

Magnet Wall

STEM Learning Ideas & Concepts

The Kodo Kids Magnet Wall was developed to provide a hands-on, minds-on, open-ended means for experiencing Newton's Laws of Motion. A good first step for adults who will be facilitating play with the Magnet Wall would be a quick review of those three very important laws.

For children, the play will come naturally. You can be assured of it! All you need to do is place one ramp on the wall and the children will be intrigued! Whether you have chosen the indoor or outdoor version, the following information from our teachers in the field should answer many of your questions and help you support children as they play.

Newton's Three Laws

When it comes to motion, Newton's Three Laws summarise everything you need to know about teaching young children to discover how and why things move.

- I. Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it.
- II. The relationship between an object's mass (m), its acceleration (a), and the applied force (F) is $F = ma$. Acceleration and force are vectors (as indicated by their symbols being displayed in slant bold font); in this law the direction of the force vector is the same as the direction of the acceleration vector.
- III. For every action there is an equal and opposite reaction.

In other words...

1. A moving object will keep moving in that direction until something physically pushes on it. So if the ball is rolling down the ramp and collides with something, its motion will change.
2. It takes more force to accelerate massive objects. If you placed a bowling ball on the ramp, its mass would be greater than the force pushing up from the ramp, which would cause the bowling ball to push the ramp down and probably hurt everyone's feet. So don't use a bowling ball! If you used a wooden ball on a ramp the forces pushing on the ball, coupled with the mass of the ball would make it move forward. If you used a tiny marble on the ramp, its small mass would cause it to accelerate down the ramp quickly, because it has much less force than the other forces at work.
3. The third law refers to action and reaction pairs. My force is pushing down on the floor as the floor's force is pushing up on me. And the same for the ball, it is pushing down on the ramp and the ramp is pushing up on it.

Support for Newton's Laws of Motion

The challenge is how to get all this information across to the child. Our answer is, don't, it happens naturally! First of all, by playing and experimenting your kids are gaining a deep understanding of how objects interact and move through space. They are learning about motion in a way that prepares for learning these concepts later in primary and secondary grades. Until they have these experiences and see and feel the movement themselves they will never truly understand the Laws of Motion.

Pick a few keywords to work with and throw them into the conversation whenever possible. "Did you see that ball whack the other ball?" "Wow, the momentum of that ball transferred a lot of energy to the other ball!" Use complex vocabulary again and again, soon your children will use "transfer of energy" and more all on their own.

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STEM Learning Ideas & Concepts (continued)

Setting Up the Magnet Wall

Initially place one ramp on the wall and leave several ramps and balls in bins nearby. Place a few balls in the ball catching tray at the bottom of the wall. Remove all the other parts and add them in after all the children have had a chance to play and move the ramps about. For some programs this could be hours, days or even weeks. A very big part of children's understanding comes with setting it up themselves. Without adults having to explain anything, the children will make their own discoveries, as they examine the ramps and watch one another play. It is helpful for adults to verbalize and make a record of the children's findings, such as...the ramps have magnets, the wall is magnetic (ferrous), the ramps can be positioned in many ways.

Challenges for Children - Pose the following:

Make a pathway that includes a ball drop along the way.

Make a pathway that causes the ball to travel uphill at some point along the path.

Make a pathway that zig-zags down the wall, using as much vertical and horizontal space as possible.

Teachers can also add more variables with the addition of some loose parts. Cardboard mailing tubes, clear pipe, cars, and wooden eggs invite interest. Over time introduce other types of balls; rubber balls, tennis balls, whiffle balls, golf balls, wool balls, bumpy balls, hacky sacks, and a few that light up.

Key Words

motion, travel, collision, momentum, force, energy, push, pull, forward, backward, speed, trajectory, energy, kinetic energy, accelerate, decelerate, quick, slow, crash, bump, velocity, increase, decrease, stop, rest, continue, pathway, course, system

Q's for children and adults

Do certain ramp positions work better than others?

How will you know if you are successful or if your idea works?

Does speed, or slope, or both affect a ball's energy?

Do balls have energy when they are at rest?

How many ways are there to launch the ball?

Who was Sir Isaac Newton? What are the Three Laws of Motion?

What do the words force and momentum have to do with this magnetic wall and ramp system? Where in the school or library can we find out about these important words?