



1 Hour Pre-Visit Lesson Plan

Quarry

Date:

Years 3 - 6

Teacher:

Lesson Objectives		<ul style="list-style-type: none">• To excite the children about their trip• To know that a force is a push or a pull• To know that gravity pulls us towards the centre of the Earth• To explore how friction and air resistance can affect motion• To work collaboratively to plan and create an effective zip wire
Starter Activities	10 mins	<ul style="list-style-type: none">• PowerPoint: Show the children Slides 1- 3 and click on the links. Explain that they will be visiting Zip World Penrhyn Quarry where they will be having a turn on the Quarry Flyer zip wire and taking a tour around the Quarry on one of Zip World's famous trucks. Spend time navigating the website and watching the videos. Briefly look at the history of the quarry.• Slide 5: Explain that to help us understand how the attractions at Zip World work, we will be spending our lesson trying to understand forces. Ascertain from the children that all forces are pushes and pulls.• Years 3 - 4: PowerPoint Slide 6 – spend a few minutes in pairs looking for pushes and pulls around the classroom/playground (having a few toys around the classroom in preparation may be helpful – invite the children to make them move). Come back together and ask the children to share what they found. Record different examples on the Venn diagram. Where would we put examples that use both pushes and pulls?
Main Activity	15 mins	<ul style="list-style-type: none">• Slide 7: Scrunch up a ball of scrap paper. Ask a volunteer to hold it up and drop it. Why did the paper drop to the ground? Elicit gravity and pull together the facts that children already know about it.• Slide 8: Now ask another child to drop a piece of paper of the same size, this time flat. What was different about how this dropped to the ground? Discuss that gravity still pulled it down, but this time we could tell that another force acted against it. The paper hasn't changed weight, just shape. Discuss air resistance; the first scrunched up ball still had to push air out of the way as it fell down, but less of it as it was a smaller shape. The big piece of paper had to push more air out of the way (greater air resistance), so took longer to travel down. Drop the papers again, this time simultaneously, to show the difference more clearly.



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Main Activity cont.	20 mins	<ul style="list-style-type: none">• <i>Air resistance is an example of friction.</i> Look at Slide 9 together and discuss friction – encourage the children to rub their hands together to feel the heat it makes. Establish that friction always works against motion – whether this is an object falling (where air resistance works against gravity), or an object travelling forwards/backwards (air resistance and friction from the surface on which it is travelling work against the motion).• Activity Sheet 1: Give small groups a card each. In pairs, look at the attractions at Zip World and discuss the forces at play – focus on gravity, air resistance and friction. Pick a few pairs to explain their ideas to the class, showing Slide 10. Discuss the tyres of the truck and kart versus the smooth zip wire and the effects the materials have on friction. <i>Would the truck drive as well with smooth tyres? Would the rider travel as fast if the zip wire were rough/bumpy?</i>• Slide 11: (If time is limited, this could be a whole class discussion rather than group activity) Show the class the garden wire and explain that you need to make a zip wire – encourage the children to help you to put one end higher than the other so that gravity can pull the rider down. Show the toy and explain that they have a challenge; can the class come up with the best harness to get the toy down the zip wire? They must consider the best material to limit friction (and more able children might consider position of rider to limit air resistance). Split the children into mixed ability pairs and encourage them to chat about their ideas. If possible, give each group a piece of wire to test their harness at their desks.• If time allows, they can draw and annotate their ideas on Activity sheet 2.
Extension Work	-	<ul style="list-style-type: none">• Children could test other variables (changing only one at a time), including: incline of zip wire, weight of toy and type of zip wire (string, pipe cleaners etc.) to see the effects they have on the speed.
Plenary	15 mins	<ul style="list-style-type: none">• Bring the class together and test out each material. Ensure that all other variables are kept the same. Ideally, test each three times and take an average speed. If time is limited, pick just one or two pairs of children to test their ideas.• Establish that forces act on everything around us; gravity is pulling everything towards the ground, and friction and air resistance act against movement.• Slide 12: Encourage the children to look out for the forces discussed today during their visit to Zip World so that they can come back with examples. Will they be able to spot the materials (and positions of riders) chosen at Zip World to limit friction where needed (zip wires) and maximise it at other times (on the truck wheels)?



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AfL	-	Observing, contributions to discussion, written work and verbal responses to questions.
Key Skills	-	Collaboration, questioning, communication, problem solving, reflection.
Key Words	-	Push, pull, force, gravity, friction, air resistance, motion.
Differentiation and Success Criteria	-	<p>Group children in mixed ability groupings; peer support.</p> <p>Offer more guidance to less confident children.</p> <p>Encourage more confident children to consider multiple forces acting at once on objects.</p> <p>All children will know that a force is a push or a pull and that gravity pulls objects towards the ground. They will have made a harness for their zip wire.</p> <p>Most children will understand that there are different types of force, including gravity and friction, and that they can affect motion. They will have worked with their team to plan and create a harness that aims to limit air resistance.</p> <p>Some children will understand how other forces such as air resistance can affect an object's motion, using arrows to show the size and direction. They will have planned, created and reflected upon their harness and be able to explain with clarity the forces in action.</p>
Resources/ Preparation Needed	-	<ul style="list-style-type: none">• PowerPoint• Scrap paper x 4• Activity sheet 1: print enough cards and cut out for each group• Activity sheet 2, one per child for extension work• A small toy (enough of the same toy for each group would be beneficial for group work)• A selection of rough and smooth materials for the harness such as pipe cleaners, paperclips, string, wool, straws, toilet rolls• Garden wire for zip wire• A timer• A selection of fasteners such as Sellotape, food bag ties, stapler
Evaluation	-	For teacher to complete:

Note: Please amend PowerPoint and Worksheets to suit your cohort and year group.

Years 3 and 4 children should focus on all forces as pushes and pulls, omitting the air resistance activity.

Years 5 and 6 children should omit the push and pull starter exercise and take more time on the main activity.