

CIC Lesson Plan

Lesson Name Which falls faster?

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For Grade 2nd

Related CA Science Standards and Vocabulary

Specific standards and new vocabulary related to lesson

CA Science Standard(s):

Physical Sciences (2nd) –

2) Motion can be described (observe position change over time)

3) Motion can be changed with force (push, pull, size of change is related to strength or amount of force)

5) Objects fall to Earth unless held up

Investigative (2nd) – a, c, e, and h

Vocabulary Definitions:

Force – something that makes objects move

Gravity – The force which makes things fall

Air resistance – The force of the air pushing back against something moving

Density – how heavy is an object *for its size?*

Introduce and Engage

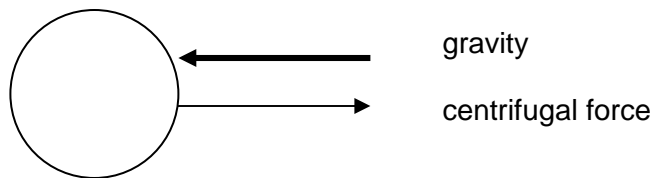
Making personal connections, engaging curiosity, building connections to kids' experiences

Building Connections to Kids' Experiences: *Can you think of an experience most kids would have related to your topic? Is there something to show that will grab their attention? Or can you pose a mystery with a question about something they see everyday?*

Today we're going to talk about one of the oddest forces. Forces are all around us. [Write the word force on the board, and then define:] A force is when something pushes on something else, and makes it move. Sometimes forces act against each other and cancel each other out.

Let's talk about something you see everyday. When you drop something, what happens? It hits the ground—why? why doesn't it go up? [If someone mentions gravity write it down underneath the word force.] Things fall towards the Earth – the ground - because of a force we call "gravity".

Let's think about gravity's effect on us for a minute. Imagine that we're this little piece of clay and we live right here in California. [Stick small clay person on globe that can be spun with your hand.] Now the earth is spinning around very fast, it has to go all the way around – xx miles – in 24 hours. So let's give our globe a spin. What happened? This is centrifugal force – How many of you have been on one of those merry go round, the kind you run around and push? What happens when you go really fast? Have you noticed that , the faster you go the harder it is to hang on against the force pushing out. [draw picture] So as the earth spins, how come we all don't go flying off into space? We're not holding on! Right, gravity holds us down.



Today we're going to do some experiments with gravity to find out more about it.



Learning Experiences

What kids will see, do, hear, touch, taste or make.

Any combination of demonstrations, hands-on activities, and pictures that helps kids explore new ideas. Describe specific experiences in the order you plan, including instructions you need to give students.

Demonstration:

We're going to use a chart like this to record the data from our experiments. [Draw data chart on the board.] I'd like you to pass around these two balls and look at them. [pass balls with same size and noticeably different weight.] Can somebody describe the difference between the two balls? [list all differences on board] If not mentioned – Does one feel heavier than the other? The weight you feel is actually the pull of gravity on the object.

If we dropped these two balls at the same time, do you think one will fall faster? Which one? [mark prediction on the chart] OK, let's see. I'd like a volunteer to be our "dropper". Your job as dropper is to stand on this chair when I say "start" and to carefully drop both things at the same time from the same height. [To the group:] I'd like all of you to be the "observers" this time. Use your eyes and your ears to figure out if one object hits the ground before the other. Your ears will be the most accurate – listen for one "thump" or a "thump-thump" sound. You'll have to be quiet – no talking. I will be our "recorder" to write down what we find out. Everybody ready? Start!

What happened? Did they hit at the same time or different? [If lot's of disagreement suggest another trial.] They hit at the same time. [Record results on data sheet] Were you surprised?

So how can we describe what we observed? [Help students get to: Two objects of the same size and different weight fall at the same speed] This is our hypothesis [write on board if this is new vocabulary] – an idea to test.

Individual Experiments:

You're going to do your own experiment to explore our hypothesis. You'll do your experiment three times to be sure what you're seeing and so that each of you get a turn being the dropper, the observer, and the recorder. For trial 1 I'll give you your job and then you will trade jobs for trial 2 and 3 when I say "trade jobs". [split students into groups of three by counting off Group 1: recorder, dropper, observer,]

When I say so, each group will come and get a bag of objects and your data table and choose a place where you can do your experiment with hitting anything. First, Look at your objects and decide together which one you think might fall faster, and why you think so. Recorder – your job is to fill in the first three rows on our sheet [point to rows on chart on the board] after your group decides what to say. You have 5 minutes and then I will clap like this as a signal to be quiet so we can start our experiment. When everyone is quiet, I'll say "Start". Drop your objects and record the results from trial 1. I will say "trade jobs" so you can each have another job and then clap for quiet to start trial 2. and do the same again for trial 3. Any questions?

Group 1 please get up and choose an area to work. Group 2, etc. [Each group gets two objects and a sheet]

[Clap] Start Trial 1. Trade Jobs for Trial 2. [Clap] Start Trial 2. Trade Jobs. [Clap] Start Trial 3.

[Clap] Ok let's all come back up here and see what you found out.

Sharing Experiences & Building Ideas

How kids will share experiences and build links to ideas and vocabulary.

Sharing and Interpretation: *Ideas for questions to invite sharing and guide interpretation of experiences.*

Students present their results—which fell faster?

Draw pictures with forces—big arrows for the strongest force (gravity) and small arrows for weaker forces like air resistance, and interpret as a group why one might have fallen faster than the other.



For example: Our hypothesis says that the same surface area on the bottom should fall at the same speed, but it looks like in this experiment the objects were the same size on the bottom surface but they still fell at different speeds. Some other force must be at work here. What do you think it could be?

Explain air resistance. Connect object shape to amount of air resistance, and point out that lighter objects are affected more by air resistance than heavier ones. A really thin, light object like a leaf or paper can actually be pushed enough by the air to sort of float down taking a wiggly path down rather than a straight path.

Closing Statements: *connect experiences to larger world, big ideas, vocabulary.*

So what forces affected the way things fell in our experiments today? [gravity, air resistance]
Do heavier objects fall faster than lighter ones? [no – write on board – Two objects of the same size and different weight will still fall at the same speed, unless another force interferes.

This makes gravity a really weird force. Think about it. If a river was pushing a light rock and a heavy rock of the same size – which one would move further, faster? The light rock because there is less mass – less stuff - to move. If the wind is pushing two sail boats with equal size sails across the lake, which boat will go faster the heavier boat or the lighter boat? The light boat because there is less mass – less stuff - to move.

But gravity makes everything fall at the same speed – regardless of weight! It actually pulls harder on objects with more mass and less hard on objects with less mass so they will move at the same speed. Physicists are still trying to figure out why!

Follow-On Activities

Ideas for follow-on activities, your favorite kid books, things to notice

Things to observe in the future: Pay attention to how things fall; Think about forces when on roller coaster, merry go round, swing, on a bus, etc.

Materials and Preparation in Classroom

Required materials and classroom set-up for complete lesson.

7 baggies, one for each group, containing 2 objects and a sheet to record predictions/observations. Pairs of objects should illustrate a clear idea. Examples:

Wood & Metal Ruler – same size and weight, different material → material doesn't matter, fall at same rate

Board & Paper – same size, very very different weight → same air resist. has disruptive effect on very light objects with large surface area like paper or leaf

Baseball / Nerf ball – same size, different weight → air resist. minimal, fall at same rate

hard Frisbee ring / fabric Frisbee ring – same size, different weight → air resist. minimal, fall at same rate

ping-pong ball, golf ball – same size, diff. weight → air resist. minimal, same rate

Soft cube, soft disk (w/ hole) – same weight, different size → different air resistance has effect on larger surface area. Also can illustrate differences in air resistance if disk turned sideways

Styrofoam cup / Plastic cup – same size, different weight → air resist. minimal, fall at same rate

Classroom Needs: Can kids stand on chairs? Board space for writing. Hard floor to drop objects on.

Set-Up Requirements: Set up baggies with objects and data table in each one.

