

MANAGING OUR NEED FOR SPEED (LEVEL 2)

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	Can you make your vehicle?
Total Time Required	~5 hours over 5 days
Supplies Required	Tub, Water, Paper, Tube and other scrap material
Learning Outcomes	<ol style="list-style-type: none"> 1. Grasping the initial ideas of the physics concepts of gravity, force, motion, sinking-floating, wind 2. Making hypothesis and testing these through experiments 3. Understand the importance of transportation safety rules and regulations and related professions
Previous Learning	Knowledge of conducting and writing science experiments

DAY 1

Today you will explore different vehicles and transportation regulations.

Suggested Duration	Activity and Description
10 minutes	<ul style="list-style-type: none"> • Learners will explore how we go from one place to another. • Draw and label the different ways to get to places <ul style="list-style-type: none"> - Example: Bikes, rickshaw, car, boats.
5 minutes	<ul style="list-style-type: none"> • Learners will start by making a list with all the air vehicles they know. • Learners will draw and write all the reasons people would use air vehicles <ul style="list-style-type: none"> - Example: To travel to another country, to go to space, to deliver emergency post.

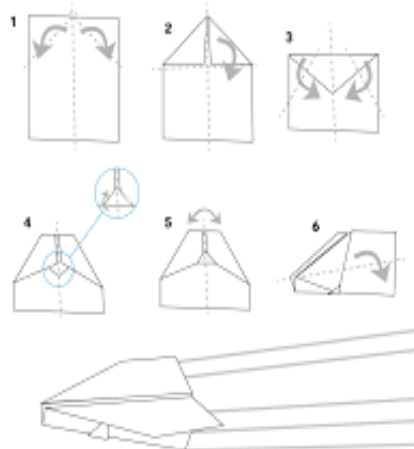
15 minutes

- Learners will explore the concept of gravity. Any object that is left in mid-air will fall to the ground because of gravity.
- Learners can try leaving a ball, or a toy in the air and see that it will all fall to the ground.
- Gravity is a force that tries to pull two objects toward each other. Earth's gravity is what keeps you on the ground.
- Learners will explore the speed and force of gravitational pull by trying objects of different mass and seeing what falls faster to the ground.
- Learners can start with making a guess of the objects that will fall fastest.

Object	Guess / Hypothesis	Result / Experiment Evidence
Ball		
Paper		
Pen		

10 minutes

- Learners will make their own paper planes by following the steps:



15 minutes

- Learners will explore how different things fly.
- Learners will fly their plane. They will try different ways to throw the plane and see if it flies higher or further.
- Learners will think about why some planes are going higher or further than others.

- Learners will add wind with a fan or by blowing air to see if the plane flies further.
- Literacy extension: Learners will write an essay with the title of: A world without gravity! Let your imagination run free - thinking about a world where nothing stays down. You and everything around you could float and fly!

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"> • Learners will make a list with water vehicles that they know. • They will think about the different types of water bodies like lakes, rivers and seas. 															
10 minutes	<ul style="list-style-type: none"> • Learners will write or draw the different reasons why people would use water vehicles. <ul style="list-style-type: none"> - Example: fishing, transportation, pearl diving. 															
20 minutes	<ul style="list-style-type: none"> • Learners will explore what sinking and floating is. • Fill a tub with water and collect a few “waterproof” objects that do not have batteries. • Make a list of these objects and try to guess whether the objects will sink or float in the water. Then place the objects in the tub and write what happens. <table border="1" data-bbox="467 1276 1365 1770"> <thead> <tr> <th>Object</th> <th>Guess / Hypothesis</th> <th>Result / Experiment Evidence</th> </tr> </thead> <tbody> <tr> <td>1.Spoon</td> <td>Sink</td> <td>Float</td> </tr> <tr> <td>2.Bowl</td> <td>Sink</td> <td>Sink</td> </tr> <tr> <td>3.Block</td> <td>Float</td> <td>Sink</td> </tr> <tr> <td>4.Pen Cover</td> <td>Sink</td> <td>Float</td> </tr> </tbody> </table>	Object	Guess / Hypothesis	Result / Experiment Evidence	1.Spoon	Sink	Float	2.Bowl	Sink	Sink	3.Block	Float	Sink	4.Pen Cover	Sink	Float
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"> • Learners will think about the reasons that some objects sink or float • Example: 															

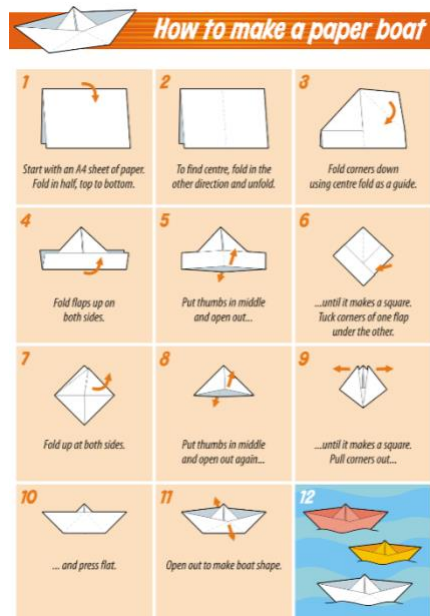
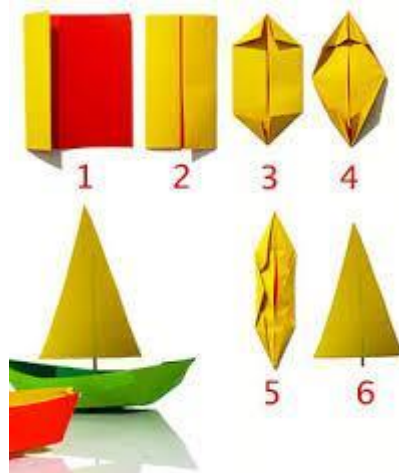
- Objects that are heavy sink
- Objects that are big sink.

5 minutes

- Learners will do the experiment again to test their reasons and make a guess on how boats float.

20 minutes

- Learners will make paper boats that float on the water.



- Learners will make multiple boats and check if it sinks or floats.
- Learners will try to move their boat.
 - Learners can blow on the boats to see how it pushes forward. This is how it sails with the wind.
 - Learners will create their own rowing oars to explore how engine propellers help push the water and move forward.

10 minutes

- Learners will make their own oars with popsicle sticks or straws. Make sure the bottom of the oar has a broad and flat surface.



DAY 3

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

Suggested Duration

Activity and Description

15 minutes

- Learners will make a list and draw a list of land vehicles that they know. Try to organize these in terms of speed from fastest to slowest
- For example:
 - Train
 - Motorbike
 - Car
 - Bus
 - Bicycle

15 minutes

- Learners will explore the concept of friction and the importance of wheels to help most land motion.

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- 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.
- For example, even if you rub your hands together that causes friction.
- Learners will move different objects on the ground to see the impact of friction
- Learners can move a square or rectangular block or a triangular shaped object – these can be constantly pushed with force, but these cannot be rolled. Learners can try the same with a circular tube to see how it rolls forward more easily with less force

15 minutes

- Learners will design roads to reduce resistance or friction.
- Is it easier for the vehicle to move faster when the ground is bumpy or uneven?
- Learners will guess and test whether they think a tube or toy car can move faster on different surfaces and roads.
- The surfaces on which the vehicle moves faster with less force has lower friction
- Make sure that learners apply the same level of force or push on the vehicles.

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		

15 minutes

- Learners will explore why they think some surfaces increase or decrease resistance and share answer with parents.
- Learners will design a ramp that can be made with a book on any flat surface that is at an incline
 - How much effort / force needs to be applied to help it go down?
 - How much effort / force needs to be applied to help it go up?

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"> ● Land vehicles: Learners will explore all traffic rules. ● As traffic police, they will make 5 relevant signs that help slow down land transportation to prevent 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"> ● Learners will think about traffic in the water and people that will help in managing this. ● Learners can make their own lighthouse to help boats navigate in the darkness ● Learners can make this with empty toilet paper rolls, tubes and paper.
20 minutes	<ul style="list-style-type: none"> ● Learners will 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. ● They will think of the shortest message they can send to pilots to make sure there are no issues. ● Literacy extension: We will learn how to summarize key messages. In the case of air control and other things like SMS etc. we have to pass on important information, and we cannot use too many words to share this information. How can we best summarize the message to pass the key important points? ● (2 levels of worksheet are attached) ● Learners can also write their own short messages to communicate the following scenarios. Learners can communicate 1 or all 3 of the scenarios: <ul style="list-style-type: none"> - Learner booking a railway ticket on the phone (Key points: i) Origin and Destination - From where to where are they travelling;

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- 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.)
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DAY 5

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

Suggested Duration	Activity and Description
20 minutes	<ul style="list-style-type: none"> ● Learners will imagine and create their own vehicle that combines all the science principles they have learnt until now: <ul style="list-style-type: none"> - Anti-gravity - Floating - Low resistance ● Learners will 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"> ● Learners will think of the purpose of the vehicle ● For example: <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"> ● Learners will draw their vehicle and label it and show it their family. ● They will explain the relevant features to make it work best on land, water and air.

ASSESSMENT CRITERIA

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

ADDITIONAL ENRICHMENT ACTIVITIES

- Learners can explore creating their own moving car with rubber-bands as in Level 3 of the same project.

MODIFICATIONS TO SIMPLIFY

Learners can test the concepts of friction and sinking and floating by designing their own boat and testing the cars and then design their own vehicle.



WORKSHEET 1

Can you summarize the following instructions between a pilot and air traffic controller?

Example:

Long Form: Hello, I am testing the sound system. Pilot Sam, can you hear me?

Short Form / Summary: Mic, check testing.

Question 1:

Long Form: Hello, how are you? I am trying to test this mic, this is Pilot Sam. I can hear you, can you hear me also?

Key Messages:

Short Form / Summary:

Question 2:

Long Form: Hello Pilot, can you hear me? Please do not come to land right now because there is another flight using the runway to take off. Please circle around the airport in the air for some time

Key Messages:

Short Form / Summary:

Question 3:

Long Form: Air Controller, this is Pilot Sam from the Plane that was coming from London.

We have flown a long time and our fuel is finishing, if this happens, we will not be able to continue flying and might even crash. Please can we land soon

Key Messages:

Short Form / Summary:

Question 4:

Long Form: Ok Pilot I understood. I have some important questions how much more petrol do you have in your plane? How much more time can you fly before you have to land? I have 2 more flights; I can stop them and ask you to land first.

Key Messages:

Short Form / Summary:

Can you summarize the following communication between the pilot and the air control tower?

Question 5:

Long Form: Thank you, Air Controller – Since we flew for 10 hours, we only have 5 litres of fuel left and maybe we can circle one more time for another 3 minutes and then we will have to land. I suggest you ask the other planes to wait

Key Messages:

Short Form / Summary:

WORKSHEET 2

Directions: Read each passage

1. Create a title for the passage related to the main idea.
2. Accurately summarize the text.
3. Your summary must describe all key ideas from the text.
4. Do **not** include opinions or personal info in your summary.
5. Highlight or underline key ideas in the passage

Example:

Long Form: *There was a grumble in the air and dark clouds forming, the captain on the ship looked up at the sky. The captain had his hands folded and was wearing a rather worried expression while he muttered to himself. The mild breeze that was blowing against the sail through the afternoon, was now a strong gusty wind and the entire ship was rocking from side to side. The sea waves were beginning to rise and crash into the ship, sometimes coming over the deck*

Main Idea: *There was a storm and the captain was worried*

Short Form: *There was a storm forming and the captain of the ship was worried. The wind was stronger than the afternoon and rocking the boat and the sea waves were coming over the deck.*

Paragraph 1: Imagine a herd of elephants almost flies past you at sixty miles per hour, followed by a streak of tigers, a pride of lions, and a bunch of clowns. What do you see? It must be a circus train! As early as 1871, people started using trains to have a moving circus from city to city. Before circus trains, it would be difficult for people to move the animals, performers, and equipment with a team of more than 600 horses. Since there were no highways, these journeys were tough and took a long time. Circuses would stop at many small towns between the large venues. Performing at many of these small towns did not make a lot of sense or make money for the circus. It was difficult for the circus to become too big because of these issues until they started using trains and reaching many of the big cities for big audiences. These performances were much more profitable, and the profits went toward creating an even bigger and better circus. Multiple rings were added, and the show went on. Today, Ringling Bros. and Barnum and Bailey Circus still rely on the circus train to transport their astounding show

Main Idea of the Passage:

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Summary:

Paragraph 2: I am trying to test the sound system and checking that you are able to hear and understand me clearly. I am speaking from the main air controller tower in the Dhaka airport and my name is Ron. My job is to make sure that only one plane at a time is taking off from the runway at a time to make sure that planes do not crash. Since you cannot see the other planes that might be ready to take off or land, I will coordinate between all of us. There are many planes waiting to take off and since there is only one runway to be used, we think it is better for you to not land right now. I understand that you have come from far away, so I want to make sure that you have enough fuel in the tanker to be able to stay in the air for some time. We want to make sure that another three flights take off before so that the passengers on the flight do not get very late to their destination.

Main Idea of the Passage:

Summary: