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Claw Game Maker: Squeeze or Cradle?

Grades 6-8 · 45 minutes

Physical science · Engineering



Slides, rubric and answer key **Print and go** **No student accounts**

Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a claw settings table
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 4 and 5 and in high school physics
- Standards: NGSS

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A stronger grip is not always a better one. Students bench a capsule ball and find it holds at a grip far below what friction allows, because the curled tips close under it and carry it on their shape. They straighten the tips and it slips; they hook the pads and the bear is cradled at a grip that would never squeeze it. By the end they can say when a claw squeezes and when it cradles, and what each needs.

At a glance

ESSENTIAL QUESTION

When does a claw hold a prize by squeezing, and when by cradling, and what does each need?

OBJECTIVES

Students will be able to:

- tell squeezing (friction from the push) from cradling (the tips under the prize, carrying it on their shape)
- show on the bench that a round prize cradles at a grip far below its friction line
- change the tip curl and the pad angle and say what each did to the grab
- explain why a stronger grip can pop a round prize out instead of holding it

VOCABULARY

Squeeze, Cradle, Tip curl, Pad angle, Friction line

STANDARDS

MS-PS2-2

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/clawmaker?lesson=squeeze-or-cradle&ref=tpt-clawmaker-2 once on a student computer: open Test, bench the capsule ball at 0.3 N and watch it hold, then open Build, Claw and drag Tip curl to nearly straight and bench it again. About five minutes.

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser with WebGL, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: more grip or less for the ball? Take a vote and keep the numbers.	Answer the warm-up on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app. Open Build, Claw and zoom in on the claw. Show Three claws and Curled and hooked: drag Tip curl and Pad angle slowly and watch the prongs change as you drag. Say the two words: squeeze and cradle. > **It's working when:** Cup a ball in your fingers from below, then try to lift it by squeezing its sides with straight fingers.	Fill in the vocabulary.
12 to 22	**Guided practice (We do)** The ball together	Students open the link. The guide takes them to the bench with the capsule ball at 0.3 N (it holds), then to Build to straighten the tips, back to the bench (it slips), then to hook the pads. Walk the room and ask what changed. > **Watch for:** Students who turn the grip up to fix a slip. Ask them to keep the grip and change the shape.	Follow the guide and record held or slipped each time.
22 to 38	**Independent practice (You do)** The settings table	Students fill a table: for the bear and the ball, at straight, curled and hooked tips, the lowest grip that holds. Then bare metal tips with hooked pads: cradling needs little friction, so the bear still holds. > **If they ask:** "The ball slipped at 12 N with straight tips. It held at 0.3 N with curled ones. Why did more grip not help?" Popping out	Fill in the settings table and answer the two questions.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Go back to the warm-up vote: the ball needed less grip, but not because it is lighter. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/clawmaker?lesson=squeeze-or-cradle&ref=tpt-clawmaker-2. A claw machine in a room, seen the way a player sees it: a 70 cm box, three rubber-padded prongs parked closed over the chute, and a pile of bears, ducks and capsule balls.

1. **The ball.** Open `Test`, pick Ball in a capsule on the bench, set 0.3 N and run it. It holds: the curled tips close under it.

2. **Straight.** Open `Build`, `Claw`, and drag `Tip curl` to nearly straight. The prongs change as you drag. Bench the ball at 0.3 N: it slips. At 12 N it still slips: the squeeze pops it out.
3. **Hooked.** Put the curl back and drag `Pad angle` to hooked. Bench the bear at 0.5 N: cradled.
4. **Metal.** Pick bare metal tips and bench the bear again at 0.5 N with the hooked pads: it still holds. At 0.5 N with straight metal tips it slips at once.

> Every slider on the Claw sub-tab changes the claw while it moves, and the physics follows on release.

Background for the teacher

A claw can hold two ways. Squeezing uses friction: the tips push in, and friction up along the tips carries the weight, up to a limit set by the push and the grippiness of the pair of surfaces. Cradling uses shape: the tips close under the prize and carry it the way cupped fingers carry a ball, and the push barely matters.

A 45 g capsule ball has a friction line of about 0.3 N with rubber tips, and it cradles at 0.3 N with curled tips. With straight tips it cannot be held at any grip: a hard sideways squeeze on a smooth ball pushes it out, like a wet bar of soap. A bear has limbs the tips can hook under, so hooked pads cradle it at 0.4 N on the bench, half its friction line.

Real arcade claws have curled tips with rubber pads: the curl for cradling, the pads for friction when it has to squeeze. Students who set the pads to hooked find the honest machine check of Build a Fair Machine easier to pass, and the bench shows why.

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- What did the tips do under the ball at 0.3 N?
- Why did the ball slip at 12 N with straight tips?
- Why does the bear cradle with hooked pads even on bare metal?
- Which prize would hooked pads not help, and why?
- What do real claws have both the curl and the rubber for?

> The second question is the real test: a student who can say that squeezing a smooth round prize pushes it out has let go of "stronger is better".

Cross-curricular extensions

- Math: the friction line is weight divided by the prongs times the grippiness. Work it out for the ball, the bear and the boxed toy.
- Biology: how do a bird's feet hold a branch while it sleeps? Squeeze or cradle?
- Engineering: sketch a claw for a flat boxed toy, which nothing can get under.

- English: explain cradling to a younger student in three sentences, with a drawing.

Vocabulary

Squeeze	Holding by friction: the tips push in from the sides and friction holds the prize up.
Cradle	Holding by shape: the tips close under the prize and carry it, with almost no squeeze needed.
Tip curl	How far the end of each prong bends inward. Straight tips squeeze; curled tips get under.
Pad angle	How far the pad at the very end of the tip bends in again, like a fingertip.
Friction line	The grip a straight squeeze would need to hold a prize: its weight divided by the prongs and the grippiness.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up and act out squeeze and cradle with your hands as you say them.
- Pair each learner with a partner; the table is held or slipped.
- Accept the explanation as two drawings: fingers squeezing a ball and fingers cupping it.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students, one changing settings and one recording.
- Zoom the browser to 150%.
- Allow the ball only in the settings table where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "The ball held at a tiny grip because the tips ___."
- Fill in the ball's first row together.
- Use the Kid level: the grips read weak, medium and strong.

STUDENTS READY FOR MORE

- Work out the ball's friction line and compare it with the grip that cradled it.
- Find a pad angle at which the bear holds at 0.5 N, then explain why hooked pads fail on the boxed toy.
- Solve the Slippery ball puzzle under Puzzles.

Adapting for other grades

Younger students: In grades 4 and 5, set the level to Kid, do the guide and the ball's rows only; drop the third rubric row; total 8, and 6 meets the objectives.

Older students: In high school, switch the level to High school and compare each holding grip with the friction line the bench shows: cradling holds under the line, squeezing cannot.

Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/clawmaker?lesson=squeeze-or-cradle

Essential question: When does a claw hold a prize by squeezing, and when by cradling, and what does each need?

Warm-up: A smooth 45 g ball: more grip or less than a 180 g bear? Why? _____

1. **Vocabulary.** Squeeze, cradle, tip curl, pad angle, friction line: write each in your own words.

2. **The guide.** The ball at 0.3 N with curled tips: _____. With straight tips: _____. The bear at 0.5 N with hooked pads: _____.
3. **The settings table.** For the bear and the ball, at straight, curled and hooked tips: the lowest grip that holds.

4. **Bare metal.** The bear at 0.5 N, hooked pads, bare metal tips: _____. Straight metal tips: _____.

1. Why did the ball hold at 0.3 N and slip at 12 N?

2. Why do real claws have curled tips and rubber pads?

Exit ticket

Name: _____

1. Cradling a prize means (A) squeezing it harder (B) the tips close under it and carry it on their shape (C) lifting it faster

2. A smooth ball with straight tips (A) holds at a high grip (B) pops out when squeezed hard (C) holds at any grip

3. Hooked pads on bare metal tips still cradle the bear. What does that show?

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Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	Shape does the holding; the push barely matters.
2	B	A hard sideways squeeze on a smooth round prize pushes it out.
3	Cradling needs the shape, not the friction	Squeezing needs grippy surfaces; cradling carries the prize from below. A full answer says friction still helps when it must squeeze.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
Data	A settings table with the bear and the ball at three tip shapes, the lowest holding grip found for each, and the bare-metal row.	The table with the lowest holding grips found.	A partial table.	No table.
Evidence	Uses the bench to show the ball cradling under its friction line and slipping at a high grip with straight tips.	Shows the ball holding at a low grip with curled tips.	Says the ball held, without the comparison.	No evidence.
Explanation	Explains squeeze against cradle, what each needs, and why a stronger grip pops a round prize out.	Explains squeeze against cradle.	Says curled tips hold better.	No explanation.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for MS-PS2-2, with shape as the variable alongside the force.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-PS2-2**	6-8	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	Students change the shape of the tips and the grip one at a time on the bench and record whether the prize held.

Checked November 2026 against: NGSS MS-PS2-2, Motion and Stability: Forces and Interactions.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/claw-game-maker/lessons/squeeze-or-cradle/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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