

MANAGING OUR NEED FOR SPEED (LEVEL 1)

Description	Learners will explore the theme of transportation with vehicles in the sea, land and air. Learners will explore how vehicles move and related regulations, before making their own dream vehicle!
Leading Question	What's the fastest vehicle that you can make?
Total Time Required	5 hours over 5 days
Supervision	High
Subjects	Social Science, Art, Design and Science
Supplies Required	Tub, Water, Paper, Tube and other scrap material, paper, papers of different densities (if available)
Learning Outcomes	<ol style="list-style-type: none"> 1. Begin to grasp the concepts of gravity, friction, motion, sinking-floating 2. Making hypothesis and testing these through experiments 3. Understanding the importance of transportation safety rules and regulations and related professions
Previous Learning	Familiarity with conducting science experiments

DAY 1

Today you will begin to explore different vehicles and their design challenges.

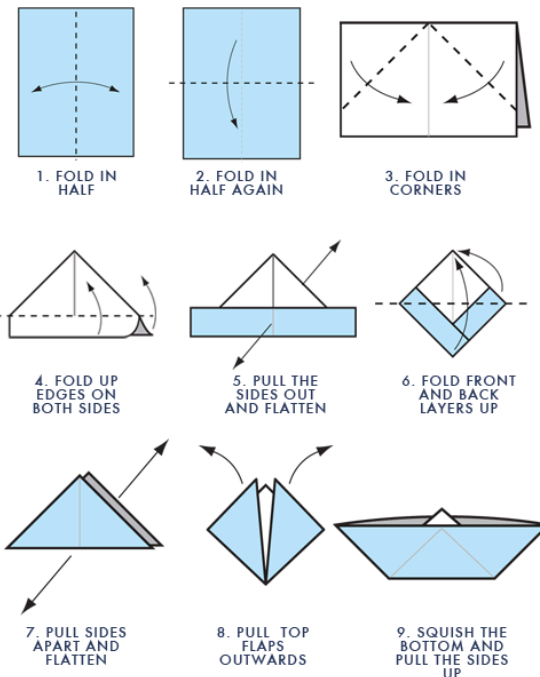
Suggested Duration	Activity and Description
10 minutes	<ul style="list-style-type: none"> • Illustrate and/or label different ways that you can use to get to different places (e.g. cycling, rickshaw, car, bike, boats, etc.). • Can think of ways of grouping these forms of getting from one place to another one.
15 minutes	<ul style="list-style-type: none"> • One possible grouping is related to the element on which they move: air, water, or land. • Look at the original list and add other air vehicles that you know about. • Write or illustrate the different reasons people would use air vehicles (e.g. to travel to another country, to go to the moon / space, for surveillance, to deliver emergency posts, etc.)

15 minutes	<ul style="list-style-type: none"> ● Reflect on what you learned from the experiment: ● What did you notice? ● What are you wondering about real planes based on what they observed with the paper planes? ● Which was the most successful plane? (e.g. the one that reached the furthest, or the highest, or the one that stayed in the air for longer)? ● What were the characteristics of the most “successful” plane? ● In the cases where the planes failed to fly, it was because they were not able to overcome the force of gravity. Most objects or even organisms cannot fly or float because of the force concept of gravity. Any object that is left in mid-air will fall to the ground because of a force of the earth called gravity. Therefore, the greatest challenge for the engineers that build planes is to overcome the force of gravity. ● Can you think of other challenges when designing planes?
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DAY 2

Today you will explore water vehicles and what causes them to float.

Suggested Duration	Activity and Description
5 minutes	<ul style="list-style-type: none"> ● Go back to the first list of vehicles that you created on Day 1. ● Add additional water vehicles that you know about. ● Think about the different types of water bodies like lakes, rivers and seas. their characteristics (e.g. rivers flow in one direction, oceans have waves, water in ponds doesn't run, etc. ● Also, think about the reason people would go on water vehicles.
15 minutes	<ul style="list-style-type: none"> ● Learners will write or draw the different reasons why people would use water vehicles. For example fishing, navy, transportation, pearl diving etc.
20 minutes	<ul style="list-style-type: none"> ● Write or draw the different reasons why people would use water vehicles. For example fishing, navy, transportation, pearl diving etc. ● To explore the concepts of sinking and floating, fill a tub with water and collect a few “waterproof objects” that do not have batteries. Make a list of these objects and then try and guess whether the objects will sink or float when put in the water – then place that object in the tub and write what actually happened.

	Object	Guess / Hypothesis	Result / Experiment Evidence
	1.Spoon	Sink	Float
	2.Bowl	Sink	Sink
	3.Block	Float	Sink
	4.Pen Cover	Sink	Float
10 minutes	<ul style="list-style-type: none"> Think about some of the reasons that some objects sink or float Example: <ul style="list-style-type: none"> Objects that are heavy sink Objects that are big sinks. 		
5 minutes	<ul style="list-style-type: none"> Re-try the experiment to test their reasons or hypothesis and make a new guess on how and why boats can float. Based on the experiment, write or share aloud the characteristics of objects that float. 		
20 minutes	<ul style="list-style-type: none"> Make your own paper boats that float on the water. Come up with your own designs! There are some examples below: 		

	<ul style="list-style-type: none"> • Make multiple boats (of different sizes and using different types of paper) and check if they sink or float. • Try and move their boat • Blow on the boats with a straw and see how it pushes the boats forward. This is how sailboats move with the wind.
<p>10 minutes</p>	<ul style="list-style-type: none"> • Create your own rowing oars to explore how engine propellers help push the water and move boats forward. Make your own oars with little toothpicks, popsicle sticks or straws etc. Make sure the bottom of the oar has a broad and flat surface <div data-bbox="662 648 1211 1014" data-label="Image"> </div> <div data-bbox="662 1026 1211 1392" data-label="Image"> </div> <p>Optional: You can explore the concept of density. Density is a property of matter (like weight- how much force is pulling the object down, or volume-how much space an object occupies) and is a measure of how much matter an object has in the space it occupies. It is similar to how compact something is. If an object has less density than water, then it will float.</p>

DAY 3

Today you will explore land vehicles and what causes them to slow down.


Suggested Duration	Activity and Description																		
15 minutes	<ul style="list-style-type: none"> Refer again to the original list and add any land vehicles that you can think about. Organize them in terms of: <ul style="list-style-type: none"> Train Motorbike Car Bus Bicycle 																		
15 minutes	<ul style="list-style-type: none"> You will explore how different vehicles move to go faster and slower on different surfaces. You will also explore the importance of round wheels to help land motion. Move a square or rectangular block or a triangular shaped object – these can be constantly pushed with force, but these cannot be rolled. Try the same with a circular tube to see how it rolls forward more easily with less force. Design different roads to reduce resistance (or friction). Is it easier for the vehicle to move faster when the ground is bumpy or uneven? Make a guess and then test whether they think a tube or a toy car can move faster on different surfaces and roads. The surfaces on which the vehicle moves faster with less force has less resistance (or friction) <p>For example:</p> <table border="1" data-bbox="467 1171 1398 1648"> <thead> <tr> <th>Surface</th> <th>Guess / Hypothesis</th> <th>Result / Experiment Evidence</th> </tr> </thead> <tbody> <tr> <td>Smooth wooden or tile floor</td> <td>Fast – Low Resistance (Friction)</td> <td>Fast – Low Resistance (Friction)</td> </tr> <tr> <td>Sweater on a surface (bumpy or uneven surface)</td> <td>Medium – Med Resistance (Friction)</td> <td>Slow – High Resistance (Friction)</td> </tr> <tr> <td>Cement floor</td> <td>Fast – Low Resistance (Friction)</td> <td>Medium – Resistance (Friction)</td> </tr> <tr> <td>Carpet</td> <td></td> <td></td> </tr> <tr> <td>Grass</td> <td></td> <td></td> </tr> </tbody> </table> <p>You will explore why you think some surfaces increase or decrease the resistance (friction) and share an answer with their parents</p> <p>Smooth surfaces have less resistance to motion (friction) than rough surfaces.</p>	Surface	Guess / Hypothesis	Result / Experiment Evidence	Smooth wooden or tile floor	Fast – Low Resistance (Friction)	Fast – Low Resistance (Friction)	Sweater on a surface (bumpy or uneven surface)	Medium – Med Resistance (Friction)	Slow – High Resistance (Friction)	Cement floor	Fast – Low Resistance (Friction)	Medium – Resistance (Friction)	Carpet			Grass		
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	<p>For an extension activity, you can explore the concept of friction. Friction is the resistance of motion when one object rubs against another. Anytime two objects rub against each other, they cause friction. Friction works against the motion and acts in the opposite direction – it is what causes objects to slow down unless pushed. Any object that rubs against another object causes friction, for example even if you rub your hands together that causes friction.</p>
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DAY 4

Today you will learn about the rules and regulations for transportation.

Suggested Duration	Activity and Description
20 minutes	<ul style="list-style-type: none"> ● Now that we have learned how to design the fastest plane, boat and car – it might be quite dangerous to move at very fast speed. Did you know that one person gets hurt every 25 seconds because of a road accident due to high speed? Let's try and think of all the rules and regulations associated with transportation and also the professions <p>Land Vehicles:</p> <ul style="list-style-type: none"> ● Explore all traffic rules and as part of the traffic police, make 5 relevant signs and lights that help slow down land transportation to prevent accidents. Design your own signs that you think will be more effective in preventing accidents. For example: <ul style="list-style-type: none"> - Red, yellow and green light, - Stop sign - School zone sign - Zebra crossing - Speed limit sign
20 minutes	<ul style="list-style-type: none"> ● Think about traffic in the water and people that will help in managing this. ● Make your own lighthouse to help boats navigate in the darkness ● Lighthouse is a tall structure that can help boats find their way in the darkness with a light at the top.

	 <ul style="list-style-type: none"> You can make this with empty toilet paper rolls, tubes and paper.
20 minutes	<ul style="list-style-type: none"> Now, pretend to be the air-traffic controller and help planes with when to take-off, land or where to fly to make sure that planes do not crash into each other. Think of the shortest message you can send to pilots to make sure there are plane crashes.
20 minutes	<ul style="list-style-type: none"> Write, or role play the key messages for any one or three of the scenarios below. Think about the key messages to share and a clear and short way to communicate it. Options: Someone booking a railway ticket on the phone (Key points: i) Origin and Destination - From where to where are they travelling; ii) Date and timing; iii) Name of the train; iv) Class of travel; v) Number of passengers) A captain on a ship letting the ship crew know about a storm (Key points: i) Details on the storm – intensity of the storm; ii) What should the crew be doing; iii) What safety precautions can we take etc.) An announcement from the pilot in the plane (Key points: i) Destination – where are they travelling; ii) Travel – how long is the flight and what will the weather be; iii) Safety procedures - seatbelt, walking in the plane etc.)

DAY 5

Today you will imagine and create their own vehicle that combines all the science principles that you have learnt.

Suggested Duration	Activity and Description
20 minutes	Imagine and create your own vehicle that combines all the science principles that you have learnt till now and is:

	<ul style="list-style-type: none"> ● Anti-gravity ● Floating ● Low resistance ● Describe the features of this vehicle through drawings or writing. <ul style="list-style-type: none"> ● How can we make sure that the vehicles stay in the air and not fall with gravity? ● What will make the vehicle stay afloat in the water? ● How can the vehicle face the least friction to move forward with the most speed and the least amount of effort?
10 minutes	<ul style="list-style-type: none"> ● Think of the purpose of the vehicle <p>For example:</p> <ul style="list-style-type: none"> ● To pick up sick people to go to the hospital ● Pick up children to go to school
20 minutes	<ul style="list-style-type: none"> ● Draw your vehicle and label it and show it to your family. ● Explain the relevant features to make it work best on land, water and air. <p>Family feedback should include:</p> <ul style="list-style-type: none"> ● What do they love about the vehicle's design? ● Any questions they might have about the explanation? ● Any areas of improvement in either the design or the explanations? <p>Use the feedback to revise your design.</p>

**Modifications
for
simplification**

Learners can test the concepts of friction and sinking and floating by designing their own boats and testing the cars and then designing their own vehicles.

ASSESSMENT CRITERIA

A majority of my learners were able to:

- Creativity in the final vehicle designed, including the purpose
- Demonstration of understanding of physics concepts of gravity, friction, floating-sinking
- Ability to design a plane that flies, the fastest land transportation and a boat that floats
- Clarity of road signs, lighthouse and ATC
- Ability to make hypothesis and guesses with reasons explaining the project phenomena