SCIENCE
YEAR 5-6
Cycle A – Unit 6

Forces: friction & forcemeters

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RANGE

How things work

2. forces of different kinds – **friction and forcemeters**
3. the ways in which forces can affect movement and how they can be compared

KEY VOCABULARY

gravity
mass
force
weight
friction
air resistance
newtons (N)
variables
reliability
table
average
bar chart
line graph
axes
scale

Developing thinking
(Plan-Develop-Reflect integrated into activities)

LNF - Main Numeracy Strands covered*

Strand:
Developing numerical reasoning.
Element:
Identify processes and connections.
Represent and communicate.
Review.

Strand:
Using number skills.
Element:

LNF – Literacy (writing) opportunities

Element: Organising information and ideas
Writing accurately

Writing to inform, instruct and explain

Curriculum Cymreig

School to identify and provide opportunities for developing this skill within the scope of the unit.

Use number facts and relationships. ***Calculate using mental and written methods.*** ***Estimate and check.*** --- **Strand:** ***Using measuring Skills.*** **Elements:** ***Length, weight/mass, capacity.*** --- **Strand:** ***Using data skills.*** **Element:** ***Collect and record data, Present and analyse data, Interpret results.*** **Refer to LNF Numeracy framework for details of specific skills within each element.*	**Developing ICT** *School to identify and provide opportunities for developing this skill within the scope of the unit.*	**Personal and social education** *School to identify and provide opportunities for developing this skill within the scope of the unit.*

Science – Medium Term Planning (half term)

Year Group	**5/6**	Term	**Cycle A – Unit 6**	Unit Title	***Forces – friction and forcemeters***

Range: *How things work*
2. forces of different kinds – **friction and forcemeters**
3. the ways in which forces can affect movement and how they can be compared

Cross Curricular Links:

Skills (Principal skills in bold italics)	**Suggested activities**	**Resources and web links**	**Assessment Opportunities**
COMMUNICATE ***Communicate clearly using drawings*** **PLAN** Identify gaps in prior knowledge **REFLECT** Suggest how the method could have been improved	**1. Big Question: What do you know about forces?** Record diagnostic assessment – mind map, KWL grid or ideas poster etc. Show video clips of different forces in action and/or Concept Cartoon. Discuss. **Introduce the skill – Communicate findings. Recap using force arrows** • Play a true-false card game using statements • *Active Assessments: Pushes and Pulls. (Page 141)* activity. **Practise the skill – Communicate findings. Recap using force arrows** • Show children forcemeters and point out the spring inside them. Review how they work. Help children to practise reading the forcemeter. • Use a graphic organiser to consider the parts of a forcemeter and their function. • Complete graphic organiser (whole-and-part relationships) using parts of a forcemeter. • Recap on newtons (N). • Start a forces glossary in pupils' books – to be completed over forthcoming tasks.	http://resources.hwb.wales.gov.uk/VTC/2009-10/science/cripsat/e32-forces/index.html http://www.echalk.co.uk/ http://www.bbc.co.uk/education/subjects/z2pfb9q	Use preferred diagnostic strategy/tool ***Can pupils organise their findings using scientific language? (Level 4))***

COMMUNICATE ***Use SI units*** **PLAN** ***Plan the process/method to be used*** ***Plan the observations and measurements to take*** **DEVELOP** Make careful observations	**2. Big Question: Can we create our own forcemeter?** **Introduce the skill – Plan the process/method** • Challenge: design and build their own forcemeter using card, elastic bands and plastic bags. (Idea from the NFER Let's Think Through Science book.) • Attach elastic band to carrier bag and add mass (apples). Can pupils measure extension as the band stretches? Tabulate findings. • Attach elastic band to top of a piece of cardboard so that bag/band moves freely in front of cardboard. Record extension of band on cardboard as mass is added in bag. • Empty bag and add small apples (approx 100g). Mark extension; one apple, two apples etc. Tell pupils small apple = 100g. Can they convert 'appleometer' scale to g? • Tell them 100g = 1N. Can they now convert 100g to 1N, 200g to 2N etc.? **Practise the skill – Plan the process/method** • Think of ways of designing the forcemeter body/case. • Children to set success criteria for their forcemeter design. • Pupils make another attempt at making a forcemeter using 100g apples to create a scale. **To write to instruct** **Text type: Diagrams and annotation**	Alternative method: http://www.instructables.com/id/Be-a-scientist%3A-make-your-own-force-meter./	***Can pupils record using SI units? (Level 4)*** ***Do pupils use scientific skills and knowledge to plan their work? (Level 4)***

PLAN ***Identify the key variables to be controlled in a fair test*** **DEVELOP** ***Check observations by repeating them in order to collect reliable data*** Use apparatus and equipment correctly and safely **REFLECT** Begin to evaluate outcomes against success criteria.	**3. Big Question: Which design of trainers produces most friction?** **Introduce the skill – Identifying variables/reliability. OAM unit 6** • Introduce task 6c. • Oral data collection - Are the grips on Nike trainers better than the grips on Reebok trainers? Class vote. Do longer shoes have more grip? • Diamond ranking the features of trainers and their construction. • Card sort activity - to include statements about the kind of sole, colour of the sole, cost and make etc. • What makes a 'good' planning sheet? Question, prediction, identification of all variables etc. Model example from science guidance for pupils. **Practise the skill – Identifying variables/reliability. OAM unit 6** Compare the soles of trainers – draw attention to the lines and patterns. Quick questions. • Plan an investigation into friction. Ask the pupils what shoes have the best grip and how they intend to prove this (encourage the pupils to drag their trainers across the carpet and/or up a ramp using a forcemeter). • Planning sheet – aim for pupils to complete an independent planning sheet. • Consider using the pupils' own homemade forcemeter. Concentrate on creating a table in order to repeat the results to ensure accuracy / average (create tables with multiple columns and rows including the average). **To write to inform** **Text type: science write-up/report**	http://resources.hwb.wales.gov.uk/VTC/2009-10/science/cripsat/e32-forces/index.html http://www.echalk.co.uk/ http://www.bbc.co.uk/education/subjects/z2pfb9q	***Can pupils identify key variables? (Level 4)*** ***Can pupils take repeat readings to ensure reliability? (Level 5)*** Can pupils draw their own bar charts? (Level 4) Can pupils identify patterns and trends? (Level 4)
COMMUNICATE ***Use tables, bar charts and line graphs*** **DEVELOP** ***Form considered opinions and make informed decisions***	**4. Big Question: Which design of trainers produces most friction? Cont.** **Introduce the skill – Line graph or bar graph?** • Review results from previous task. • What type of graph does our data give us? • Categoric data (e.g. types of shoes or surface versus force needed to move) gives a bar chart. • Give pupils the 'Which graph' planner. **Practise the skill – Line graph or bar graph?** • Pupils to construct their own bar charts. • Peer- or self-assess graphs. • Can they identify patterns and trends?	http://www.mrnussbaum.com/coolgraphing.htm http://www.amblesideprimary.com/ambleweb//mentalmaths/grapher.html	***Can pupils draw their own tables and bar charts? (Level 4)*** ***Do pupils understand reliability? (Level 5)*** Can pupils identify patterns and trends? (Level 4)
DEVELOP ***Form considered opinions and make informed decisions*** **REFLECT** ***Suggest how the method could have been improved***	**5. Big Question: How does our 'homemade' forcemeter compare to the real one?** **Practise the skill – Make careful observations and review success criteria** • Repeat the above investigation using pupils' own forcemeter. • Compare the results of both devices. • In groups, describe what they have learnt and explain which way worked best and why. • As above, give every pair 5 different objects, e.g. a cup, a shoe, pencil case, t-shirt, school bag etc, and a forcemeter (with scale of 0-10N) • Complete task 6a Science Ideas Form (Optional Assessment Materials 2006: Unit 6) which asks them to measure the mass and weight of 5 different objects. • Ask the pupils to suggest improvements in their design. **To write to evaluate** **Text type: non-chronological report**		***Can pupils decide whether their method was successful by referring to their success criteria? (Level 4)***

PLAN ***Make predictions using prior knowledge*** ***Identify the key variables to be controlled in a fair test*** **DEVELOP** Use apparatus and equipment correctly and safely	**6. Big Question: Which band stretches the most?** Ask children to explore what happens to the length of an elastic band when different masses are suspended from it. **Introduce the skill – Identifying key variables in a fair test** • Help pupils identify all variables in this task (type, length, width of band, size of mass etc). • Identify the key variables to change, measure and keep the same. • Make predictions using science ideas if possible. • Model planning using interactive planning boards. **Practise the skill – Identifying key variables in a fair test** • Ask pupils to choose science roles in groups, e.g. people, equipment and thinking managers etc. • Pupils carry out investigation. (SAFETY - do not over-stretch the bands.) • Help children to represent data as bar or line graph (depending on variables) • Thinking manager to report back to class, including a description of findings. Equipment manager to discuss ways of improving the method. **To write to inform** **Text type: tables and notes**	http://resources.hwb.wales.gov.uk/VTC/2009-10/science/cripsat/e32-forces/index.html http://www.echalk.co.uk/ http://www.bbc.co.uk/education/subjects/z2pfb9q	***Can pupils make predictions using scientific ideas? (Level 4)*** ***Can pupils list all independent and dependent variables? (Level 5)***
PLAN Make predictions using prior knowledge Identify the key variables to be controlled in a fair test **DEVELOP** ***Check observations by repeating them in order to collect reliable data*** ***Use apparatus and equipment correctly and safely*** **REFLECT** Begin to evaluate outcomes against success criteria.	**7. Big Question: How do we make the 'best' car catapault?** Following-on from previous activity, challenge pupils that they have been commissioned to report back to a toy manufacturer on the best design for a car catapault. *NB - This concept is outlined in the old ACCAC assessment units for Curriculum 2000. It involves stretching and pulling back an elastic band between the legs of a chair and propelling a sand-filled container across the floor. Many variables may be manipulated, e.g. type of band, size of band, type of floor, mass of tub, size of tub etc.* **Introduce the skill – Measuring carefully and checking observations for reliability** • Challenge pupils to identify all variables in this task • Identify the key variables to change, measure and keep the same. Allow pupils to select their own variables to change/measure. • Make predictions using science ideas. • Model planning using interactive planning boards. **Practise the skill – Measuring carefully and checking observations for reliability** • Pupils produce group planning sheets • Ask pupils to choose science roles in groups, e.g. people, equipment and thinking managers etc. • Pupils carry out investigation. (SAFETY - do not over-stretch the bands.) • Can pupils represent data as bar or line graph (depending on variables)? **To write to inform** **Text type: science write-up/report**	http://resources.hwb.wales.gov.uk/VTC/2009-10/science/cripsat/e32-forces/index.html http://www.echalk.co.uk/ http://resources.hwb.wales.gov.uk/VTC/2011-12/science/tinopolis/skills-through-science/index.html	***Can pupils select measuring equipment with correct scales? (Level 5)*** ***Do pupils understand reliability and take 3 readings to calculate an average? (Level 5)***

COMMUNICATION ***Communicate clearly using writing, tables and graphs.*** **REFLECT** Suggest how the method could have been improved	**8. Big Question: Can you write a science report?** **Introduce the skill – Communicate using writing, tables and charts** • Thinking manager to report back to class, including a description of findings. Equipment manager to discuss ways of improving the method. • Recap on language style in science reports. Share examples and ask pupils to mark key aspects with coloured pencils. **Practise the skill – Communicate using writing, tables and charts** • Ask pupils to determine some success criteria for their science report. • Plan the report and identify evidence they will include (tables and graphs?) • Produce report, share and gauge whether the success criteria have been met. **To write to inform and explain** **Text type: non-chronological report**	http://www.sciencekids.co.nz/sciencefacts/scientists.html http://www.bbc.co.uk/sn/	***Can pupils organise and communicate their findings using science ideas? (Level 4)*** ***Can pupils organise their findings systematically, integrating text, tables and using SI units? (Level 5)***

REFLECT ***Describe how they have learned, and identify the ways that worked the best.*** Link the learning to similar situations, within and outside school.	Revisit initial diagnostic assessment. Can pupils demonstrate understanding at end of topic and discuss new skills learned and/or practised?	Use preferred AfL strategy	***Can pupils describe how they have learned and identify the ways that worked the best? (Level 4)*** ***Can pupils identify the thinking/learning strategy they used? (Level 5)***
Evaluation			