BUILD A MAGLEV MAGNETIC LEGO TRAIN

ACTIVITY DESCRIPTION

Children are challenged to build a magnet levitating train that can balance on a magnet track without falling. They explore the characteristics of magnets, how magnets behaviour and learn about force and motion. Student's design, develop, create and modify a working system to meet they needs of the railway for the future.

THEME

- Force
- Motion
- Magnets

MATERIALS REQUIRED

MAGNETS

- Neodymium Magnets (size 20mm x 10mm x1mm) 5 magnets per group, (to attach to the top of the top of the Lego track).
- Or as an alternative a single Bar Magnet (to attach to the top of the Lego track) 1 bar per group.
- 2 x Magnets (size 20mm x 10mm x1mm) to attached to the train.

LEGO PIECES

- 1 x 10 Lego plate (used to create a long railway, will have magnets attached, other pieces joint together can also work if plates are not available).
- 2 x 3 Lego plate (this is the train starter and will have magnets attached).
- Assorted Lego bricks, 1x1, 1x2, 2x2 (for children to develop a suitable train and track design).
- Assorted Lego plates Lego (for children to develop a suitable train and track design).

INSTRUCTIONS

INTRODUCTION

Puffing Billy operates as a steam engine and is powered along the train by the power of steam. Trains can also be powered by electricity. The fastest trains in the world are found in countries from Japan, Europe, South Korea, Singapore and China. Does anyone know what they are? They are the Maglev Train. The Shanghai Maglev Train is the fastest train in operation, reaching a top speed of 430km/h. Today we are going to explore how the fastest trains in the world work and create a Maglev train using Lego.

Have you ever played with magnets? When you have two magnets, you can arrange them so that they either push against each other (repel) or pull toward each other (attract). Engineers can use this scientific principle to create very fast-moving trains. Engineers have developed magnetically levitated trains that move without touching the ground. These trains use powerful magnets to lift the train upward and propel it forward.

DESIGN CHALLENGE

Build a magnetic levitating train that can balance on a magnetic track without falling.

STEP 1: PLANNING PHASE

Parent supervisors talk to children about why it is important to plan their train's design before they build it. Encourage them to think about what design elements will provide the most stability for the train.

What does levitation mean?

How will the train balance on the track?

What can make it more stable?

How heavy should the train be?

STEP 2: BUILDING AND TESTING PHASE

Introduce the materials. Give children their magnets for the track and train. Handout the Lego bricks.

Children work to create a small section of a railway track. Using Lego bricks, they design and modify their track making sure they have a stable base and support columns. Children may need help to tape the Neodymium black magnets to the top of the track using sticky tape. Ensure the magnets are aligned so the poles are facing the same direction.

Then construct the train using the LEGO blocks and magnets provided. Children test and modify their track and train to see if it levitates successfully. Encourage Children to return to the planning phase by thinking about what can be changed and improved. Repeat the planning, building and testing process until they are able to complete the challenge.

STEP 3: SHARE YOUR FINDINGS

Children share their train and tacks with their family and friends. They share the challenges they faced when planning, building and modifying. They discuss their thoughts on Maglev trains for the future.

BACKGROUND INFORMATION

DEFINITIONS

Magnet	A stone or a piece of metal that attracts other metal.
Attract	To pull towards each other.
Repel	To push away from each other.
Poles	The ends of a magnet

CHARACTERISTICS OF MAGNETS

Magnets are usually made of iron. Any metal with iron in it, will be attracted to magnets. Steel contains iron so therefore a paper clip will be attracted to magnets, however other metals such as copper, gold and aluminium do not contain iron, so they are not attracted to magnets.

They can repel other magnets. When two magnets are close, they create pushing and pulling forces towards each other. The forces are strongest at the end of the poles. Magnets can attract other materials. They have two ends called Magnetic poles.

Every magnet has one north pole and one south pole. The blue end is the south pole the red end is the north pole. Like poles (north, north) repel each other. Opposite poles (north, south) attract each other. They do this because there is force between them.

Common Uses of Magnets

Magnets are used in most electronic devices. They are used to keep the refrigerator door closed. They are used to slow down roller coasters. Televisions, computers and ovens all operate with magnets.