Lesson: “Why are so many toys made out of plastic?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

Hey, this is Doug! I want to show you something. I don't know if you ever noticed this before, but toy cars, action figures, dolls, LEGO—have you ever noticed what material they're made of? So many toys today are made of plastic. Why is that? Why are so many toys made out of plastic? Well, it turns out we haven't always made toys out of plastic, because plastic had to be invented. Before the invention of plastic—now, I'm talking about the time of your great-great grandparents—their toys were made out of a different material: wood. Some of these toys were actually very nice, but there was a problem. These wooden toys took a long time to make because each toy had to be carved by hand, like this. Wooden toys were expensive because it was so much work to carve even a single toy. Even a little wooden toy like this might cost an entire week's pay. That would be like this little toy hippo costing a few hundred dollars. Isn't that crazy? So many parents had to make toys themselves by carving them from wood in whatever little free time they had. So most kids were lucky to have just one or two toys. You can understand why people started to ask themselves, wouldn't it be great if there were an easier way to make things? Like, imagine if all you had to do was carve one toy, and then you could just hit a button to make copies. And poof, you'd have lots of the same toy in almost no time. Now the toys would cost less to make. Every child could have more toys. What you'd really need in a situation like this is a faster, easier way to make a certain shape so that you could

make lots of toys all at once. Like, what if you want to make lots of copies of this lion shape? Can you think of any way to do that? I'll give you a hint by showing you an example totally different from toys. Say if, instead of toys, you wanted to make a bunch of popsicles, like these awesome lion-shaped popsicles that are sold at the zoo. Now, what could you do to make lots of these? You know you could take a big chunk of ice, and you could carve it into an animal shape. But that would take a long time, and you don't want just one. You want a whole bunch of these the exact same shape. Can you think of an easier way to do it? How do you think popsicle companies make lots of copies without having to carve each one?

EXPLORATION VIDEO 2

I gave popsicles as an example because, notice, there's something special about ice. Ice is a material that has this property where it can melt into a liquid, like this—watch. This is an ice cube quickly melting on a hot frying pan. You see it's becoming a liquid? It's water. Water is just the liquid form of ice. Ice is the solid form of water. Ice has the property of being meltable. Being meltable is a really useful property for a material to have because you can pour a liquid into any shape you want. Like, if I pour water into this ice cube tray with rectangular shapes and then I freeze it back into a solid, out comes a lot of rectangle-shaped ice cubes. Or if you had a tray with shapes like this instead, you'd get monster-shaped ice cubes. Liquids always take the shape of the container you pour them in. So if you want a bunch of lion-shaped popsicles, all you'd need is a lion-shaped tray. You can keep making lots of special shapes with ice over and over again for very little time or work. But what does this have to do with toys? Well, obviously, it wouldn't be a good idea to make toys out of ice. They'd melt in your hand. And wood as a material—well, wood doesn't have the property of being meltable. There's no such thing as liquid wood. Remember, most toys today are made out of plastic. You see where I'm going with

this? Plastic. Why do you think toy companies started using plastic to make toys instead of wood? What do you think might be so special about plastic?

EXPLORATION VIDEO 3

It was in the year 1856. A scientist named Alexander Parks was experimenting in his laboratory by mixing different chemicals. When he mixed cotton with strong acid and other chemicals, he accidentally discovered a new material—plastic. One of the things that was so great about this new material was that, just like ice, plastic has the property of being meltable. Like, look what happens to these plastic army men over a stove. Whoa, you see this? Plastic melts into a liquid when you heat it up. And unlike ice, which melts even when it's just a little warm, plastic melts at a much higher temperature than ice. So plastic won't melt in your hand. Once you get plastic really hot and it melts into a liquid, you can then squirt it into any shape you want. You can squirt it into a dot shape, like you see here, or you could squirt it into a LEGO man shape or toy dinosaur shape or any shape. So when plastic was invented, for the first time in history, it was possible to make millions of toys since you could pour liquid plastic into a shape and just let it cool. That made it easier and cheaper. If your great-great-grandparents could walk around a toy store today, they'd be amazed at how many toys there are and how much cheaper they are thanks to the invention of plastic. I should point out to you that ice and plastic are not the only materials that have the property of being meltable. Metal and glass are two examples of materials that can be melted, too, and they can be poured into shapes. If you want to see some really amazing videos of metal and glass in their liquid form, check out the videos in the Extensions. Right now, though, look around you. Can you think of any materials that melt?

ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to experiment to find out what kind of candy melts, and more importantly, what kind of candy doesn't melt. You're doing this experiment to help a friend who has a big problem. You see, you just got a postcard in the mail from your friend. They've been gone all summer visiting a summer camp called Camp Way Too Hot, which is located in the American state of Florida. Let's read what your friend wrote, shall we? "Camp is going OK, I guess, but it's 10 miles from the nearest store. We ran out of candy on day two, and we have two more weeks to go. Please send candy!" Now, the only way for mail to get to Camp Way Too Hot is by truck, and that truck has to drive for miles in the Florida sun with no air conditioning. It gets really hot inside. You want to send your friend candy, but you don't want it to melt in the truck and arrive as a box of melted goo. That would be a disaster. If you've ever left a chocolate bar in the sun, you know that it has the property of being meltable. Just like plastic, chocolate can turn into a gooey liquid. It loses its shape completely. But is all candy meltable? Today, your class is going to heat different candies to see if you can find one that won't melt. You'll see whether the candies stay solid, melt into a liquid, or just melt partway, getting soft and squishy. Then, your class can decide what kind of candy you would send to Camp Way Too Hot. You ready to begin? I'll talk you through the steps one by one.

ACTIVITY STEP 1

Find a partner to work with. When you're done with this step, click the arrow on the right.

ACTIVITY STEP 2

Each group needs these supplies. You'll get the hot water later. Different groups will get different kinds of candy to test. I know it's tempting, but don't open the candy bags. The candy is for testing, not eating.

ACTIVITY STEP 3

Do the top of your worksheet now. Your teacher can tell you what kind of candy you have.

ACTIVITY STEP 4

Your teacher will pass out hot water. Put it on the plate, but don't open the lid yet.

ACTIVITY STEP 5

Open your container, and put in the bags of candy.

ACTIVITY STEP 6

Use your sticks to push the bags underwater for two minutes. Discuss these questions while you wait. I'll put a timer on-screen so you know when two minutes are up. You ready? Here we go.

ACTIVITY STEP 7

Look at the candy while it's still in the hot water. Did it lose its shape? Circle your answer on the worksheet.

ACTIVITY STEP 8

Take out the bags and squish the candy with your fingers. Then, finish your worksheet.

ACTIVITY STEP 9

Now your teacher can ask each group for their results, or, in other words, what you found out, and write this chart on the board.

ACTIVITY STEP 10

Discuss these questions.