Grades K-5
Mini-Lesson: “How are magnets made?”

VIDEO TRANSCRIPT

VIDEO 1

[Video Call]

- Hi, Doug!

- Hi, Chiranjeve!

- I have a question for you. How are magnets made?

- Oh, that's a great question.

There are all kinds of fun things you can do with a couple of magnets. Like the kind you might see on a fridge. For example, here's something I've always liked to do since I was a kid. You can put one magnet on a tabletop and one underneath the table to make, kind of like a magnetic race car that appears to move on its own. That's just one of the incredible properties of magnets. The invisible pulling force between two magnets can go right through the material the table is made of. So it almost looks like magic. Have you ever played with magnets? What did you do and what interesting things have you noticed about magnets?

VIDEO 2

If you've not played with magnets much before, I hope you'll try. There are so many things you can notice when you do. For example, one thing you can experiment with is to find out what kinds of materials magnets attract or pull. They definitely don't attract everything. They do attract

other magnets of course and given that they stick to refrigerators, they definitely attract the metal refrigerator doors are made of. But do they attract every kind of metal? Copper is an orang-ish, pink color metal. Try holding a magnet up to a piece of copper metal or you might've noticed that magnets come in different strengths. There are the really thin refrigerator magnets which can lift up like maybe a paperclip but there are much stronger magnets than that too that can lift some pretty heavy weight. Some in fact are strong enough that you have to be a little careful, you don't want to get your fingers pinched when it pulls something toward it. And you might've noticed that if you take two magnets and turn them just the right way, magnets don't just pull but can push each other apart. Instead of attracting, they repel which feels so cool. With donut-shaped magnets, try putting them on a pencil. If you get them to repel, you can make them hover. So magnets are amazing, no doubt about that. But how do we even get magnets in the first place? Where do they come from? How are they made? Well, it used to be that magnets weren't made at all. The very first magnets that anyone knew about were natural magnets called lodestone or magnetite. It's a rare type of rock found only in a few places on Earth. It looks like a rock, but it has the ability to invisibly pull or attract other lodestone to it as well as certain kinds of metal. The thing is these natural magnets tend to be fairly weak but before long people notice that the invisible force of a lodestone can be transferred from a lodestone to a piece of iron or steel, making the iron or steel itself into a magnet. This is something you can try on your own, using magnets you have. Simply take a steel paper clip and rub it across the surface of a magnet a few times. Before long, the paper clip itself becomes a magnet. One fun thing to try is to make a chain of paper clips connecting to each other magnetically and see how long the chain gets before the magnetic force becomes too weak. When you make a magnet this way, this magnetic force still tends to be pretty weak but eventually, it was discovered that it's possible to make even stronger magnets by using

electricity. About 200 years ago, scientists discovered that there's a strange connection between electricity and magnetism, that's something you'll learn more about in middle school and high school. But by learning more about this connection between electricity and magnetism, that's one reason we've been able to figure out how to make magnets and how to make strong magnets too. This is actual video footage of real magnets being made today. The process starts by mixing together certain combinations of metals which have been discovered to work really well. Like a mix of iron metal plus other metals like a metal called nickel and a metal called cobalt. In factories, they mix these metals up by first heating them to be molten, almost like lava. Then pouring the molten metal into the shape that they want. Then once the molten metal mixture cools and becomes hard, they put it in the presence of a strong electrical current. This is the part that makes the metal mixture become magnetic. Voila! Now they've just made a strong magnet. It may seem like a lot of trouble to go through just for some magnets to put on your refrigerator. But while magnets are fun to play with, they don't just make them for hanging things on your refrigerator, there are all kinds of things, we use magnets for. Magnets used in door and cupboard latches, to make a door cupboard close shut. Giant magnets used in junkyards to help pick up old cars or any heavy objects made of steel. There are even some trains like this one in Japan called a Maglev train which is short for magnetic levitation. There's a set of powerful magnets in the track that push the train up so that it's actually floating above the track. Then there's a second set of magnets that makes the train move forward. And when a Maglev train is running, watch what happens if you line up paper clips up on the floor of the train. Whoa, you see? It really is running on magnetic force. Magnets like the kind used in Maglev trains and the ones used in junkyards are a special kind of powerful magnet called an electromagnet. They're magnets that can actually be turned on and off using electricity. What other useful things could

you do with a strong magnet that could be turned on or off? I'll leave you with that to think about.

That's all for this week's question. Thanks, Chiranjeve, for asking it!