - establishing a cause-and-effect relationship between applied force and pneumatic system response.	
3-5-ETS1-3	Plan and carry out fair tests to identify failure points
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **systematically troubleshoot a stuck Monster Mouth system** by checking whether both pistons are pushed in (no air to transfer), whether the tube connection is loose (air escaping), or whether the sticky strips are holding - isolating one variable at a time to identify the failure point.	
MS-PS3-5	Energy Transfer: Construct an explanation of energy transfer
WHERE YOU'LL SEE IT (GRADES 6-8): Learners **explain how energy transfers through their Monster Mouths pneumatic system** - the mechanical energy of pushing a piston converts to pneumatic energy as air compresses and travels through the tube, then converts back to mechanical energy to move the opposite piston and open the creature's mouth.	
MS-ETS1-2	Engineering Design: Evaluate competing design solutions
WHERE YOU'LL SEE IT (GRADES 6-8): Learners **compare their Monster Mouth's performance when using air versus water** (the hydraulics extension), evaluating which fluid produces smoother, more controlled mouth movement - and discussing trade-offs between the simplicity of air and the force consistency of water in their pneumatic-to-hydraulic redesign.	

Common Core State Standards (Math and ELA)

CODE	WHAT IT COVERS
RI.K-2.7	Use illustrations and words in a text to describe key ideas
WHERE YOU'LL SEE IT (GRADES K-2): Learners **refer to the labeled instruction sheet and visual diagrams** in their Monster Mouths kit to identify which component is the piston, which is the cylinder, and how the tube connects them - using both pictures and text to understand the pneumatic system before assembling it.	
SL.K-2.1	Participate in collaborative conversations
WHERE YOU'LL SEE IT (GRADES K-2): Learners **describe to a partner what happens when they push one piston in** and observe the other piston moving out, using vocabulary like "piston," "cylinder," and "air pressure" to explain how their Monster Mouth opens and closes during the testing phase.	
RI.3-5.3	Explain relationships between concepts in a text
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **explain the cause-and-effect relationship between pushing a piston and the mouth opening** by tracing how air travels from one cylinder through the tube to the other, connecting the written instructions to the physical pneumatic system they built.	
W.3-5.3	Write narratives to develop real or imagined experiences
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **write their Monster Mouth character's backstory using the story planning worksheet**, developing an imagined creature with a name, home, and voice - then organizing a narrative with a beginning, middle, and end to perform as a puppet show during the storytelling extension.	

CODE	WHAT IT COVERS
RST.6-8.3	Follow a multistep procedure when carrying out experiments

WHERE YOU'LL SEE IT (GRADES 6-8): Learners **follow the nine-step Monster Mouths build sequence precisely**, understanding that the order matters - pulling one piston out and leaving the other pushed in before connecting the tube, because reversing this sequence means the pneumatic system won't transfer air correctly.

SL.6-8.1	Engage in collaborative discussions with diverse partners

WHERE YOU'LL SEE IT (GRADES 6-8): Learners **compare pneumatic and hydraulic systems during the extension activity**, discussing what changes when water replaces air in the cylinder and debating why the Monster Mouth feels different to operate - building scientific argumentation skills through hands-on observation.

K.MD.A.1	Describe measurable attributes of objects

WHERE YOU'LL SEE IT (GRADES K-2): Learners **compare the lengths of the piston when pushed in versus pulled out** and observe how far the Monster Mouth opens, describing the relationship between how far they push one piston and how far the other extends - connecting physical measurement to the pneumatic system's behavior.

K.G.A.1	Describe objects using names of shapes and relative positions

WHERE YOU'LL SEE IT (GRADES K-2): Learners **identify the cylinder as a three-dimensional shape** and describe spatial relationships during attachment - "the top of the face connects to the piston" and "the bottom of the face connects to the cylinder" - using positional language like above, below, and between.

3.MD.B.4	Generate measurement data by measuring lengths

WHERE YOU'LL SEE IT (GRADES 3-5): Learners **measure how far the piston extends from the cylinder** at different push strengths and compare the distance the Monster Mouth opens, generating data about the relationship between force applied and mouth displacement in their pneumatic system.

4.OA.C.5	Generate and analyze patterns

WHERE YOU'LL SEE IT (GRADES 3-5): Learners **observe the push-pull pattern of their pneumatic system** - when one piston goes in, the other comes out, and vice versa - identifying this as a consistent, repeating inverse relationship and predicting what will happen before each push or pull action.

6.SP.B.5	Summarize numerical data sets in relation to their context

WHERE YOU'LL SEE IT (GRADES 6-8): Learners **measure how far the Monster Mouth opens across five different push strengths**, recording each opening distance in a data set, then summarize it by finding the typical (median) opening distance and the range between the smallest and largest openings - describing what that spread says about how consistent their pneumatic system is.

6.EE.A.2	Write, read, and evaluate expressions

WHERE YOU'LL SEE IT (GRADES 6-8): Learners **express the piston displacement relationship as a variable expression** - if pushing piston A in by distance d causes piston B to extend by distance d, they describe this 1:1 inverse relationship and predict what happens when the tube length or cylinder diameter changes.

LEARNERS EXPLORE

pneumatics and air pressure; force transfer through a closed system; creature/character design; troubleshooting mechanical systems; pneumatics vs. hydraulics