

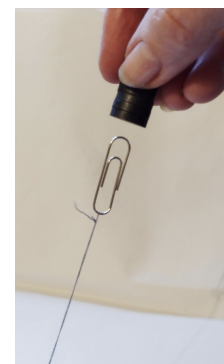
THE MAGIC OF MAGNETS (LEVEL 3)

Description	Learners will use the properties of magnets to design a board game. They will apply the knowledge of properties of magnets to do so.
Leading question	How can I use magnets to make a board game?
Subjects covered	Science, Art & Design
Total time required	40-60 min a day for 5 days
Resources required	paper, pencils, colours, glue/tape, cardboard, some magnetic materials (small magnets, paper clips), some non-magnetic materials (pieces of plastic, wood, eraser)
Learning outcomes:	<p>By the end of this project, learners will be able to:</p> <ol style="list-style-type: none"> 1. Identify different magnetic and non-magnetic substances on the basis of their properties. 2. Examine the magnetic pole and its effect. 3. Perform experiments related to the magnet's stability in a particular direction on suspension, attraction/repulsion. 4. Design a game that uses magnetic forces to attract materials. <p>21st Century Skill Outcomes:</p> <ol style="list-style-type: none"> 1. Think critically and find creative solutions to a given problem. 2. Communicate effectively to complete a given task. 3. Collaborate in a meaningful way to solve the given challenge. 4. Exhibit creativity in coming up with solutions to problems.
Previous Learning	None
Supervision required	Medium

Day 1 -

Today, you will test materials to check if they are magnetic or not and start planning your board game.

Time	Activity and Description
10 minutes	<p>Magic Trick!</p> <p>Note: Show learners a magic trick following the steps below:</p> <ul style="list-style-type: none"> - Take a paper clip and a small cylindrical magnet. - Hold the magnet between your two fingers at the top of the paperclip such that the magnet remains hidden. - The magnetic pull will travel through the paperclip so that when you place the second one against it— the paperclip will suspend there and appear to be levitating! <p>- Discuss why the second paperclip levitates by asking the following questions: What did you notice about the paperclips?</p>



	<ul style="list-style-type: none"> - Do you think some material or force is involved in making the paperclip float in the air? <p>The paperclip levitates because of the magnet (reveal the magnet).</p> <ul style="list-style-type: none"> - Have you seen or used a magnet before? - What did you use it for? Did you notice anything special about magnets? - In the next few classes, we will design a board game using magnets! The leading question for this project is: How can I use magnets to make a board game? 																				
20 minutes	<p>Magnetic and Non-magnetic Materials</p> <p>What are some properties of magnets that you know of? <i>(Take responses - they attract magnets and things made of iron, they have two poles, like poles repel each other while unlike poles attract each other, etc.)</i></p> <p>One of the most significant properties of magnets is their ability to attract things. Let us find out which materials magnets attract and which ones they don't!</p> <p>Note:</p> <ul style="list-style-type: none"> - Distribute a magnet and a few magnetic and non-magnetic materials that you sourced (such as safety pins, iron nails, leaves, coins, currency notes, old batteries, aluminium foil and a plastic ruler) among the learners. - Ask learners to draw the table shown below in their notebooks and fill out their prediction (what they think will happen when a magnet is brought close to each of these objects) in it. <table border="1" data-bbox="378 1108 1456 1444"> <tr> <td>Aim</td> <td colspan="3">To identify the materials that magnets attract and those they do not</td> </tr> <tr> <td>Material</td> <td>Safety pin</td> <td>Plastic ruler</td> <td>Coin</td> </tr> <tr> <td>Hypothesis</td> <td>Magnet will attract</td> <td>Magnet will not attract</td> <td>Magnet will attract</td> </tr> <tr> <td>Observations</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Inferences</td> <td></td> <td></td> <td></td> </tr> </table> <p>Bring a magnet close to each of these objects and write your observations (what you see). Based on your observations, write your inference (what you understand from the observation).</p> <p>Based on this experiment, what can we say about the types of materials attracted by magnets? <i>(Take responses - they attract some metals such as iron, cobalt and nickel, they don't attract other materials)</i></p>	Aim	To identify the materials that magnets attract and those they do not			Material	Safety pin	Plastic ruler	Coin	Hypothesis	Magnet will attract	Magnet will not attract	Magnet will attract	Observations				Inferences			
Aim	To identify the materials that magnets attract and those they do not																				
Material	Safety pin	Plastic ruler	Coin																		
Hypothesis	Magnet will attract	Magnet will not attract	Magnet will attract																		
Observations																					
Inferences																					
10 minutes	Planning for the Board Game																				

	<p>Think about what you want your board game to look like. Here are some questions that will help you to develop clear ideas:</p> <ul style="list-style-type: none"> - What will be the theme of your board game? - What is the plot or storyline of the game? How will you show this in your board game? Will it be through dialogues or pictures or some other creative way? - How many players can play the game? - How will you use magnets in the game? <p><i>Tip: If the learners are struggling to come up with ideas for the board game, you can give them some examples, such as a magnetic maze or a race track.</i></p>
At home activities	<ul style="list-style-type: none"> - Share your board game ideas with your family members and seek their input to enhance your ideas. - Make a list of objects at your home that use magnets.
Optional Literacy/Numeracy Activity	<p>Magnetic Personality</p> <p>Have you heard the phrase ‘magnetic personality’? What do you think it means? Does it have something to do with magnets?</p> <p>Magnetic personality is a phrase used to describe someone who has a special way of attracting and influencing other people. Think of a magnet that attracts magnetic objects towards it. In the same way, a person with a magnetic personality attracts other people towards them because of the way they behave, their positive attitude, and how they make others feel.</p> <ul style="list-style-type: none"> - What kind of qualities would you expect to see in someone with a magnetic personality? Discuss with a partner. <i>(People with magnetic personalities are usually friendly, kind, and confident. They have a warm and welcoming nature that makes others feel comfortable.)</i> - Think of a person you know who has a magnetic personality. Write a paragraph introducing the person and their qualities that attract other people towards them. - Follow the guidelines given below while writing the paragraph: <ul style="list-style-type: none"> ○ Your paragraph should have an introduction, a main body, and a conclusion. ○ Aim for a paragraph that has around 6-8 sentences. ○ Use simple language and ensure that your paragraph has a smooth flow. ○ Proofread your work for grammar, punctuation, and spelling mistakes. <p><i>Tip: If your learners struggle with writing, give them sentence starters for the introduction, main body, and conclusion. For beginners, give them a cloze passage in which the learners need to fill in a few blanks in order to complete their paragraph.</i></p>

Day 2

Today, you will discuss the use of magnets, observe a magnet’s resting position, and design your board game on paper.

Time	Activity and Description
------	--------------------------

10 minutes	<p>Uses of Magnets Which objects at your home use magnets? (<i>Take responses - speakers, fridge, cupboard doors, etc.</i>)</p> <p>Magnets are used in almost all electrical appliances, such as fridges, computers, earphones, microphones, speakers and cellular phones! They are also used in toys, such as buzzing magnets, compasses and in cupboards. Additionally, doctors use magnets during a process called magnetic resonance imaging to scan and get images of organs and other internal body parts!</p>										
15 minutes	<p>Resting Position of Magnets One of the oldest uses of a magnet is in the form of a compass. A compass works on the special property of magnets based on their resting position (the position they take when they are freely suspended). Let us find out what it is!</p> <p>Note:</p> <ul style="list-style-type: none"> - Ask learners to draw the table shown below in their notebooks and fill out their hypothesis (based on whether or not they think that all magnets have a common resting position when freely suspended). - Once done, demonstrate the experiment to them using the steps given in the row titled 'Method' in the given table. Carry out three trials and ask learners to fill in their observations and inferences. <table border="1" data-bbox="370 1003 1448 1814"> <tr> <td data-bbox="380 1016 636 1066">Aim</td> <td data-bbox="646 1016 1438 1066">To find out the resting position of a bar magnet</td> </tr> <tr> <td data-bbox="380 1079 636 1167">Hypothesis:</td> <td data-bbox="646 1079 1438 1167">All magnets have a standard resting position when freely suspended.</td> </tr> <tr> <td data-bbox="380 1180 636 1230">Materials Needed:</td> <td data-bbox="646 1180 1438 1230">a magnet, two pencils, tape, a piece of thread, and an eraser</td> </tr> <tr> <td data-bbox="380 1243 636 1759">Method:</td> <td data-bbox="646 1243 1438 1759"> <ol style="list-style-type: none"> 1. Stick one of the pencils in the eraser such that it stands straight. 2. Perpendicular to this line, stick the other pencil horizontally using tape. 3. Tie a piece of thread onto the horizontal pencil and suspend the magnet from the other end of this thread by tying the thread to the middle of the magnet. (<i>Make sure that the bar magnets used for this activity are small and lightweight so that they can be suspended from this makeshift stand that the learners create.</i>) 4. Observe and note the resting direction of your magnets without influencing or altering their positions. Conduct multiple trials, suspending the magnets from different points on the horizontal pencil to eliminate any bias. </td> </tr> <tr> <td data-bbox="380 1772 636 1814">Observations:</td> <td data-bbox="646 1772 1438 1814"></td> </tr> </table>	Aim	To find out the resting position of a bar magnet	Hypothesis:	All magnets have a standard resting position when freely suspended.	Materials Needed:	a magnet, two pencils, tape, a piece of thread, and an eraser	Method:	<ol style="list-style-type: none"> 1. Stick one of the pencils in the eraser such that it stands straight. 2. Perpendicular to this line, stick the other pencil horizontally using tape. 3. Tie a piece of thread onto the horizontal pencil and suspend the magnet from the other end of this thread by tying the thread to the middle of the magnet. (<i>Make sure that the bar magnets used for this activity are small and lightweight so that they can be suspended from this makeshift stand that the learners create.</i>) 4. Observe and note the resting direction of your magnets without influencing or altering their positions. Conduct multiple trials, suspending the magnets from different points on the horizontal pencil to eliminate any bias. 	Observations:	
Aim	To find out the resting position of a bar magnet										
Hypothesis:	All magnets have a standard resting position when freely suspended.										
Materials Needed:	a magnet, two pencils, tape, a piece of thread, and an eraser										
Method:	<ol style="list-style-type: none"> 1. Stick one of the pencils in the eraser such that it stands straight. 2. Perpendicular to this line, stick the other pencil horizontally using tape. 3. Tie a piece of thread onto the horizontal pencil and suspend the magnet from the other end of this thread by tying the thread to the middle of the magnet. (<i>Make sure that the bar magnets used for this activity are small and lightweight so that they can be suspended from this makeshift stand that the learners create.</i>) 4. Observe and note the resting direction of your magnets without influencing or altering their positions. Conduct multiple trials, suspending the magnets from different points on the horizontal pencil to eliminate any bias. 										
Observations:											

	<p>Inferences:</p> <p>Based on this experiment, let us think about:</p> <ul style="list-style-type: none"> - What happens when you suspend a magnet freely? (<i>It rests in a particular direction. This is the north-south direction</i>) - Does the magnet consistently point in the same direction? (<i>Yes, in the north-south direction</i>) - Are there any variations in the results of the multiple trials you conducted? (<i>There shouldn't be any variations because magnets always rest in the north-south direction.</i>) <p>A magnetic compass works on the same principle (<i>show a magnetic compass and point to the magnetic needle that allows people to find out north and south directions</i>). Based on that information, we can find east and west directions too.</p>
15 minutes	<p>Designing the Board Game on Paper</p> <p>Based on the inputs you received from your family members, improve your ideas and draw a rough sketch of your board game on paper. Can you include a suspended magnet in it?</p> <p>As you do this, think of these questions:</p> <ul style="list-style-type: none"> - What would be the size of the board game? - How will you present the storyline/plot? - What are the rules you would like the players to follow? Write down these rules on a separate sheet. - What materials would you need to build this game? Where will you get them from? Think of materials that are easily available in your surroundings.
At home activities	Arrange the materials that you will need to make your board game.

Day 3 –

Today, you will explore the properties of magnetic poles and start making your board game.

Time	Activity and Description
15 minutes	<p>Recap & Magnetic Poles</p> <p>What properties of magnets have we studied so far? (<i>Take responses - attract some metals such as iron, cobalt and nickel; don't attract other materials; rest in a north-south direction when freely suspended.</i>)</p> <p>So far we investigated how magnets behave with other materials. Now, let us investigate how they behave with each other.</p> <p>Note:</p> <ul style="list-style-type: none"> - Show learners a bar magnet and its two poles - North (N) and South (S). Inform them they will now investigate what happens when the poles of two different magnets are close to each other.

	<ul style="list-style-type: none"> - Once done, ask them to draw the table shown below and fill in their hypothesis (such as north will attract north and south will attract south, or north will attract south, etc.) - Finally, demonstrate the experiment to them using the steps given in the row titled 'Method' in the given table. Carry out three trials and ask learners to fill in their observations and inferences. <table border="1" style="width: 100%;"> <tr> <td>Hypothesis:</td> <td>North and south poles will attract each other.</td> </tr> <tr> <td>Materials Needed:</td> <td>2 magnets</td> </tr> <tr> <td>Method:</td> <td> <ol style="list-style-type: none"> 1. Bring two ends of a magnet close together, and observe what happens. 2. Turn one magnet around and observe what happens. 3. Turn the other magnet around and observe what happens. </td> </tr> <tr> <td>Observations:</td> <td></td> </tr> <tr> <td>Inferences:</td> <td></td> </tr> </table> <p>What did you observe and infer? (Take responses - North attracts South but repels North, South attracts North but repels South; like poles of a magnet repel each other and unlike poles attract each other)</p>	Hypothesis:	North and south poles will attract each other.	Materials Needed:	2 magnets	Method:	<ol style="list-style-type: none"> 1. Bring two ends of a magnet close together, and observe what happens. 2. Turn one magnet around and observe what happens. 3. Turn the other magnet around and observe what happens. 	Observations:		Inferences:	
Hypothesis:	North and south poles will attract each other.										
Materials Needed:	2 magnets										
Method:	<ol style="list-style-type: none"> 1. Bring two ends of a magnet close together, and observe what happens. 2. Turn one magnet around and observe what happens. 3. Turn the other magnet around and observe what happens. 										
Observations:											
Inferences:											
25 minutes	<p>Making the Board Game</p> <p>We will now start creating the game!</p> <ul style="list-style-type: none"> - Which of these materials that you arranged would you like to use in the game? Test them to check if they are magnetic or not. Remember, your game needs to use magnets! - Make a note of how you want to use the properties of magnets in your game. See if you would like to include the properties of poles in your game anywhere! - Once you have tested the material, also choose what you will use as the board for your board game. - Once you have decided on the material for the board, create the board game based on the design you had finalised in the last class. - Be creative and artistic! Use colours and things from your environment to create a fun game. - Finally, come up with a name for your game! <p>Tip: You may give examples of materials that can be used for creating the board, such as chart papers, A4 sheets, foil, or cardboard.</p>										
At home activities	Complete creating the board game and bring it to the next class.										

Day 4 –

Today, you will test the game that you designed, fix any issues it has, and prepare to present your game to your family.

Time	Activity and Description
15 minutes	<p>Testing the Board Game Play the game with your friend and see if there are issues that you face. If some part of the game is not working, fix the issue and play the game again.</p> <p><i>Note: If you are facilitating the project with one learner, play the role of the friend who helps the learner test the game and identify issues.</i></p>
15 minutes	<p>Preparation for Presentation</p> <ul style="list-style-type: none"> - First, write down the instructions that players need to follow to play the game correctly. Make sure these instructions are easy for players to understand what they should and shouldn't do. Include: <ul style="list-style-type: none"> ○ The set-up of the game ○ The goal ○ How to play ○ How to determine the winner - Next, think about the properties of magnets that you have used in your game. In your presentation in the next class, explain every property that is used and how. For example, if you are using magnets in a racing board game, you are using the property of magnets that attract magnetic materials and the magnets are used to propel the car on the racetrack. <p><i>Tip: If learners struggle to write, ask them to draw out portions of their presentation to plan how they will deliver it.</i></p>
10 minutes	<p>Peer Feedback: Request a friend to read the instructions you wrote and try to play the game.</p> <ul style="list-style-type: none"> - Ask them to tell you what they understood and could not understand. - Also, observe if they are playing the game correctly or not. - This will help you understand whether or not the instructions are clear and simple. - Finally, ask them about what they liked and did not like in the game. - Make a note of the feedback on the instructions and the game.
At home activities	Improve the board game you have designed to incorporate peer feedback. Make sure your game is ready for the final presentation in the next class.

Day 5 -

Today, you will present the board game to your family, receive their feedback, and reflect on the project.

Time	Activity and Description
------	--------------------------

5 minutes	<p>Preparation</p> <p>Make sure that you have the following ready, and that you have rehearsed how you want to present your board game:</p> <ul style="list-style-type: none"> - The board game - An instructions sheet explaining the rules of the game and the magnetic properties that the game uses.
25 minutes	<p>Presentation</p> <p>Present your board game to your family and walk them through:</p> <ul style="list-style-type: none"> - How you designed the board game - What are the rules of the board game - What properties of magnets are used in it <p>Encourage them to play the board game and share their feedback (what they liked and what they thought could have been done better!)</p>
10 minutes	<p>Reflection</p> <p>Congratulations on making your own board game using magnets! Now, let us think about what we learned during this project. Think about these questions:</p> <ul style="list-style-type: none"> - What did you enjoy the most while creating the board game? - What was the most challenging part of the project? Why did you find it challenging? - Which feedback from your peer was most helpful in improving the game? - What did you learn while making the board game? <p><i>Tip: Depending on the level of your learners, you can choose to get them to reflect on the first two questions or on all the questions.</i></p>

Additional enrichment activities:	<p>Magnetic or Non-Magnetic Scavenger Hunt:</p> <ul style="list-style-type: none"> - Create a scavenger hunt list with various objects and materials in the classroom or outdoors. - Divide the learners into small groups and provide them with the list and a magnet. - Instruct the groups to find and test each item on the list using the magnet to determine if it is magnetic or non-magnetic. - The group that correctly identifies the most magnetic and non-magnetic items within a given time wins the scavenger hunt.
Modifications for simplification	<ul style="list-style-type: none"> - If your learners are unable to write, encourage them to draw pictures to show their ideas, and communicate verbally. - Reflection questions can be simplified depending on the language level of the learners. - In case learners find it difficult to come up with ideas, give prompts and examples to help them think.

ASSESSMENT CRITERIA

A majority of my students were able to:

- Make predictions and observations to understand some properties of magnets.
 - Design their board game on paper keeping in mind the feasibility of creating it.
 - Create a board game that uses magnets.
 - Improve the board game based on peer feedback.
 - Explain in simple language how to play the game and the magnetic properties that they used in the game.
-