



## Teacher's Guide for: **Ice Cream**

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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Ice Cream  
A Rock-it Science Lesson  
Filmed July, 2009

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## Quick Recap



### Lesson Intro: How Water Freezes

- Teacher explains how water molecules circulate in a freezing pond, the ones at the surface dropping to the bottom as they get cold, and lower ones rising to replace them.
- As the molecules get colder, they get closer together, until they freeze -- then they get far apart.
- Water only freezes at the top of the pond. This is good for animals living in the pond, because if the water froze all the way to the bottom, the animals would freeze.
- If you can put something in between the frozen water molecules, you can trick them so they'll no longer be ice.
- When ice melts, its coldness has to go somewhere. When you eat ice cream too fast, you get brain freeze.

## Experiment Recap

### Experiment: Freeze Ice Cream



1. Check the temperature of a bag of ice. It's lower than the freezing point.



2. Each student gets a ziplock bag with a scoop of ice cream inside. They have to melt it with their hands. (Some get soda if they prefer.)



3. Teacher puts crushed ice into plastic bottle. Students in pairs put in their sealed bags and take turns shaking bottle for three minutes.



4. Students remove bags to check. Ice cream hasn't frozen.



5. Teacher adds rock salt. Students put bags back in and shake for another 3 minutes.



6. Temperature of bottle is now below freezing. Students remove bags, but do not eat ice cream. A scoop of ice cream (or soda) from the original container is given to those who want some to eat.

## ***Equipment List: "Ice Cream"***

### **Items needed for Instructor:**

- Large bag of crushed ice
- Infra-red Thermometer
- Scoop for crushed ice
- Scoop for Rock Salt
- Ice Cream Scoop

### **Items needed for Students:**

#### **Consumables (per student):**

- Ice Cream, softened, one scoop per student
- Assortment of sodas or other drinks, in place of ice cream
- 1-qt Ziplock bag
- Crushed ice, one pound per student
- Rock salt, 1/4 cup per student
- Small paper cup
- Plastic Spoon

#### **Other:**

- 1-qt Plastic Bottle with screw-on lid
- Aluminum roasting pan (1 pan per 2 or 3 students)

### **Prep Work:**

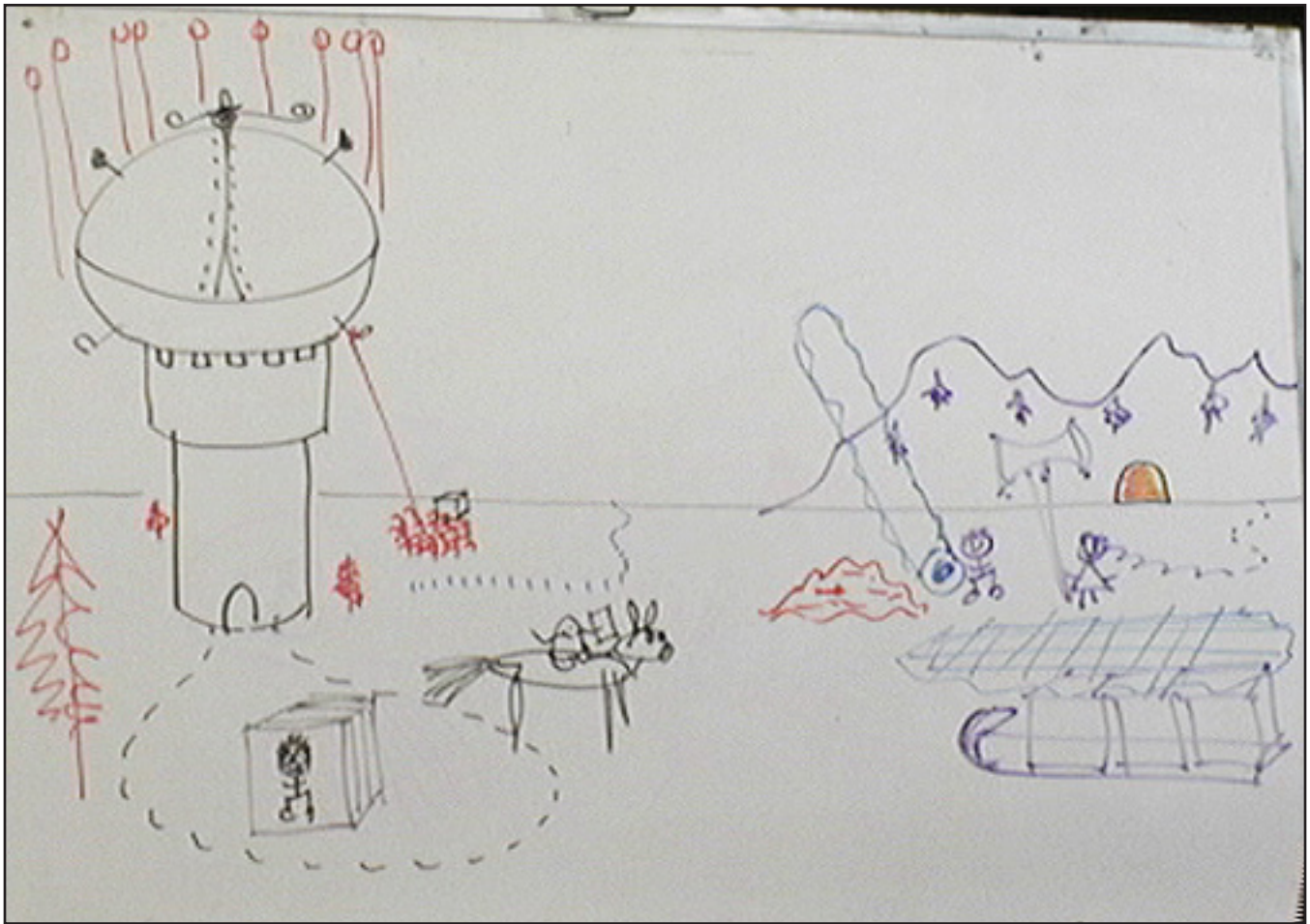
- Take Ice Cream out of freezer ahead of time to soften
- Buy a large bag of crushed ice on morning of class



Infra-red thermometer being used to check temperature of ice in plastic bottle.



## Story Quick Recap



### Part 1:

- Evil Mister Fred is a king who loves ice cream and has grown very fat.
- He kidnapped the only person who knew how to make ice cream and put him in a cage.
- Meanwhile, Jack and Jill were living as wood cutters. Jill used a big axe and Jack used a chain saw. The chain saw made lots of sawdust, which Jack hid in a cave.
- During the winter, Jack dragged his chainsaw over a frozen pond and cut it into ice cubes, which he also put into the cave.
- Now it's summer. Evil Mister Fred decided to travel around his kingdom to make sure his subjects weren't being good. He wanted to have ice cream available wherever he went.
- His minions attached thousands of balloons to Evil Mister Fred in order to get him off his castle, so he could travel. They carried the ice cream man in his cage.
- The ice cream man got sick, so he wrote down the recipe so someone else could make it.

## Story Quick Recap

### Part 1 (cont):

- A minion on horseback went on ahead to give the recipe to the next town, where Jack and Jill lived. Just before he got there, he bumped into a hive of bees and jumped into a mud puddle to cover himself with mud and keep the bees from stinging.
- When he gave the recipe to Jack and Jill, the ingredients were readable, but the directions for freezing were wiped away by the mud.
- Jack and Jill mixed up the ingredients and brought them into the cave, hoping the ice cubes would freeze the ice cream. It didn't work.
- Jack and Jill invited these three to come along with them, so they made some wheels pop out of the bottom of their tub and followed.
- Evil Mister Fred has made the Abominable Snowman angry, drilled a bunch of holes in the log to weaken it, and told the tasmanian devils that the people who are coming hate tasmanian devils.
- Jack and Jill have to find a way to get past all of them to get to Sick Town.

### Ending (Picture is the same as Part 1 -- no additional drawing was done):

- Jack and Jill knew Evil Mister Fred was on his way, and the ice cream wasn't ready.
  - Jack panicked and ran around the cave with his chain saw, scraping the roof of the cave, which was made of salt. As Jack ran around, he mixed up the salt with the ice cubes, and the ice cream froze.
  - When Evil Mister Fred arrived, he could barely fit into the cave. By the time he was finished eating all the ice cream, he couldn't get out. Jack and Jill slipped away.
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## Transcript: Introduction

Can we make water freeze at 100 degrees? Usually, water freezes right at 32 degrees Fahrenheit. You've got all these water guys hanging around -- they look like Mickey Mouse. And if there's a surface there, the Mickeys are all hanging around at the surface. And when it gets cold out, the air gets cold first. When the air gets really cold, it sucks the heat out of the water guys, and they start to get colder and colder. When they get colder, they get closer together, and they start to sink down to the bottom. And new guys come up to the top. And pretty soon the new guys get colder and colder, and they sink down to the bottom. And another groups of new guys comes to the top. This keeps going and going and going and going until they get so cold that they don't get closer together. They do something very strange -- they move further apart. As soon as they move further apart, they freeze and become ice.



The water only freezes at the top of the pond.

And the ice works perfectly. The ice protects the rest of the water under it from getting frozen. Do you know why this is good? Because if there's a fresh water octopus down there, then he won't get frozen in a giant block of ice. That's really good, because you don't want to have frozen octopuses.

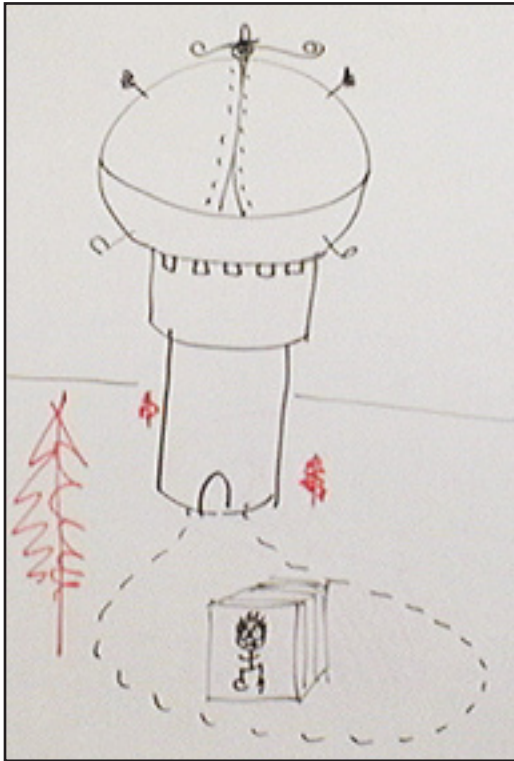
Now, if you could somehow stick something in between those guys and make them get further apart, or somehow make them get closer together, you can trick them, and they'll no longer be ice. They'll turn back into water. Can you think of anything that will make ice turn back into water?

[Student: Heat.] Heat is a good thing. What else can you use? Salt? Yeah, if you can get salt to fit in between the water guys, they'll turn back from ice into water. Yeah, you could boil it. There's something you put in your cars to keep the radiator from freezing. [Student: Antifreeze.] Yeah, that's right, it's antifreeze. Is there such a thing as uncle-freeze? [Students: Nooo!]

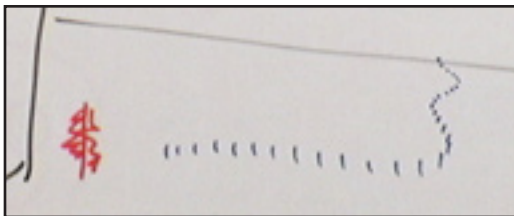
Well, today we're going to mess around with ice. When you melt the ice, its coldness has to go somewhere. So if you put an ice cube in your mouth, the coldness goes into your head. If you swallow a bunch of ice, it goes into your stomach, and the pain goes where? [Student: To your brain.] Into your brain! It's called brain freeze. If you eat ice cream too fast . . . Did you ever get a brain freeze from eating ice cream too fast?

Well, we need a crazy story and then we'll do some experiments.

## Story: "Evil Mister Fred's Ice Cream"



Evil Mister Fred on his castle, with the ice cream man in the dungeon.



The people lined up at the castle.

Once upon a time, Evil Mister Fred was a king. He loved being king because he could eat anything he wanted. And Evil Mister Fred liked to eat french fries, he liked to eat cream pies, he liked to eat cream puffs, and he liked to eat ice cream (it was just invented in those days, by the way). In fact, Evil Mister Fred kidnapped the inventor of ice cream.

So we need a castle for Evil Mister Fred, and we need a forest around the castle, and here are some giant redwood trees. Here are more giant redwood trees. The castle is so big, you could drive a train through the front door.

And Evil Mister Fred, of course, even after eating all this wonderful food, used to sit on top and watch everything. He ate too many french fries. And Evil Mister Fred loved to make decisions, and one of his decisions was that he was going to kidnap the only guy in the world that knew how to make ice cream, and put him in his dungeon. And that guy wouldn't get to make ice cream for anybody except for Evil Mister Fred. There's the ice cream guy, and he's in a cage. Yeah, we'll make him upset. There he is, trapped in Evil Mister Fred's cage.

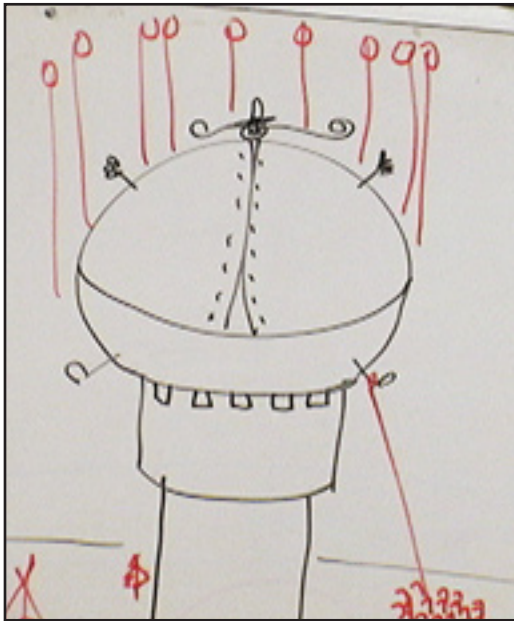
And Evil Mister Fred decided that he wanted to see if everybody in his country was being good or being bad. He wanted them to be bad. And so, he invited people from every city to come to his castle and tell him what they're doing. So all the people came from everywhere -- these are people -- and the people came to the castle. And Evil Mister Fred said, "What have you been doing?" And they said, "Oh, sir, we've been

really bad. We've been hitting each other, throwing rocks at each other, robbing banks, burning down houses, causing all kinds of chaos and mayhem." And he says, "Good for you. You go."

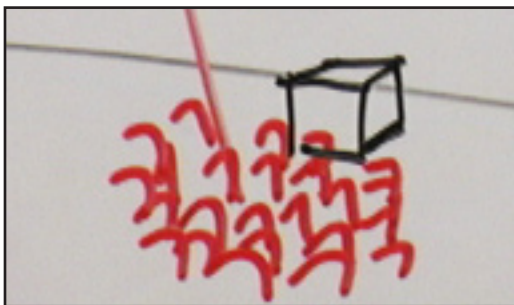
Next person, he said, "What have you been doing?" "Well, we've been good. We didn't do anything of that stuff. We've been treating each other nice, growing food, giving it to the poor." He'd say, "Throw them in jail." Next guy. "What have you been doing?" Those guys said, "Whoa! Okay, we've been bad." And everybody from then on, of course, said that they were bad. But then Evil Mister Fred said, "I don't believe you. Throw them all in jail." And everybody went running like crazy so they wouldn't get thrown in jail.

And Evil Mister Fred said, "Okay, I'm going to find out for myself just what's going on. I'm going to go from city to city and just see how bad they are. If I don't see war and chaos and burning buildings, they're in trouble."





Minions attached millions of balloons to Evil Mister Fred and tied a rope to his leg.



Minions carried the ice cream man's cage on their heads.

And Evil Mister Fred said, "Oh, you guys are hopeless! You can't do anything right." And then he said, "Chop off his head." And the guy said, "No! Don't chop off my head!" He says, "How about this -- I'll write down the recipe for making ice cream, and then you just take it wherever you go, and have someone else make it. And you can guard it." And Evil Mister Fred said, "Yeah, that's a plan."



Minion on a horse, carrying the ice cream recipe.

And he said, "Minions, let's go!" And the minions said, "Uh, boss, you're kinda high up there. How are we going to get you down?" And he says, "I don't know, but if I fall and hurt myself, it'll be your heads chopped off." And the minions said, "Oops!"

So the minions got three million helium balloons and attached them to Evil Mister Fred. Millions of helium balloons, and now Evil Mister Fred is floating on balloons. And they had to tie a rope to his leg, and all the minions got together and they held onto the rope. It took hundreds of minions just to hang onto the rope. And they're going to drag him from city to city.

And then Evil Mister Fred said, "Wait a minute. What are you going to give me for food?" And the minions said, "I don't know. You like road kill?" He says, "No! I don't want road kill. I want ice cream. Wherever we go, I want ice cream, and I want it to be the very best ice cream ever made. Take the prisoner with you."

So the minions went down and they grabbed the cage with the prisoner in it, and they put the cage on their heads and had him inside. And the guy that knew how to make the ice cream started getting really sick. He was dizzy, he was seasick, riding around on these minions' heads. He says, "Oh, I can't go, I'm going to throw up." The minions said, "Noooo!" And they dropped the cage. And he broke his ankle when they dropped the cage. And he says, "Ohhhhhh, I'm in terrible shape!"

So they got the recipe all written out, and they gave it to a minion. And he was riding on a horse. And he was supposed to take it to the first town. So we need a horse here. And he's got the recipe in his mustache. And he's heading off to the next town. The next town is up in the hills. Here's the hills. Up in the hills, there's all kinds of forest there. And they make wood up there. Do you know how they make wood? They chop down trees. And the persons chopping down the trees are Jack and Jill.

Jack likes to chop down trees, and Jill likes to chop them down a lot. Jill is really good at it. She's so good at chopping down trees, they gave her a nickname. Know what they called her? They called her LumberJill. And she's got a big axe. She can chop down a tree with one swing -- shoosh! Ahhhhhh -- crash! She walks up to the next one -- chop! And it'll all fall down.

Jack says, "Oh, I can do better than that. So he called the Acme Store of Everything and ordered a chain saw.

He goes Brrmmmm! And he's out there -- brrmmmm! -- sawing the trees down with that. When Jill chops down a tree, it just falls down and there's some branches and stuff. When Jack chops down a tree, there's big piles of sawdust everywhere. And Jill said, "You can't just leave that sawdust around. You've got to collect that sawdust and hide it somewhere."

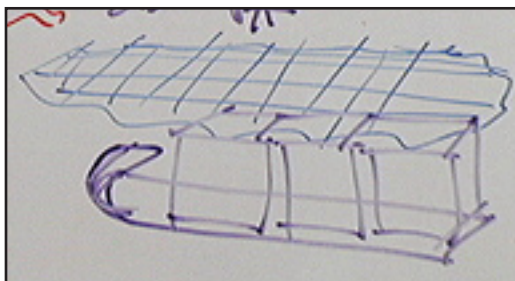


Jill with her axe and Jack with his chainsaw and a pile of sawdust.



Cave filled with sawdust.

He says, "Okay." So Jack swept the sawdust under a rug he put out there. The rug kept getting higher and higher, and Jill said, "That's not good. Find a better place." So Jack looked around and he found a cave. He says, "That's perfect! I'll put all that sawdust in the cave." So Jack grabbed that sawdust, put it on a wagon, dumped it in the cave, and the cave was full from top to bottom with sawdust.



Jack cut up the pond ice and took it to the cave on a toboggan.

And there was a lake nearby, and Jack and Jill liked to go swimming in the lake. And in wintertime, let's suppose it's winter now, and the lake froze solid. And Jack was bored. What are you going to do? It's winter, it's snowing, and there's a lake out there. You could go ice skating. So Jack got his chain saw and went out ice skating. He didn't have any ice skates, so Jack fired up his chain saw, put himself backward with the chainsaw in front of him, touched the chainsaw to the ice, and the zoom-zoomy blade like this would drive him backwards really fast, like sixty miles an hour, across the lake.

Now when he got to the other side, he'd hit a tree, and the snow would fall down and bury him in the snow. He'd dig himself out, turn around and go brrrrzzzzz and shoot back the other way. Well, he had so much fun doing this, he ended up cutting the lake into pieces. Then he had to go sideways, back and forth this way. Next thing you know, there's a whole lake of ice cubes, and Jack trying to balance from one ice cube to the next.

And Jill said, “Hey, Jack, that’s perfect. I like that. Let’s put the ice cubes in the cave. Jack said, “You can’t. It’s full of sawdust.” And Jill said, “Well, dig some out and we’ll throw some ice cubes in.” So Jack had to dig out a bunch of sawdust, and they got a big sled, a toboggan kind of sled, and they put the ice cubes on it -- big ice cubes. And they took them over to the cave and buried the ice cubes in the sawdust.

Jack said, “Well, now, that was dumb. What are you going to do with a bunch of buried ice cubes?” And Jill said, “Just wait til summer and you’ll see.” So all winter long, they cut ice cubes and they’d throw them in the cave. Pretty soon they had a cave packed with buried ice cubes.

Now summer’s come. Evil Mister Fred is floating toward Jack and Jill with his balloons. And the minion is headed toward them -- barump, barump, barump, barump -- on a horse. The minion isn’t watching where he’s going. He figures the horse knows where it’s going. He doesn’t have to watch, so he’s facing backwards as he’s riding on this horse. And the horse ducks because there was a beehive right in front of it. And the beehive hit the minion -- splat! Knocked him off the horse. He’s covered with honey, and he says, “Oh, boy, honey.” And the bees are mad. Now they’re stinging the minion -- sting, sting, sting, sting, sting -- and he’s going, “Ooh, aah, stop, stop, don’t do that!” And he started running like crazy, and the bees were following him and stabbing him, and so the minion jumped into a muddy old creek. And he covered himself with mud. Mud works great for keeping off the bees.

The minion had to walk the rest of the way to where Jack and Jill were. And Jack and Jill were the ones who were chosen to prepare the ice cream for Evil Mister Fred. The minion shows up and says, “Here you go. Here’s the recipe for your ice cream.” Jack and Jill saw this muddy old piece of paper. So they laid it on a flat rock and they scraped the mud off this way and the mud off that way. And they could read the top of this thing, and it said, “To make ice cream, mix together a bunch of cream from a cow, honey from a beehive, some flavorings, and today’s flavoring of the day is dill pickle. And then turn over to see instructions for freezing.” So they turned it over, and the ink was all gone. The mud had just washed it away.

Now, Jack and Jill know Evil Mister Fred is coming to check things out. They also know that if Evil Mister Fred is happy, he won’t kill them. But if he doesn’t like the ice cream, and he’s unhappy -- off with their heads! Now, 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.)

Okay, we’ll leave this “To be Continued . . .”

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## Experiment: *Ice Cream*

Ice. What temperature should it say? *[Students make guesses.]* It's supposed to be 32, right at the melting point, or zero degrees celsius. This wet ice, water ice. It says 17.4 degrees fahrenheit. How could it be 17.4? What do you think? Right now, it's not melting.

It's still cold from the freezer. The freezer is five degrees, so it's not to the point where it's started to melt yet. Whenever it starts to melt, it'll be 32. So it's got to get warmer to be 32. Deeper in the bag it's about 16. So this ice is pretty cold. It's colder than the freezing point. So if we put ice cream mix in there, it should freeze. We want to see if it really does that.

We're going to give you some of this ice and a container like this. You're going to put melted ice cream in with it. Your melted ice cream is going to be in a ziplock bag. So you'll have ice cubes in here, you'll put your ziplock bag in there, put a lid on it. These are padded lids. And then, we're going to shake it for three minutes -- shakey, shakey, shakey. You're going to take turns because you're going to have a partner. After you shake for thirty seconds, you're going to hand it to your partner and she's going to shake it for thirty seconds -- shakey, shakey, shakey. And then I'll say, "Switch," and she'll hand it back. Then I'll go shakey, shakey, shakey. And then after thirty seconds I'll give it back and she'll go shakey, shakey, shakey. And after thirty seconds, then I'll tell you when the three minutes are up.



Scooping ice into plastic bottle.

Some people might want to freeze ice cream, some people might want to freeze soda pop, some people might want to freeze water. If you don't want to freeze ice cream, come over here. Make a line right there. You've got a choice of vitamin water, root beer, fruit flavor stuff . . . Try to get most of the air out of your bags before you seal them.



Checking the temperature of the ice.

At the end of the three minutes, we'll take the cap off and then you'll pull out your ziplock bag. If it's frozen, it should feel stiff, like ice cream feels stiff. If it's not frozen, we'll just cut off your heads. No? Okay, we won't. So pick a partner. I went and looked for dill pickle ice cream, but they didn't have dill pickle ice cream.

Your job, when you get a bag with ice cream in it, is to melt it with your fingers. Or you can put it on your tummy. Somewhere so that it will [get warmer.] Yeah, you can put ice cream in your armpit. Is anybody here allergic to anything in this stuff? If you want to, you can try to freeze something else.





Instructor scoops ice cream into ziplock bag.

*[Instructors scoop chopped ice into plastic bottles and hand out ziplock bags containing a small scoop of ice cream or water, soda pop, etc. Students try to melt the ice cream by pressing the bag with their hands. When it's melted, they put the bag inside the bottle with the ice and screw the lid on.]*



Melting ice cream with hands.

Okay, has everybody got theirs filled up? No sitting down, you need to be standing up someplace.

*[Instructor gives the*

*signal to start, and students start shaking their bottles. Every thirty seconds, the Instructor yells, "Switch!" and the students hand the bottles to their partners to shake. After three minutes, Instructor gives the signal to stop.]*



Shaking the bottle.



After the first round of shaking, the ice cream is still soft.

Bring them back to the table. Now, what you're going to do is open the top, take the bag out, feel and see if it's frozen, and don't open the bag. You can feel through the bag. Does anybody have one that's frozen hard? Is it frozen? *[Students: No!]* Everybody put your bag back in. Now, somebody said there's a secret ingredient to make ice cream freeze. *[Student: Salt.]* Salt. We're going to add salt in there, and salt is going to melt the ice cubes. Where will the coldness go? We'll find out. *[Instructor adds a small scoop of rock salt to each bottle.]* Once you get the rock salt inside, put the lids back on and twiddle your thumbs until it's time. After you get done shaking, we're going to come around and measure the temperature in your bottle before you open it. So when we're done shaking it, just set it on the table. Ready, get set, go! *[Instructor counts the time again as the students shake their bottles.]*



Adding rock salt.

Now bring them back to the table, but don't open them up yet. We want to measure the temperature of the bottle. *[Instructor uses infrared thermometer to check bottles. Most are around 20 degrees.]* Okay, it has to be below 32 to even start freeze



Checking temperature of the bottle.

ing. The coldest one here was about 15. Is there any frost on the outside of your bottle? If there's frost on the outside, that means it's freezing some of the moisture in the air.

Now, we're going to put a few of these big tubs out. Dump the ice in the tub and see if yours is frozen. If yours seems like it's frozen, you may risk your tongue and try to taste it. It'll probably taste very, very salty. Try it and see. Just what's in the bag, not what's on the outside of the bag. Is it salty? Actually, it's very rare for these to not end up all salty, so what we're going to do is give you some ice cream out of the container that you can taste, or some drink. So if you want a little bit of ice cream or a little bit of drink stuff, come up.

*[Student: What do we do with the ice cream we made?]* We're going to throw it away.



Dumping out the bottle to see the frozen ice cream.



Everyone gets a little ice cream (or soda) to eat, from the original container (not from the ziplock bags).

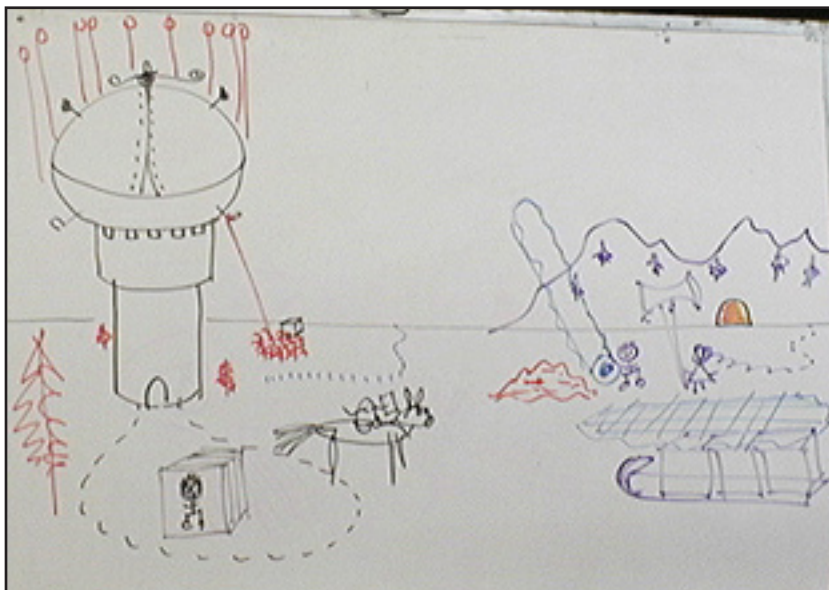


## End of Story

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

*[Note: There was no additional drawing done for the story ending.]*

So Evil Mister Fred is floating with thousands of balloons, on his way towards Jack and Jill's place. Jack and Jill were trying to freeze the ice cream. They dug a hole in the cave with all the sawdust and the ice cubes left over from wintertime. And they put the bags that they'd mixed together on the ice, and they said, "I hope it freezes, I hope it freezes, I hope it freezes." But it didn't freeze. They said, "Oh, no. We're in trouble now."



And Evil Mister Fred showed up, and Jack, being in panic mode, grabbed his chain saw and started swinging it around. He's in the cave and he's going brzzz, brzzz, brzzz -- he's cutting the ceiling, he's cutting the sawdust, he's cutting ice cubes, and he's making a big mess. And luckily for him, he didn't know it at the time, but the top of the cave was covered with salt. And salt fell down all over the ice where the ice cream was. And as he was running this way and running that way, he mixed it all up. And Jill said, "Jack! Stop!" And Jack said, "No!" Jill ran over and said, "Stop!" and made him turn off his chain saw. She said, "Look at this." Jack said, "Whoa -- it's hard! That's really good. We're saved! Yeah!"

About that time, Evil Mister Fred floated along on his balloons. And he said, "I'm hungry! Where's my dill pickle ice cream?" And Jack and Jill said, "Right here, your -- whatever you are -- your acreage!" He's big, like acreage. "Right here in this cave." And Evil Mister Fred said, "Yeah! Minions, put me in the cave." And the minions took Evil Mister Fred, and he almost fit in the cave opening. And the minions had to go push, push, shove, shove, put some butter on him, until he popped into the cave. And Evil Mister Fred said, "Yeahhh!" And he ate all of the ice cream.

Of course, Evil Mister Fred, after eating five hundred pounds of ice cream, became bigger, and he couldn't get out. And Jack and Jill decided, "We'd better go now." So they wandered off and lived happily ever after. And everybody else did, except Evil Mister Fred.

## End of Lesson

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