Teacher's Guide for:

Straw Rockets

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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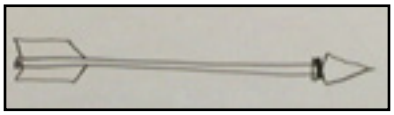
Title Page of Video

Straw Rockets
A Rock-it Science Lesson
Filmed July, 2009

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

Intro Quick Recap:

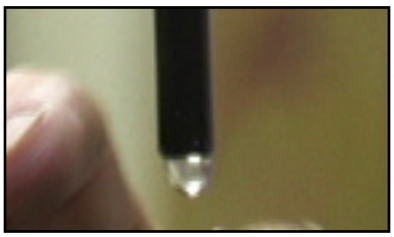


Arrow with a tip and something on the back.

- In the old days, people shot things with arrows. Sometimes the arrows would go crooked, or go around in a loop, or just fall down.
- An arow works better if you put a tip on it.
- It works a lot better if you put something on the back. This made it fly straight.

Experiment Quick Recap:

Experiment #1: Make a rocket from two straws.



The glue drools out of the straw.

- We have two kinds of straws. The smaller straw fits inside the larger one.
- *[Teacher demonstrates]* If you take the larger straw and squeeze some hot glue into one end, it will drool out a bit and make a shape like a bullet. You can dip it into cold water to cool it off. Then you can re-shape it a bit if you want.
- Place the large straw over the smaller one, with the glue tip pointing up. Hold the end of the small straw so the large one can move up and down freely.
- Blow into the small straw so the large one flies through the air.
- Have each student make two or three straw arrows with the hot glue.
- Students put on goggles before shooting straws.

Experiment #2: Make a rocket using a balloon launcher.

Balloon launcher.

- *[Teacher demonstrates]* Take a balloon and insert at least two fingers deep into is so you can stretch it over a piece of pvc pipe.
- Place a straw "arrow" in the pipe with the bullet end pointing up.
- Stretch the bottom of the balloon downward, then let it go to shoot the arrow up into the air.
- This launcher shoots the arrow higher and harder than blowing into the straw.
- Students each get a balloon and a piece of pvc pipe. They assemble their launchers.
- Students go outside to shoot their balloon launchers.
- Students wear goggles when shooting balloon launchers.
- Students can take their launchers home with them, but caution them not to shoot at anyone else.

Equipment List: "Straw Rockets"

Items needed for Instructor:

- Glue Gun
- Glue Stick
- Bucket of Water

Items needed for Students:

Consumables (per student):

- Large-diameter plastic straw
- Smaller-diameter plastic straws that will easily fit inside the larger one
- 1/2" PVC Pipe approx 3" long
- 11" Balloon
- Small Puff Balls (optional)

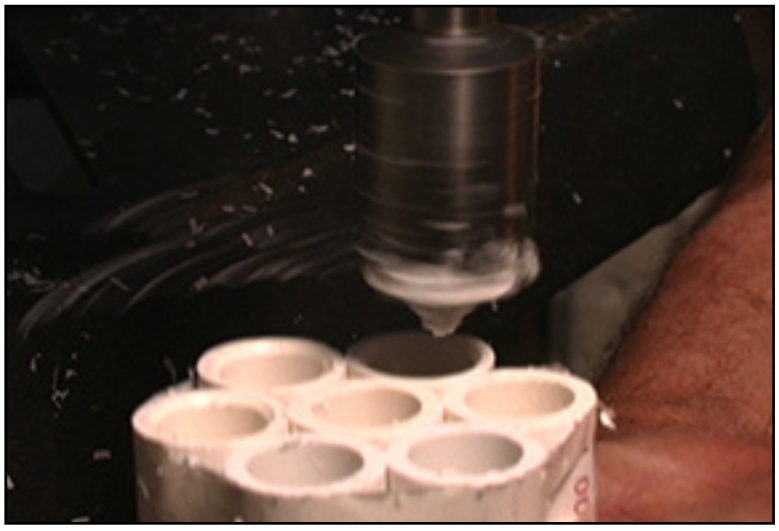
Other:

- Goggles

Prep Work:

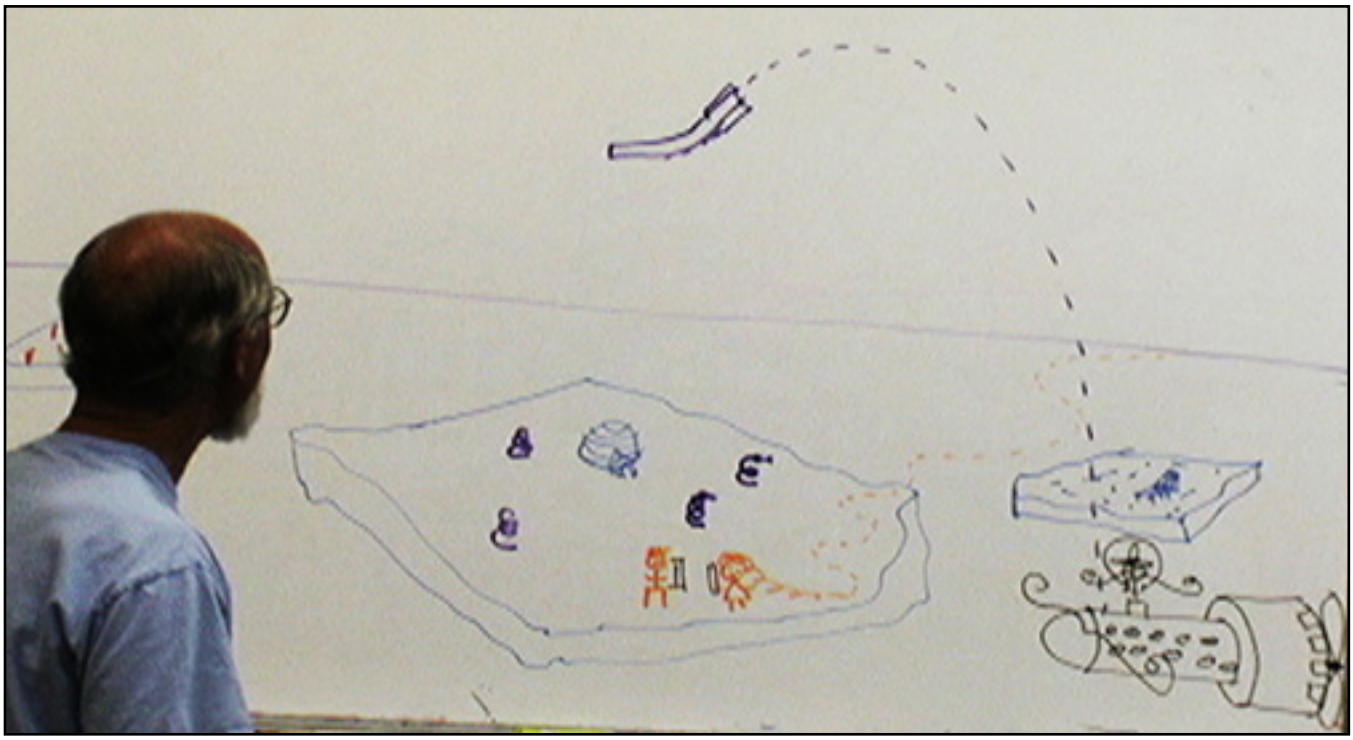
- Cut 1/2" PVC Pipe to 3" lengths
- Bevel ends of pipes so they won't tear the balloon.
- (For instructions on how to cut and bevel the pvc pipe, see the Prep video on the "Straw Rockets" page on our web site.)
- Wash goggles

Wrap PVC pipes in bundles of 7 and slice them with a chop saw.



Bevel the edges with a countersink so they don't tear the balloons.

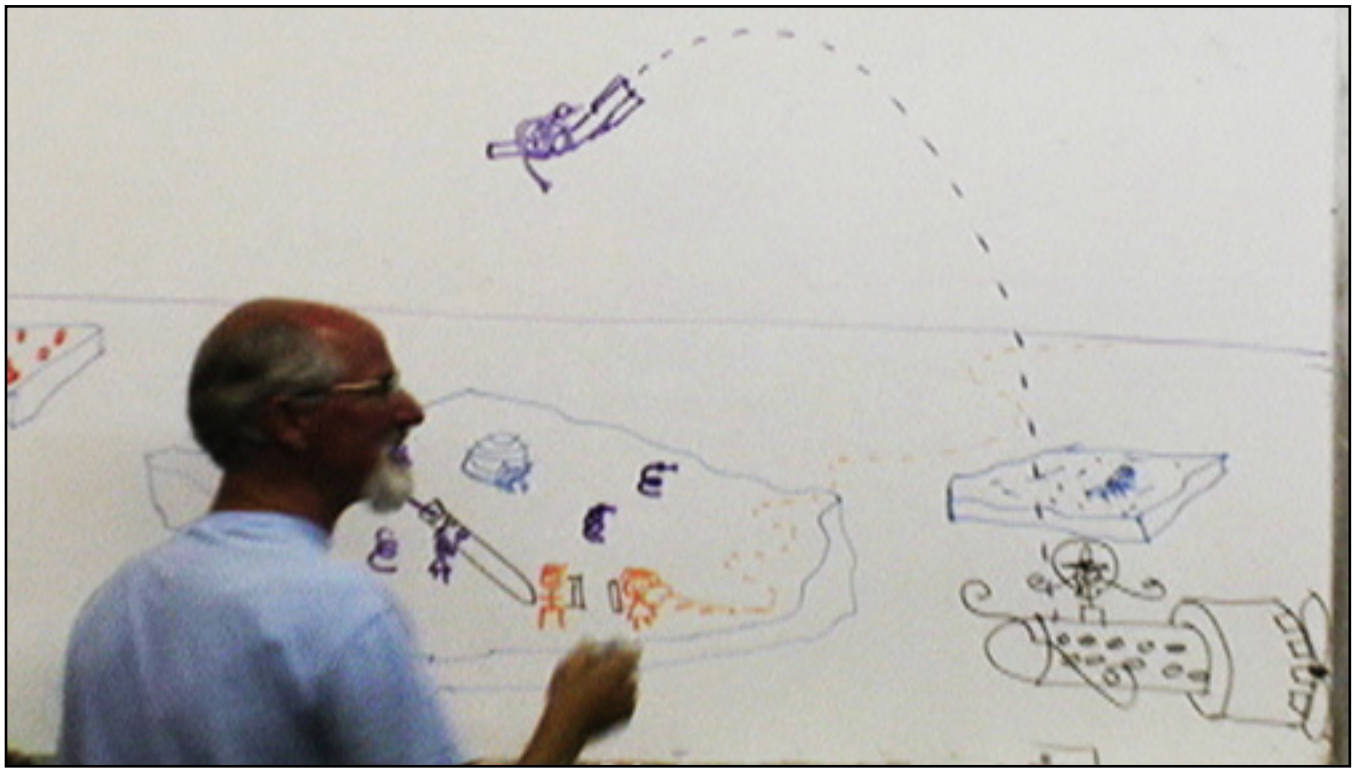
Story Recap: "*Jack and Jill's Purple Pythons*"



Part 1:

- Jack and Jill were living in igloos on an ice floe in the ocean and raising purple pythons.
- Whenever Jack and Jill wanted food, they either fished off the edge of the ice, or they sent the pythons down to get food from under the water. The pythons would bring back things like chocolate bars and pizza.
- There were other ice floes out there, and Inuits lived on some of them.
- Another ice floe had all of Jack and Jill's Kick-Mes on it. It had broken off from Jack and Jill's ice floe.
- Evil Mister Fred is down below in his castle, converted into a submarine.
- Evil Mister Fred wears a fishbowl on his head so he can breathe underwater.
- He wants to kidnap the kick-mes so he can sell them for a million dollars.
- Jack and Jill are trying to get some food to their kick-mes and bring them back to their own ice floe.
- Evil Mister Fred fired a crooked missile from his submarine, and it's headed toward the kick-mes' ice floe.

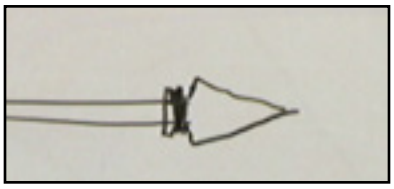
Story Recap (cont.)



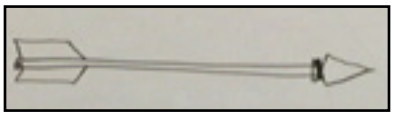
Ending:

- Jack and Jill took one of the pythons and stuck another python down its throat.
- Then Jill held the head of one python while Jack pulled on the other end.
- He stretched it way, way out, then let go, and the pythos went flying through the air.
- The python landed on Evil Mister Fred's missile, but it didn't want to be there.
- The missile started going even more crooked than before.
- The python let go of the missile just before it landed on Evil Mister Fred's head and exploded.
- So Jack and Jill were able to rescue their kick-mes.

Transcript: Introduction



Arrow with stone tip.

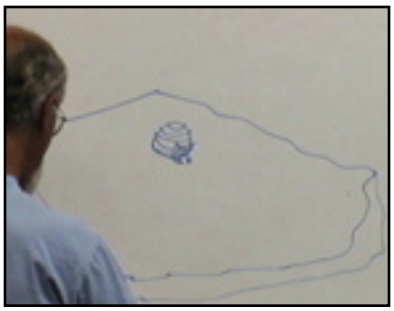


Arrow with something on the back.

In the old days, people used to try and shoot things with bows and arrows because they didn't have guns. And sometimes the arrows didn't work. The arrows would go crooked, or the arrows would go around in a loop, or just fall down. And they discovered that if you wanted an arrow to work well, the arrow had to have a tip on it. So usually there was a stick of wood, and the stick of wood by itself would fly a little ways and it would kind of tumble in the air and fall down. They discovered if you put a rock arrow tip on it, and held it on with some string and some glue, that it would fly a little bit better, because it was kind of heavy on the tip and the arrow shaft would follow the tip. And then the key thing was for them, if you put something on the back, it would fly a lot straighter than before. And the guys that discovered this gave it to people that were around, and it worked really, really good.

Today, we're going to try to make something fly. And you're going to goof around with it and see if you can make it fly straight. So if you're up on a cloud and you're trying to shoot things, you want to have something that can fly straight. But first, we need a crazy story.

Story: *"Jack and Jill's Purple Pythons"*



Igloo on an ice floe.

Jack & Jill and their pythons.

Once upon a time, Jack and Jill were raising snakes. They had lots of snakes crawling around on the ground everywhere. And let's put Jack and Jill on . . . should they be on an island or on a big raft?

[Student] On an ice floe!

Oh, an ice floe! That would be good -- we've never had them on an ice floe before. So Jack and Jill are on an ice floe, with big chunks of ice floating around in the ocean. Huge chunks of ice. There's a big chunk of ice. And Jack and Jill are living in igloos. There's an igloo on the ice. And they're raising ice snakes. Purple ice snakes. There's an ice snake with a funny little tongue.

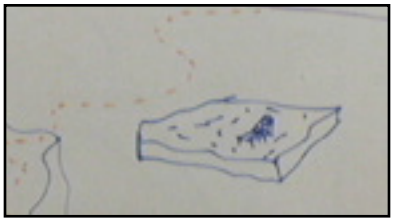
[Student] Purple python.

Purple pythons -- yeah, I like that. Purple pythons. And there's no food on the ice, unless you like to eat ice. And if Jack and Jill want something to eat, they have to go fishing for it off the edge of the ice.

[Student] Or they could send the snakes down to catch the fish.

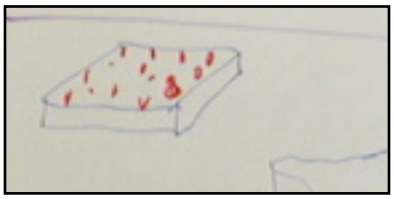
Oh, that's a good idea. Let's have Jack and Jill make them swimming snakes, have the snakes go down and bring back food for them to eat. So Jack and Jill would say, "I'm really hungry. I want a chocolate bar." And the purple python would say, "Okay, sir, we'll get you a chocolate bar." And the purple py-

thon would dive down into the water and go to the chocolate bar store and buy one for Jack and Jill and come back. So Jack and Jill would get some chocolate bars. Then Jack said, "I want a pepperoni pizza." No problem. Snakes go right down there, bring back a pepperoni pizza. They could give them anything they wanted.



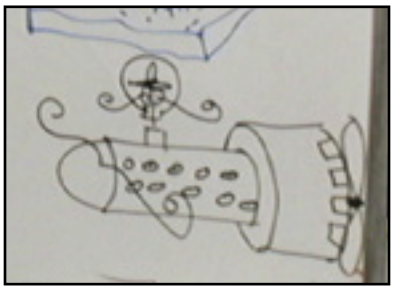
Inuits getting a suntan.

And there must be other ice chunks out here with other people. So here's another chunk of ice with some Inuits on it. Know what an Inuit is? It's kind of like an "Out-uit," but it's an "In-uit." It's the native people of the arctic region. And they were living there. They had chairs to sit on, and they had swimming suits, and they're going to get a good tan out there on the ice. And there's one with lots of native people getting suntans.



Kick-mes on another ice floe.

And then another ice floe thing out here. Let's pretend that this one used to be attached to Jack and Jill's and it broke off. So all their kick-mes are now floating over here with nobody to kick them. So Jack and Jill want to have some fun for their kick-mes, and they want to get their kick-mes back again. Now, if you were Jack and Jill, and you wanted to rescue your kick-mes . . . . Oh, we've got to involve Evil Mister Fred.



Evil Mister Fred's submarine.

Evil Mister Fred is in a submarine down below. He put a nose on his castle. There's Evil Mister Fred's castle. Oh, it needs a mustache. And he's got windows in it, and he rides on top. He needs a propeller. We'll put a propeller back here.

[Student: Couldn't he have a fishbowl on his head?] Oh, good idea. Let's put a fishbowl on his head. There's a fishbowl on his head so he can breathe. So Evil Mister Fred is riding his submarine underwater, he's heard that Jack and Jill have lost their kick-mes, and he wants to go capture the kick-mes, kidnap them, and sell them for a million dollars each.

Evil Mister Fred's crooked missile.

Would it help if Evil Mister Fred had missiles on his submarine? You never know. Maybe he could shoot some missiles out of the holes, and maybe they could hit the kick-mes. So let's put a few missiles up in the air that Evil Mister Fred has launched out. Always good to have a few things up in the air. So here's a missile heading close to the kick-mes. It's a crooked missile. And Jack and Jill are trying to get some food to their kick-mes and bring them back to their own ice floe piece. If you were Jack and Jill, 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 . . ."

Experiment:

Experiment #1: Make a rocket from two straws.

Now we need to do some experiments with what's in this box. Let's see what's in the box. You never know. There's some stripey straws, some colorful straws, there are some black straws, and that should be enough different colors. We have to see if they fit nicely. First, we'll try one of our colorful straws and one of our black straws. Will the colorful one fit inside the black one? No. And the black one doesn't fit inside the colorful one. Will one of the stripey ones fit inside either the colorful one or the black one? Yeah, it fits easy in there.

Squeeze hot glue into one end of the big straw.

Now, this black straw is just sitting here minding its own business. We're going to shove glue up its nose. I'm going to put the glue gun nozzle right in there and go squeezy, squeezy, squeezy.

Now it's got glue coming out of its nose. And can you see the glue, it's drooling out like a big old booger? See, we know there's glue in there because it's drooling.


The glue drools out of the straw.

When it drools just right, so it looks like the end of a bullet, we're going to dip it in a bucket of water. That'll cool it off. Let's see what shape it is now. It's kind of bullet-shaped. I like that. It's still kind of warm. What can we do with a straw that has an end on it like that?

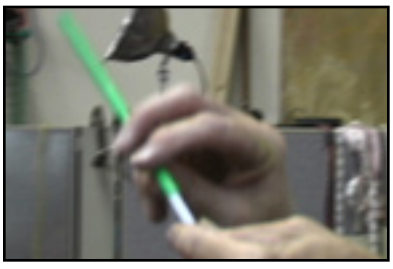
[Student] Blow it so it goes up into the air. With the other straw. Put it in the hole and then blow it.


Dip it in water to cool it off.

Oh, put it in the hole and then blow it. *[Instructor inserts stripey straw into black straw.]*

[Student] Without holding the black straw.

Okay, so the black straw can slide? Okay. *[Blows into stripey straw, and black straw flies up into the air.]* Good idea!


Insert small straw into big straw.

Let's try one of the bigger straws. We'll gob some glue on the inside of that.

[Student] Make it sharper.

Yeah, you can make the tip any way you want. And let's see if it'll drool out. It's starting to drool. Shall we dip it now? Now, this one's a bigger straw, it's wider. Will it go as high as the other one, or not as high as the other one? This one has a lot of space, so when I blow, a lot of air's going to come back at me. *[Blows on straw and launches it.]* Oh, it touched the ceiling. So it looks like both of them work. It's just that you have to blow pretty hard to make it go.


Blow through straw.

So for our first experiment, you're going to make some straws and get some skinny straws and blow them around. But since there's a lot of people here, you might accidentally get a straw and go bmmph! -- right in your eye. Oh, man, that really hurts! So we're going to use safety goggles.

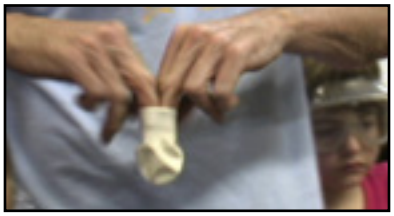
So come over here and pick one of the colorful straws, one of the skinny ones, and one of the black ones. If you want to, you could put a fuzz ball on the end of the straws. I just found those in the box. If you want to glue a fuzz ball on the end, you can do that, too. And when you're ready, come over here and I'll gush some glue on the inside, and you shape it the way you want it shaped. Then you dip it in the bucket after you get some in there. We're going to gush the black one. If we gush the stripey one, you blow on it and you blow your eyeballs right out of your head. *[Students pick out straws and Instructor puts hot glue in the large one.]* You might want to make a couple of extra arrows in case you lose your arrows.

Experiment #2: Make a rocket using a balloon launcher.

For this experiment, you need a balloon and a tube. And you set the tube on the table. And then you take a balloon and stick at least two fingers inside of it -- more is better -- and you go squish, squish, squish. And you make your fingers crawl inside until you are trapped. These are balloon handcuffs. You now have a balloon stuck on your fingers. And you stretch the balloon and you put it over the pipe like that. Now you've got a balloon and a pipe. What possible good could this be? Well, it can be really good.


Tubes made from PVC pipe.

I'm going to put a straw in the balloon. The pipe keeps the mouth open. Then I'm going to pull on the balloon. I don't really have to grab the straw at all; I'm just going to pull on the balloon, way back, and I'm going to let go. What do you think it's going to do? Okay, watch up there. *[Instructor releases balloon, firing straw toward ceiling, where it gets stuck in the insulation.]* It went up but it didn't come down. Where did it go? Look way up there. Do you see a green straw stuck in the silvery stuff?


Stretch balloon with your fingers.


Balloon on pipe.


Drop straw into pipe.


Pull back on balloon and release.

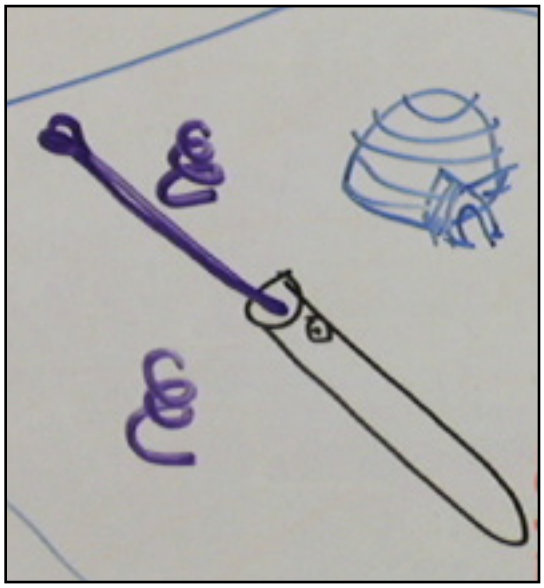
So, we're going to do these outside, because I don't want a bunch of holes in my ceiling. And you don't get to point them at each other because you don't want straws stuck in you. You can shoot them up in the air.

[Instructor passes out pvc pipe and balloons, and students assemble them.] Okay, now you grab your arrows and your balloon pipe and take everything that you have. Grab your pipe and all your arrows and your regular straw. *[Students go outside and shoot straws with balloon pipes.]*

End of Story

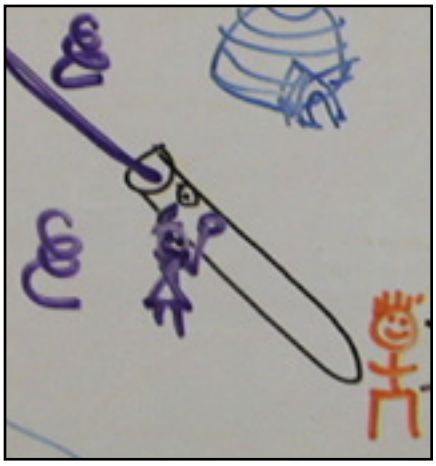
**** DO NOT * present this part of the lesson until after the experiments!***

Well, you guys have created a pretty weird story here. Where are we -- Antarctica? On an ice flow in Antarctica. Okay, and we have a crooked missile fired by the crooked Evil Mister Fred. Jack and Jill are trying to get their kick-mes back from the piece of ice they drifted away on, and they have a whole bunch of purple pythons with them. The pythons can get them anything they want from down under the water. And Evil Mister Fred is trying to blow up the kick-mes so he can capture them and sell them for a million dollars each. Jack and Jill said, "We've got to do something to rescue our kick-mes!" And Jack said, "Why? They get blown up, they just become kick-mes again." And Jill said, "Well, yeah, but we should rescue them anyway."



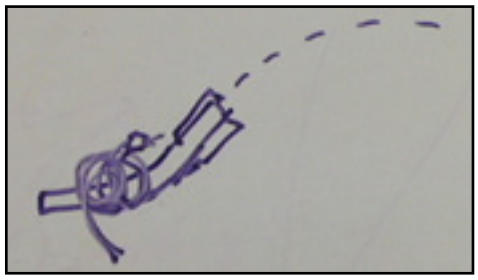
One python inside another.

So they took one of the pythons, and they stuck another python down his throat. So now you have one python with his mouth open, and another python stuck down his throat. There. There's a python sticking in the mouth of that python.



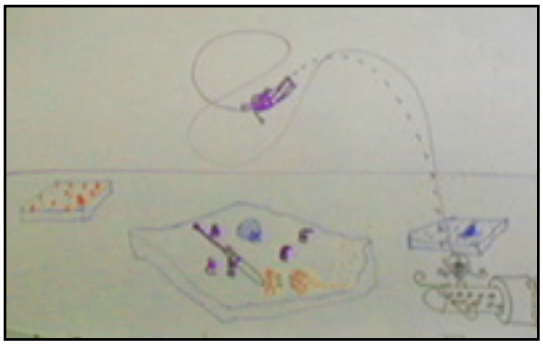
Jill holds python and Jack pulls.

And then Jill held the head of this python, and Jack pulled on the other end. And he started stretching the python -- stretch, stretch, stretch, stretch, stretch, stretch. And he let go, and the python went flying through the air. And as he bent, he would go this way and that way, and he could go in all kinds of circles and stuff. And the python landed on Evil Mister Fred's missile.



Python lands on missile.

And he said to himself, "Oops!" Because he didn't want to be on a missile. Now the missile starts going even more crooked than before, and the python says, "I'm out of here!" So he lets go of the missile. And the missile landed on Evil Mister Fred's head and exploded. And Jack and Jill were able to rescue all of their kick-mes, and they all lived happily ever after, except Evil Mister Fred.



Missile lands on Evil Mister Fred.

Now, you can keep your straw shooter. Be careful if you're shooting it at home because you saw how far they can go. You don't shoot at little brothers and sisters.

End of Lesson

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