





Learning Scientific Skills Outside the Classroom

Scientific Skills

Predicting	Measuring	Recording
Country of Origin	Suggested Age Range	Suggested Theme
 Spain	9 - 10	Forces
Location outside the classroom		Benefits of using this location
Outside on the playground		There are high areas to release objects from and a large space for cars and rockets to travel
Learning Objectives – Scientific Skills		Learning Objectives – Knowledge
To use prior knowledge to make a prediction To accurately measure mass and distance using appropriate measuring equipment To record results in a table		To know that gravity is a force which makes objects fall towards Earth To understand the law of inertia To discover the effects of a change in mass on the movement of a toy car To know that every action has an equal reaction and apply this principle to a balloon rocket
Key Vocabulary		
Scientific skills vocabulary – predict, predicting, measure, measuring, accurate, record, recording, scales Knowledge vocabulary – inertia, gravity, motion, mass, acceleration, deceleration, action, reaction, force		
Resources / Equipment		
<ul style="list-style-type: none"> • Equipment for gravity speed test – a large and small ball, a piece of paper • Equipment for mass – metre long strip of cardboard, toy cars, weighing/mass scale, measuring strip, Lego, tape • Equipment for balloon rockets – straw, string, balloons, tape 		
Teaching Activities		
<p>Discuss – Through discussion, retrieve pupil’s prior knowledge on forces. There are always forces acting on us, forces affect everything and they can change how things move.</p>		
	<p>Explain – Tell children that today they are going to explore some of the different forces which can act on objects and look at three laws which apply to forces. They are going to start by looking at the force of gravity. Gravity is a force which makes objects fall towards the centre of the Earth.</p>	
	<p>Activity 1: Gravity</p>	
	<p>Prediction – They are going to drop a large ball and a small ball from the same height at the same time and see which one hits the floor first. Children predict which one is going to hit the ground first and why.</p>	
	<p>Activity – In pairs or small groups, children drop a large ball and a small ball (such as a football and a tennis ball) from the same height at the same time.</p>	
<p>Discuss – Was their prediction correct? Why do you think this was?</p>		
<p>Activity – Children repeat the activity, again making a prediction first, using one of the balls from the previous activity and a piece of paper.</p>		
<p>Discuss – Were their predictions correct? What do their findings tell us about how gravity pulls on objects? What happens when you drop something light like paper?</p>		



Explain – Gravity makes all falling objects accelerate at the same rate. Things only slow down or speed up if there is another force acting on it. Paper takes longer to fall than the balls because it is slowed down more by the air, the force of air resistance makes objects descend more slowly than when they are moving under the influence of only gravity.

Activity 2: Mass and deceleration

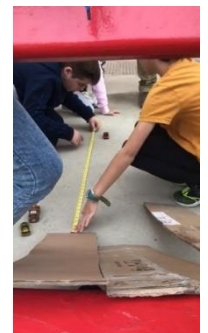
Explain – They are going to use a ramp for some toy cars and investigate the effect of mass on deceleration and therefore on distance travelled before objects stop moving. Children need to be aware that gravity also acts on the cars pulling them down but this is not explored in this situation.

Explain that they can choose their own cars but will need to accurately measure the mass of each car they use. The cars will be sent down the ramp ensuring that an equal force is applied to each car at the top of the ramp to ensure a fair test. The distance the cars travel before they stop will be recorded.

Measure – Children choose the three cars they want to use and measure their mass accurately using scales. The mass of each car will be recorded.

Activity – In groups of three, children build a ramp using a piece of cardboard with Lego bricks to support the ramp. They place each of their chosen cars at the top of the ramp and apply an equal force to the cars so they roll down the ramp.

Measure – Children measure the distance the cars travelled beyond the ramp before they stopped with a measuring strip and record their results in a table. Pupils should repeat the experiment at least 3 times so that they can have increased trust in their results.



Discuss – What did your results show you? What effect does mass have on the deceleration of a car and consequently the distance it travelled?

Activity 3: Blast off



Explain – They are going to investigate what happens when you create a balloon rocket.

Demonstrate – Show children how to make a balloon rocket. One child will thread a piece of string through a straw and hold it in a horizontal position while another child inflates a long party balloon. The balloon is then carefully taped to the straw while a child continues to hold its neck. They then release the balloon.

Activity – Children work in small groups to make balloon rockets which they then release and watch the ‘rockets’ fly across the strings.

Discuss – Children share and discuss their experience with the balloon rockets. How and why did the rockets fly?

Explain – When the air was released out of their balloons in one direction, the force pushed the balloons in the other direction. This powerful forward motion comes from the energy of the balloon forcing the air out. As predicted by Newton’s Third Law: “For every action there is an equal and **opposite** reaction”. Children have forced gas out of the rocket without burning fuel, as it happens with real rockets.

Examples of children’s work and teacher comments from country of origin

	Mass	Distance
car 1	20g	0,39cm
car 2	10g	0,29cm
car 3	5g	0,19cm

Next steps could be to use different materials for the ramps to think about friction, a different type of force that opposes motion. They could also try the balloon experiment with a different shaped balloon. Finally, they can try to put the string upward and compare and write down the results. Vertical position will slow down the speed of the rocket due to the effect of gravity.