Encke's Lesson - Science

Book of Beasties

Objectives

Lesson 1 – Parent/ Child Version.

L.O:

To Understand the Major Forces in Rocket Science.

Rocket Science

MAIN TEACHING – It Is Exactly Rocket Science. (10 minutes)
Start the lesson by asking your child if they know how we travel to space. Acknowledge any mention of flight or spaceships but lead them towards the idea of rockets. Explain that rockets aren't just another name for spaceships or missiles but also the name of the engine that powers a spaceship or a missile. Explain that rockets move-or thrust-themselves by exploding their contents -or fuel-behind them, pushing them forward, though tell your child that this is an oversimplification.

Tell them that they will be creating their own rockets from balloons to see how they work and playing with variables to see what affects the rockets movement. Explain that a variable is something you alter within the same experiment in order to observe its impact.

MAIN TASK – (35 minutes)
Activity Breakdown:

1. Pass the wire through the straw (minimum 3m of wire).
2. Tie the wire between two objects at the same height (e.g. the back of two chairs).
3. Bring the straw towards one end of the string.
4. Inflate the balloon and pinch the end, but do not tie it.
5. Tape the balloon to the straw with the pinched end pointing towards the closest end of the string.
6. Mark the string where your balloon-straw rocket now rests.
7. Release the balloon.
8. Mark the new spot on the string where the balloon-straw rocket now rests.
9. Measure the distance and record.
10. Repeat the steps 1-9 a few times, this time changing the height of one of the chairs causing the rocket to go up hill and making the hill steeper and steeper on each attempt.

Extra Information

Materials Required:
- ✓ Wire
- ✓ Balloons (preferably long balloons, but not necessarily)
- ✓ Straws (non-bendy)
- ✓ Scissors
- ✓ Tape
- ✓ Marker pens of different colours
- ✓ Ruler/Measuring tape
- ✓ Balloon pump (not necessary but may be required for smaller children)

Key Words:
Thrust/Propulsion
Fuel
Variable
Friction
Air-Resistance
Hypothesis
Gravity

Traffic light expected lesson outcomes:
- ✓ I can construct a simple air-powered rocket.
- ✓ I can construct a simple air-powered rocket and name the major forces involved.
- ✓ I can construct a simple air-powered rocket and explain the interactions of the major forces.

Objectives	Rocket Science	Extra Information
	⑪ Repeat the step 10, this time cutting the straw to make it shorter. **Mini-Plenary:** Discuss the experiment with your child. During this discussion ask them to tell you what the fuel was (air trapped in the balloon) and what the variables were for the experiment (the angle of the string and the length of the straw, bonus points for mentioning the amount of air in the balloon). Assuming the experiment went successfully they should note that the rocket goes a shorter distance the steeper the angle of the string and that it goes slightly further with a shorter straw. Ask them volunteer explanations for these results. Keywords to acknowledge being friction, resistance and gravity. **PLENARY – (20 minutes)** Explain that in the first experiment there were two major forces; thrust and resistance. Ask your child to draw a small spaceship facing right. Get them to add an arrow pointing right above the ship with a label saying 'Thrust'. Reinforce that in our rocket the thrust was caused by air escaping the balloon but that other rockets burn chemicals to create controlled explosions. Have them add another arrow under the ship pointing left with a label saying "Resistance". **High light that this resistance is from the air in our atmousphere, and will not be experienced in the vaccum of space.** Explain that resistance is anything that slows or stops movement. Ask them for examples of resistance they can think of (e.g. car brakes, water when swimming, air when cycling). Explain that any movement through air is met with "air-resistance", much like movement through water is slowed down, though the effect is more noticeable in water because water is denser. Tell them that in our experiment we also had another resistance in the form of the straw rubbing against the wire and that by using a shorter straw we reduced this resistance, but that air-resistance was still there. Explain that in the rest of our experiments there was another force involved. Tell them to redraw the ship, this time pointing up. Have them add the "Thrust" label and arrow to the left of the ship pointing up and add the "Resistance" label and arrow to the right of the ship pointing down. Ask your child how the forces have changed. Lead them towards the idea of the thrust being the same because the same fuel is being used in the same rocket, but that now there is another force to overcome. If they are having trouble naming this force try picking an object up and dropping it to give a hint. Explain that the additional force is gravity. Gravity being the force that keeps us on the ground. Explain that the pull of gravity is increased, the steeper the angle of the wire.	

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	Tell your child that gravity is what is called a 'Fundamental Force' - a force that cannot be reduced or explained by another force. This may prompt questions about air-resistance being a fundamental force and if there is time you can explain that it is not, because it can be explained by smaller forces interacting but that it is a much more advanced subject in physics. Tell your child that gravity and air-resistance are the two major forces that act against thrust with a rocket, with air-resistance increasing the faster or bigger the rocket (perhaps ask them to imagine moving their hand faster in a pool or with something in their hand) and gravitational resistance increasing the heavier the rocket (imagine the difference between lifting a feather vs a boulder). Explain that with a heavier rocket, perhaps carrying more stuff, more fuel would be needed to launch the rocket. But because fuel has a weight as well, that would make the rocket heavier too, requiring even more fuel. Tell the class that working out exactly how much fuel to use is one of the many reasons rocket science is so complicated but that they have just made their first steps towards mastering it.	

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Reflection	Child's Progress