KS3 SCIENCE WORKSHOP
Guide's Plan

Key Stage 3 Science Workshop

PREMISE

This workshop aims to get students discovering, thinking and talking about forces, with more focus on the process than on the outcome of each mini experiment. The hint of competition will give the workshop pace and an air of excitement!

LEARNING OBJECTIVES:

- **To describe the effect of resistive forces**
- **To prove that the rougher the material, the greater the friction**
- **To prove that an object's surface area affects the air resistance acting on it**
- **To describe the forces involved in floating and sinking.**

NATIONAL CURRICULUM LINKS

Science

Forces
Pupils should be taught about:

- forces as pushes or pulls, arising from the interaction between 2 objects
- using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces
- forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water
- forces measured in newtons, measurements of stretch or compression as force is changed
- non-contact forces: gravity forces acting at a distance on Earth and in space

Working scientifically
Pupils should be taught to:
Scientific attitudes

- pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility
- understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review

Experimental skills and investigations

- ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience
- select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
- use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety

I'M A CELEBRITY JUNGLE CHALLENGE

- make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements

Analysis and evaluation

- present observations and data using appropriate methods, including tables and graphs
- present reasoned explanations, including explaining data in relation to predictions and hypotheses
- evaluate data, showing awareness of potential sources of random and systematic error

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KEY SKILLS:

- Collaboration
- Communication
- Creativity
- Observation
- Problem-solving

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TIMINGS	ACTIVITIES
Starter (5 minutes) **Briefing Room**	1. Welcome the students. Discuss the Jungle – did the students see any of the activities they might be doing later/what activities have they taken part in? Establish that understanding how we move and what things act for and against us, might help us travel more quickly and easily through the jungle – perhaps even helping us to become King or Queen of the Jungle! We will be learning about the forces acting on you today. 2. What are forces? Give students time to discuss with the person next to them and ask for volunteers to share what they know (for example, forces are pushes and pulls that act on an object dues to the interaction with another object. All forces have got both magnitude and direction. If unbalanced, forces can change an object's speed, direction or shape. They are measured in newtons (N). They can all be divided into contact (e.g. tension, friction, normal contact force etc.) or non-contact forces (e.g. gravity, electrostatic force, magnetism)). 3. Explain that in small groups, the students will be learning about forces; they will have a short time at each table to complete a challenge using the information cards given to help them do their best. They must read the information cards to help them work out the best solution. 4. With the teacher's help, split the students into four small, mixed ability groups. Send each group to a table and ask them not to touch anything yet! Give teams a few minutes to think of a team name.
Main Activity (45 minutes) **Classroom**	1. Explain that on your bell, the students will be moving to the next table until they have completed all four challenges. Show them the clockwise movement around the room. Like good scientists, encourage them to consider the hazards in the room (standing on a chair, water tank etc.) and to be careful where needed. 2. Some challenges are competitions – let's see which team will win! Just like in the jungle, it is really important that they work together as a team if they are going to succeed. Spend a few moments discussing how best they will do this. Encourage the students to share the skills they think they will need, such as: • Listening properly to each other • Talking about our own ideas • Making sure everyone is involved • Supporting those who find something difficult • Valuing other people's opinions and ideas 3. Give students 10 minutes at each table before ringing the bell and helping them move to the next table. Float around the groups, helping to guide them and encourage collaboration as needed. Encourage helping adults to stand at a table and help students record their results clearly, put things back for the next group at the bell and keep pace.

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Plenary (10 minutes) **Classroom**	1. Stop the students. Stand at each table in turn and ask for volunteers to briefly share what they did and learned at each table. showing any great designs. Which team made the best zip wire/ parachute/ boat?! If there is time, test them out. Possible questions to prompt students: **Table 1: Establish that friction is affected by the smoothness of the surface and by the weight of the object.** • What experiment did you design to help you find the best material? • Do you think this was a good test? Why? • Was it a fair test? What was your independent variable (type of surface)? If time allowed, did you test each variable more than once – why is this sensible? (so you know the results are accurate) • What were your results? Why have different tables got different newton readings (they used different shoes with different grips and weights)? **Table 2: Establish that air resistance (and not mass) affects the pull of gravity but if we streamline (reduce the surface area touching the particles of air), we can help objects move faster.** • Which force made Mini Ant and Dec travel on the zip wire? (gravity) • Which forces acted against them (air resistance and friction on the pulley) • How fast was your zip wire ride? Which team made the fastest one?! • What things did you do to make it faster? • What other things could you have done if you had had time? **Table 3: Establish that there is a link between surface area and air resistance. The greater the surface area in contact, the greater the air resistance.** • How slowly did each group get Ant and Dec to fall? Who created the best parachute?! • What factors (size, string, weight) affected it? Why? • Do you think we could slow their fall further still? (The bigger the surface area of the parachute, the more air resistance and the slower the descent). **Table 4: Establish that for a boat to float, the density of the boat (and its contents) must be less than the density of the water being displaced.** • Did you manage to make a raft that floats? What happened when you added Ant and Dec's heavy cargo? (The extra weight pushed more of the boat under the water, which displaced more water. If the hull was deep enough, the boat would have floated. If water went in over the top, the boat may have become too heavy so that weight was greater than upthrust, and it sunk.) • Which team's boat held the most? • How did you make your boat float? Students may have experimented with larger surface areas or more depth to make their boats stable and less dense than water, modelling ideas on cruise liners that carry a lot of weight. When a boat is placed in water, it displaces an amount of water equal to the boat's weight – as long as the object is less dense than the water, it will float. Encourage students to explain what happened using scientific explanations. 2. Praise any sensible experiments that were fair and effective (using one variable and with materials tested many times to avoid flukes) and any well-thought-out ideas, based on science. 3. Congratulate the winners of each table – and pretend to crown them king/ queen of this jungle!