



Teacher's Guide for:
Exploding Film Cans

Note: All activities in this document should be performed with adult supervision. Likewise, common sense and care are essential to the conduct of any and all activities, whether described in this document or otherwise. Parents or guardians should supervise children. Rock-it Science assumes no responsibility for any injuries or damages arising from any activities.

NOTE: This is the transcript of a lesson that was videotaped during an actual Rock-it Science class with real students, not actors. The students' brainstorming comments are included on the video but are not transcribed here because they're not part of the lesson presentation.

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Exploding Film Cans
A Rock-it Science Lesson
Filmed June, 2009

Rock-it Science
2110 Walsh Ave, Unit F
Santa Clara, CA 95050
www.rockitscience.org

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Intro Quick Recap:

Lesson Intro:

- If there's a gas leak in your home and you light a match, what will happen?
- If there's just a little bit of gas, nothing will happen. If there's a medium amount, the house will blow up. If there's a large amount, nothing will happen.
- A fire needs three things to stay alive: oxygen from the air, something to burn, and some heat to keep it going.
- If you have some oxygen and just the right amount of gas, you'll get an explosion. If there's too much gas, it pushes out the oxygen, so it can't burn.



Experiment/Demo Quick Recap:

Experiment Intro:

- One way to do our experiment is with breath spray.
- Puff breath spray over a cigarette lighter so it ignites.
- The cigarette lighter has gas in it, because it made a flame. The breath spray has gas in it, too, which is why it ignited. If you used it while smoking a cigarette, it would blow up.
- Demonstrate the film can launcher. If you press the button, it makes a small spark jump between the metal pieces on the other side, where the film can will be attached. Turn off lights to make it easier to see the spark.
- Press the button on the side a cigarette lighter (not the striker) and hold it inside the film can for several seconds to get some gas into the film can. Count the seconds while you do it.
- Put the film can onto the lid, press the button, and see if the can pops off. If not, take it off, wave it around to get air into it, and try adding more or less gas than before.



Breath spray ignites over cigarette lighter.



Film can launcher.

Experiment/Demo Quick Recap (cont.):

Experiment: Making Film Cans Explode

- Students work in pairs. Each pair gets a film can launcher, a plastic film can, and a cigarette lighter.
- All students must wear goggles; earmuffs are optional, but recommended.
- Students take turns putting various amounts of gas into the film can and launching it to see which amount works best.



Demo: Tennis Ball Cannon

- Teacher uses a large pvc tube, large enough to hold a tennis ball snugly. The bottom of the tube is capped, and it has a small hole near the bottom, large enough to insert a barbeque lighter.
- Teacher sprays about 6 squirts of breath spray into the tube, inserts the tennis ball into the open end, inserts the lighter into the small hole, and lights it. If the right amount of breath spray has been used, the tennis ball will shoot out of the cannon.
- After demonstrating the cannon indoors, take the students outdoors and have them stand at a distance from the cannon and try to catch the ball when it flies toward them.



Equipment List: "Exploding Film Cans"

Items needed for Instructor:

- Breath Spray
- Cigarette Lighter
- Tennis Ball Cannon
- Tennis Balls (3 or 4)
- Butane Lighter

Items needed for Students:

Consumables (per 2 students):

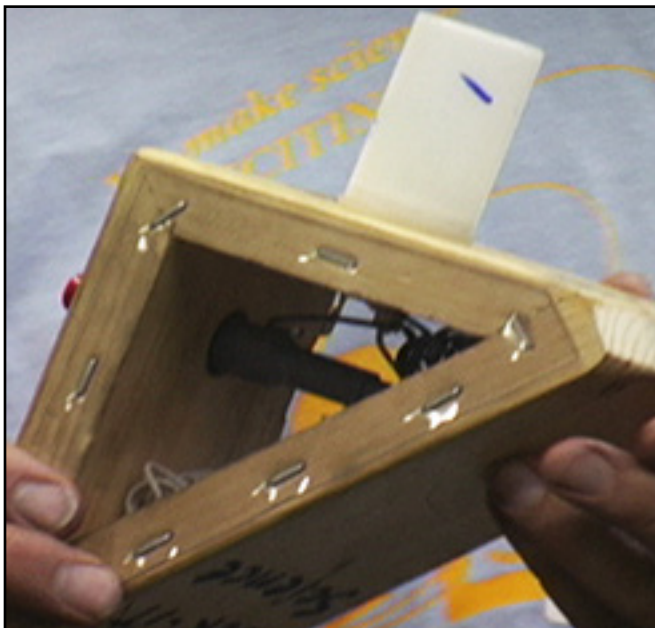
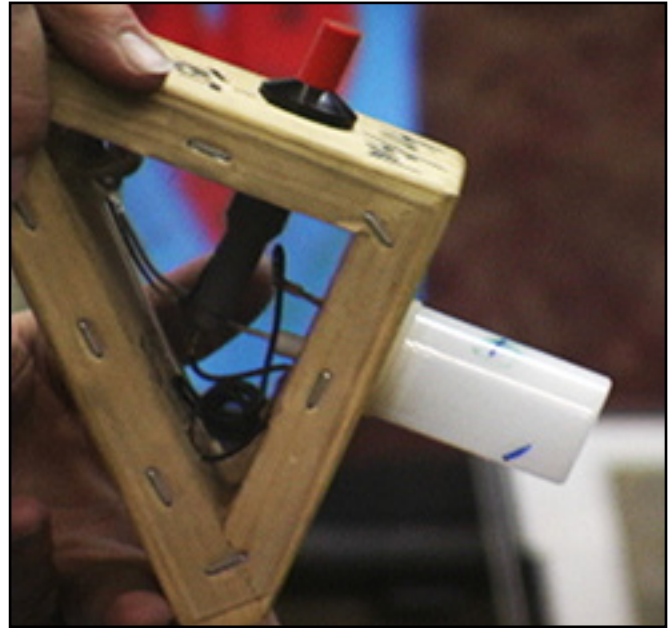
- Breath Spray (must be the kind that contains *butane*)
- OR Cigarette Lighter

Other:

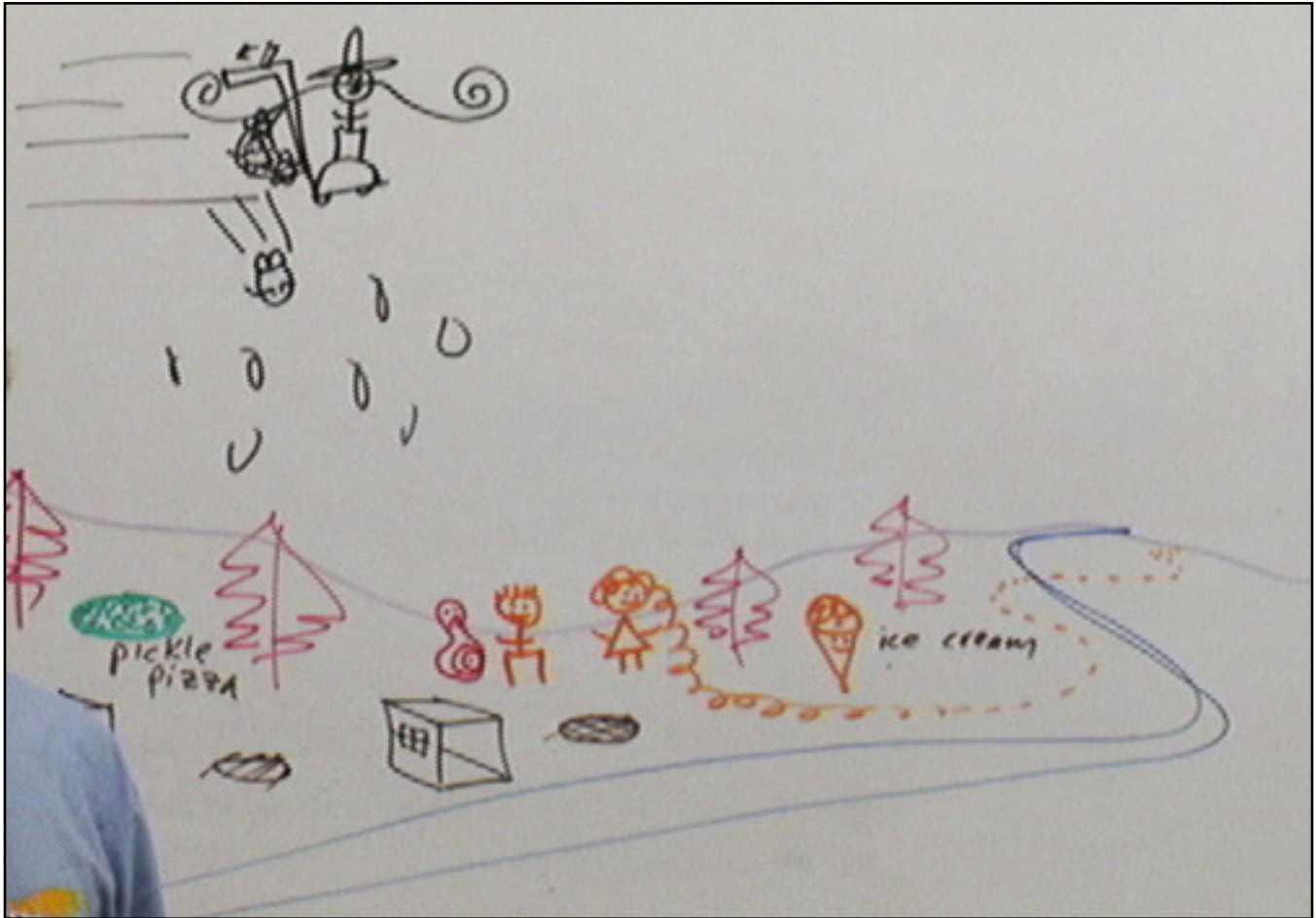
- Film Can (1 per 2 students)
- Launch Pad (1 per 2 students)
- Goggles
- Earmuffs (optional, but recommended)

Prep Work:

- Construct film can launchers.



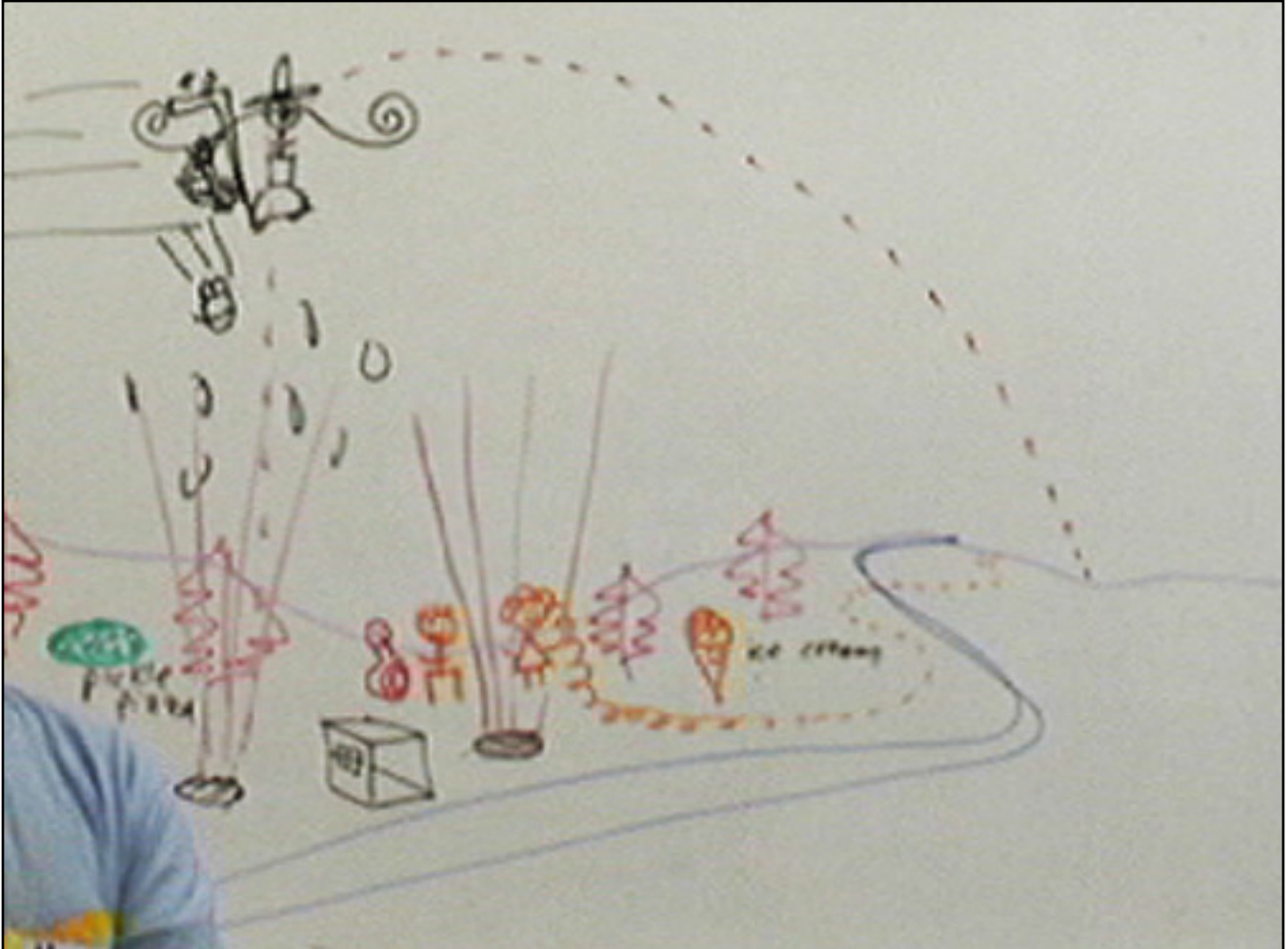
Story Recap: "The Kick-Mes Against the Minions"



Part 1:

- Evil Mister Fred is flying around on his vacuum cleaner.
- Jack & Jill and other people are living in cardboard boxes in the redwood forest.
- To get food, they dig holes in the ground and cover them with sticks and leaves.
- Some kinds of food that roam around the forest include ice cream cones, pickle pizzas, and pine-apples.
- These foods fall into the holes, and people come to the holes when they want to eat.
- Jack and Jill have their friends the Kick-Mes with them. Kick-Mes are only happy when they're being kicked, or dropped off cliffs, or smashed, or blown up. Afterwards, they return to their original shape. Jack and Jill drop Kick-Mes into the holes to get food for them.
- Evil Mister Fred, flying on his vacuum cleaner, has a vacuum bag full of minions. He drops minions into the holes to steal the food.
- Jack and Jill drop Kick-Mes into the holes, hoping they'll kick out the minions. But they don't know how many Kick-Mes to use.

Story Recap (cont.)



Ending:

- Jack & Jill throw the Kick-Mes down into the pits with the minions. The minions hit the Kick-Mes with their baseball bats, and the Kick-Mes liked this.
- Then Jack and Jill order a case of breath spray from the Acme Store of Everything
- They squirt breath spray into the pits, then toss in a lighted match.
- Minions and Kick-Mes blast out of the pits.
- One of the minions hits Evil Mister Fred, knocking him off his vacuum. As he falls, he keeps getting hit by other minions and gets knocked clear over the mountains.

Transcript: Introduction

Suppose you're in your house -- here's your eyes -- you're looking out the window. And you smell something nasty -- yechh! And let's suppose that in your house there's a gas stove, and the gas stove is leaking gas. And you say, "Wow, I wonder what that bad smell is." And then the electricity goes out -- poof -- and it's dark in your house. And you say, "I'm going to find that bad smell, even if it's dark." So you light a match. What happens? Does your house explode?

[Student: No, the match gets on fire.] The match catches on fire.

Well, if there's just a little bit of gas in there, and you light a match, nothing happens, just like he said. If there's a medium amount of gas, it goes ka-boom! And if there's a whole lot of gas, it does nothing. Isn't that weird? You'd think with a whole lot of gas it would make an even bigger ka-boom. But in order to make a ka-boom, the gas has to have something to burn with.

There's three things it needs to stay alive. Can you think of one thing it needs to stay alive? *[Student: Air.]* Air, yeah. There's oxygen in the air. What else does it need to stay alive? *[Student: Something to burn?]* Okay, something to burn. And it also needs some heat to keep it going.

So in your house there's a certain amount of air, a certain amount of oxygen. If you put just the right amount of gas, it'll go ka-boom! If you put too much, and shove out all of the air, then it can't burn -- there's no air there. And if there's too little, there's not enough gas to get it started. So today we're going to be goofing around with ways to find out how much is just the right amount of air.



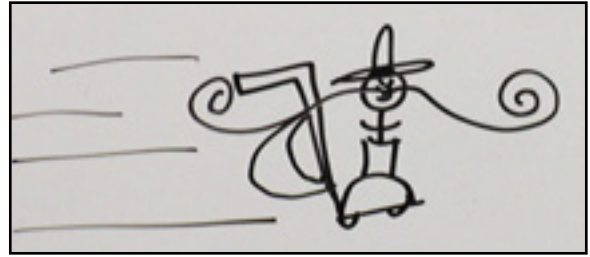
A certain amount of gas is needed to make an explosion.

Do you guys like loud noises or not? If you like loud noises, you can listen to loud noises. If you don't like loud noises, we have earmuffs.

We have lots of earmuffs. When we do the experiment, you can put on an earmuff so you don't hear any loud noises. Now we need a crazy story.

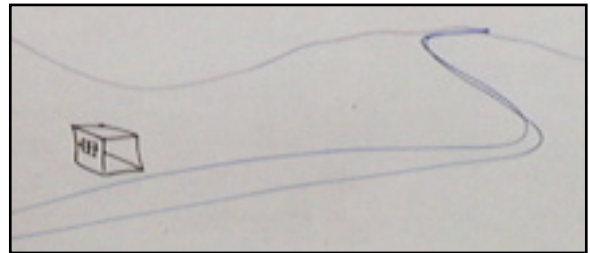
Story: "The Kick-Mes Against the Minions"

In our stories, we always have Jack and Jill and The Evil Mister Fred. And let's suppose that Evil Mister Fred flies around on a vacuum cleaner. Here's his vacuum cleaner. It's got wheels. And there's his sombrero, and there's his mustache. There's Evil Mister Fred, and he's flying around. Now, he always tries to make everybody else miserable. It's his job. Somebody has to make everybody miserable.



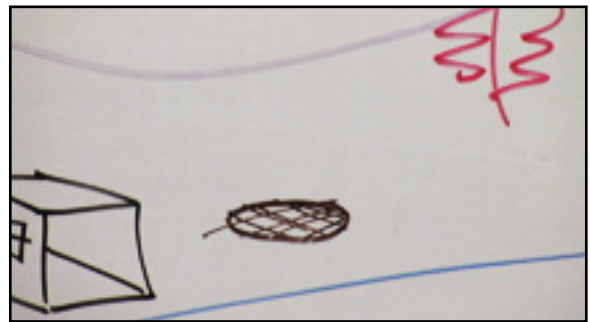
Evil Mister Fred on his flying vacuum cleaner.

And down below we have some land, and there's a river by the land, and there's people living there in cardboard boxes because they can't afford houses. Yep, there's some nice cardboard boxes, they cut holes for windows and just leave the front open. They live here and there in the forest. We need a forest -- let's put in a forest of redwood trees.



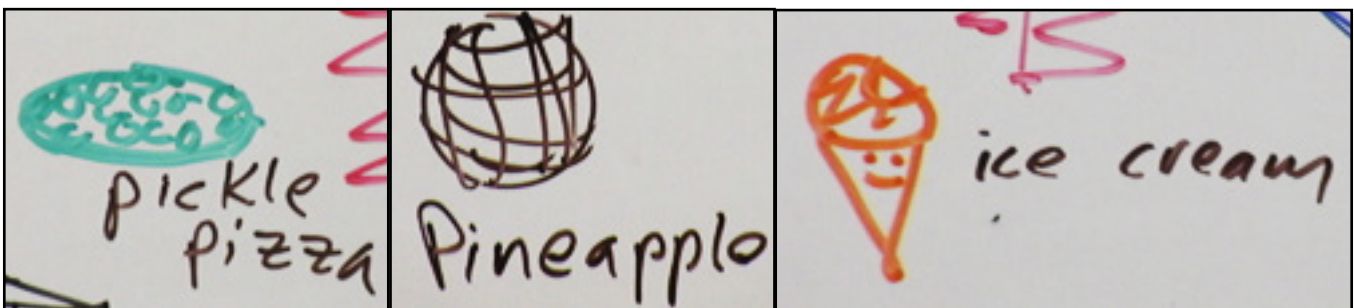
The people lived in cardboard boxes.

And the people are looking for ways to get food. And they discovered that if you dig a deep hole in the ground, food will fall into the hole. But if they see the hole first, the food won't fall into the hole. So you disguise the opening of the hole by putting some sticks over it and some leaves and some dirt, so it just looks like the ground. And if there's food coming by -- suppose there's a giant orange-flavored ice cream cone coming by. He's just walking by, minding his own business -- boing, boing, boing, boing -- and he doesn't see the hole. Next thing you know, crash! -- the ice cream cone falls down into the hole. And then when you're hungry, you go look -- there it is, food to eat.



They covered the holes with sticks and leaves.

Now there's wild ice cream cones wandering around the forest, there's grape pizza pies What, you guys don't eat grape pizza pies? Well, maybe this is a pickle pizza pie running around. It could be a pineapple pizza pie. Let's just put some pineapples here that they could eat. Pineapples running around.



Food roaming the forest included Pickle Pizzas, Pineapples, and Orange Ice Cream Cones.

There's a pineapple. There's a pickle pizza. And here is an ice cream. And there's holes -- let's put a bunch of holes, because there are lots of hungry people.

Now, a couple of people that live out there are Jack -- he's got short hair -- and Jill -- she doesn't have short hair. This is Jill. She's got long hair. Jill's hair is infinitely long, and it can grow infinitely fast if you try to cut it off.

And they have some friends with them. They have their friends the Kick-Mes. Kick-Mes are little guys that look like this, and they have a target on their stomach, and they're always sad. They're only happy if you kick them. If you kick them right on the target, then they yell and say, "Yayyy!" They love being kicked on their targets. If you kick them over a cliff, and they go crash, crash, crash, crash down the cliff, they laugh and giggle the whole way. If you kick them in front of a big old tank, and they get run over and squished out flat, oh, they love that! Or if you kick them into a fire, they burn up into smoke, and then the smoke comes back together, and they just laugh, they think this is great.

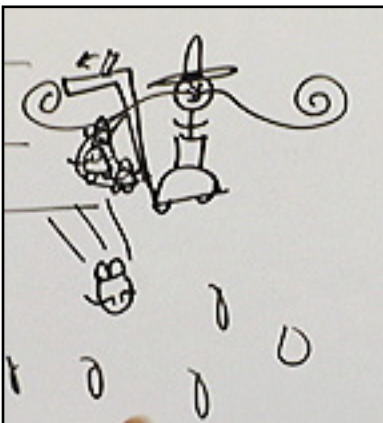


Jack & Jill with their Kick-Me.

So Jack and Jill kick their Kick-Mes all around, they play soccer with them, they play basketball with them, and have a good time with all their Kick-Mes. And whenever they need food, they'll kick a Kick-Me down the hole, and the Kick-Me will gather the food up and throw it up to Jack and Jill.

So Evil Mister Fred sees all this going on, and he decides to make their life miserable. Evil Mister Fred has a whole vacuum cleaner bag full of minions. Minions are little guys with no arms. They have to do everything with their mustaches. Luckily, they have very strong mustaches. And the minions are his army. He wants to take over the world with them. They're not too smart, but they do what he says, or at least they try to.

So he's got this whole bag full of minions. And he says, "I've got an idea. I'm going to turn my vacuum cleaner around backwards. Instead of sucking stuff in, it'll blow it out. So he did. He pushed the Backwards button, and now it started shooting minions out. So now it's raining minions on Jack and Jill, like that. Minions, minions, minions, minions, bouncing all over the place. And as soon as the minions hit the ground, they're eating up all the food, and having a terrible time trying to find enough food, until they find these holes where the food is. And minions go down in the holes to eat the food.



Evil Mister Fred blew his minions out of the vacuum cleaner bag.

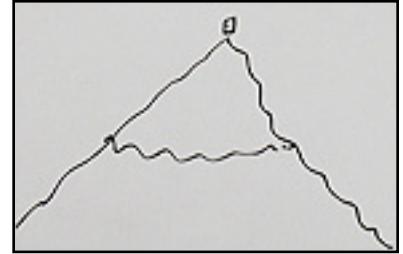
And Jack and Jill want to get rid of them. And they start kicking Kick-Mes down into the holes with the minions, hoping the Kick-Me will kick the minions out of the hole. They discovered that if you put too many Kick-Mes in the hole, it doesn't work too well. If you put too few Kick-Mes in, it doesn't work too well. But if you were Jack and Jill, and it was raining minions, and you were trying to stop them from eating all your food, what would you do?

Imagination and Brainstorming Time

[Students make suggestions] (THERE ARE NO WRONG ANSWERS! Whatever they say, you should reply: "That's a good idea," "They might do that," etc. After brainstorming, proceed with the experiments, then finish the story.)

And we're going to leave this "To be continued . . ."

Sometimes in our stories Jack and Jill might call the Acme Store of Everything. The Acme Store of Everything exists on top of Mount Everest. I'll draw it here so you can see what it looks like. Here's Mount Everest. It's 29,000 feet tall. There's snow all over it. At the very tippy-top, there's a door that floats in mid-air all by itself. Well, you can walk around the door and see the front of the door and the side of the door and the back of the door and the other side of the door. But if you go over and grab the door handle and turn it and open the door, inside you'll see this huge warehouse that's full of elves. And the elves have really good ears. So if Jack and Jill say, "Wow, I'd like to have an F-4 Fighter Plane with machine guns, all of a sudden, poof! -- they'll have an F-4 Fighter Plane with machine guns. So Jack and Jill can ask for anything they want. In our story, Jack and Jill haven't decided what they want yet. They don't know how to stop the minions from eating all their food.



The Acme Store of Everything is a door at the top of Mount Everest.

Experiment/Demo:

Experiment: Make Film Cans Explode

Now, for our experiment, we have a couple of ways to do it. One way is with breath spray. Let's see if this has any in it. Yeah, that's got some in it. Did you see the little puff? Okay. And the little puffer is made to puff because there's some gas in there. We'll see if the gas lights. *[Sprays the breath spray over the flame on a cigarette lighter.]* Did you see that? So this thing has gas in it *[cigarette lighter]*; you saw it make a flame. And this has gas in it *[breath spray]*, but it doesn't usually flame. Imagine you want to freshen your breath, and you want to puff some of this in your mouth. And you've got a cigarette in your mouth. Is the cigarette lit? Yeah. And you go poof!! -- you could blow off your face! If you have a beard, you could probably catch your beard on fire. And you'd go around doing the "ooh-ah ooh-ah dance."



When breath spray squirts across the lighter flame, it ignites.

Here we have an odd-looking thing. You can see through it, and there's wires in there. There's a picture of Evil Mister Fred on this one. And it's got this white thing on the top. And then there's some metal pieces. When you push hard on the red button, if you look hard down here at the bottom, you might see a little spark. See the little spark? *[We'll turn off the lights]* and you'll probably be able to see the spark. The video camera won't see the spark. It's a very small spark. There -- see the spark? Okay, it's not a big spark, but you might be able to see it.



Film can launcher.

Come over here and grab a pair of earmuffs. You can wear them if you like them.



Press the button to release the gas.

First we're going to use the gas that's in the cigarette lighter. And to use it, there's a little thing right here that you push down. Gas comes out, but it doesn't make a flame. Right there is kind of a little step. When you push the little step, invisible gas comes out. We're going to try to get some gas to go into this, so I'm going to stick it down inside, push the paddle, I'm going to count to six. One thousand one, one thousand two, one thousand three, one thousand four, one thousand five, one thousand six. So there's some gas in there, we hope. We put the lid on. And we're going to do the little spark and see if the gas does anything. *[Nothing happens.]* Now, either there was too much or there was not enough. Now we're going to do like this *[waves the can around]*. That takes the gas out.

Now I'm trying with breath spray. We'll go squirt with breath spray, put that on, and we're going to click it *[film can pops off]*, and that was just the right amount.

So in the experiment, we're going to make it so you guys can use these things and try to figure out whether you should use two seconds' worth, three seconds' worth, four second's worth, five second's

worth, or six second's worth to make it go pop. All right? And we're going to be just shooting them all over the place. And if you like the noise, you can listen to the noise. If you don't, you can put on your earmuffs. And we should probably use eye protection so you don't get bonked in the eye. Pick out some goggles that look like they work for you. And you're going to work with a partner, so choose someone to work with.

[Demonstrates lighter.] We don't want you just lighting flames and burning people's hair off. You can make flames with them to see if it works, but when you do the experiment, you just push the little paddle at the bottom and point it into the film can. When you push the little paddle, it lets out gas. You can't see it, I don't know if you can smell it, and you put it down into the cup and count one thousand one, one thousand two, one thousand three, one thousand four, one thousand five -- you decide how many seconds you count. If you happen to guess right, when you fire it, it'll go off. And then you go find your film can and try it again.



A student squirts gas from the lighter into the film can.

I recommend earmuffs because if it's right next to you, it's pretty loud.

[Instructor passes out film can launchers and lighters, and students experiment with them for several minutes.]

What we're going to do is load them up with the amount you think usually works best, and then we're going to turn off the lights, and I'm going to go five, four, three, two, one, and you're going to fire them all at the same time in the dark. Let's see how many can go off. *[Lights off.]* Five, four, three, two, one. *[Students fire all film cans at once.]* Okay, now we're going to put the film cans back on, and we're going to put them back in the box.



Film can on top of launcher.



A student prepares to launch his film can.

Demo: Tennis Ball Cannon

[After collecting the launchers, goggles, and earmuffs, the Instructor brings out a small pvc cannon.]

This is a small cannon of sorts. Sometimes it works, sometimes it doesn't. We're going to put in about six squirts of breath spray -- one, two, three, four, five, six -- we're going to stick in a tennis ball. [Student: And then you press that white thing.] No, there's no white thing to press, just a hole. And we have a cigarette lighter, and we're going to try and hit our dragon up there and try not to break the lights. *[Instructor places end of long butane lighter in hole in cannon.]* So we'll put this here. Okay, five, four, three, two, one. *[Tennis ball shoots out of the cannon and bounces off the wall.]* We can try this outside and see how high it goes. *[Student: Can we make it?]* No, your parents probably wouldn't be happy if I gave you a tennis ball cannon. Let's go outside.

[Outside, Instructor stands at one end of the parking lot and the students at the other, waiting to catch the balls. Instructor swings the empty cannon back and forth a few times.] I'm putting fresh air in it. Are you ready? *[Instructor fires cannon and students try to catch the tennis balls. After shooting four or five balls, they go back inside.]*

Usually, less than three doesn't work, and more than ten doesn't work. Somewhere between four and eight is usually about right.



Tennis ball cannon.



Cannon fires balls.

End of Story

**** DO NOT * present this part of the lesson until after the experiments!***

Okay, Evil Mister Fred is dropping minions on Jack and Jill, and the minions are eating all their food down in the pits. And Jack and Jill said, "We've got to get rid of them." So they said, "Kick-Mes, go jump down in the pits with the minions and play games with them." The Kick-Mes said, "Oh, boy!" And Jack and Jill just threw them down on the minions. And minions have baseball bats, and they were banging away at the poor little guys, which they liked, and fighting with each other.



Minions and Kick-Mes came blasting out of the holes.

And Jack and Jill said, "Okay, I think we've got this figured out." They called the Acme Store of Everything and ordered a whole case of breath spray, like these things. They said, "Hey, you guys don't smell so good! We'll fix you up." And they squirted it in on the minions and the Kick-Mes down in the hole. And Jack said, "Jill, should we do this?" And Jill said, "Oh, yeah, they'll love it!"

So Jack lit a match and threw it in the hole. And it went KA-BOOM! And out came a whole bunch of Kick-Mes and minions, flying like rockets out of these holes. Yeah, they made exploding Kick-Mes and minions.

And one of the holes was directly under Evil Mister Fred. And some of his minions came up and ka-blam! -- hit him right off of his vacuum cleaner. As he was trying to fall, -- boom, boom, boom -- more minions kept hitting him, until Evil Mister Fred got blasted clear over the mountains. And everybody lived happily ever after, except Evil Mister Fred.



Evil Mister Fred got blasted clear over the mountains.

End of Lesson

If you have questions about this lesson, please ask them through the online [Teacher Support Forum](#) on our web site.