John Boyd Dunlop and his stretchy, bendy invention!

(Uses of everyday materials)

CHEMISTRY

Overview and rationale:

As our children get that little bit older, they become more and more fascinated by the things they touch and feel and the world around them in general. As their capacity to question the world builds, they are able to explore and investigate to find the answers to those questions. John Boyd Dunlop invented the pneumatic tyre and this ground-breaking creation is a step-off point for our children to explore all things squishy, squashy and bendy! Through practical enquiry and activities, this science topic encourages our children to make more detailed observations, spot patterns, similarities and differences, and begin to think of different ways in which to answer scientific questions. Investigating states of matter and solids, liquids and gases, forms a significant part of the science curriculum in KS2 and this topic provides a little insight into some of the concepts that will be explored further in the juniors.

SCIENCE LEARNING STATEMENTS

Area of Learning	Skills and Knowledge
Scientific Enquiry and applying knowledge in context	I can explore the world around me and raise my own simple questions. I can share my ideas with others.
	I can experience different types of science enquiries, including practical activities.
	I can begin to recognise different ways in which to answer scientific questions.
	I can carry out simple tests using some basic equipment.
	I can use simple features to compare objects, minerals, materials and living things. With help, I can decide how to sort and group them.
	I can ask people questions and use simple secondary resources, select my own, reliable secondary sources.
	I can observe closely using simple equipment to help. I can observe changes over time.
	I can with guidance, begin to notice patterns and relationships.
	I can use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data.
	I can record simple data using at least two different methods.
	I can use my observations and ideas to suggest answers to questions. I can talk about what I found out and how I found it out and offer my own opinions.
	I can with help, record and communicate my findings in a range of ways and begin to use scientific language.

MATHS AND SCIENCE ACROSS THE CURRICULUM – Data Handling and Statistics

Science NC: gathering and recording data to help in answering questions: pictograms/bar charts, carroll diagrams

NATIONAL CURRICULUM OBJECTIVES

1. identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses
2. find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching

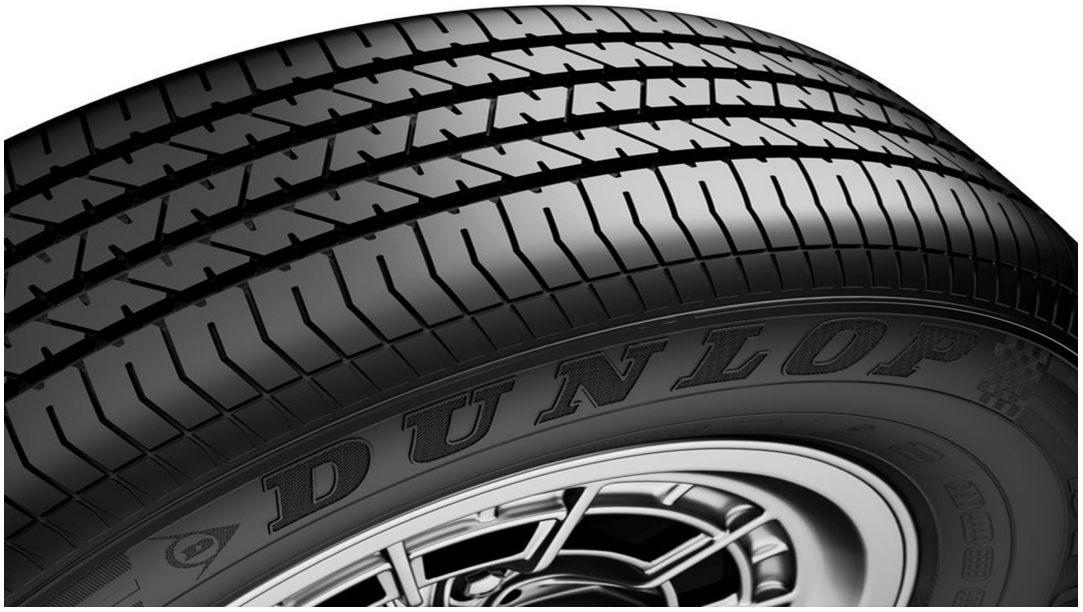
School Value	Topic relevance: How/when/where/why is it needed?
Resilience	John Boyd Dunlop, like countless other inventors, had to be resilient in trying new ways of making his inventions work. He knew that in order to get it right, he needed to make lots of mistakes first!
Respect	We have a great deal of respect for inventors like Dunlop. Even today, their imagination and finding new ways of thinking makes our lives much more interesting!
Responsibility	In order to create something new, we need to take responsibility and be pro-active – we should always believe in ourselves.
Pride	We should be proud of all of the achievements of inventors throughout history and be inspired by their resilience and belief.

KEY VOCABULARY

Names of materials – increased range from year 1. Properties of materials - as for year 1 plus opaque, transparent and translucent, reflective, non-reflective, flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing. Bend/bending, stretch/stretching

‘CORE’ KNOWLEDGE	‘ADDITIONAL’ KNOWLEDGE
1) I know all objects are made of one or more materials that are chosen specifically because they have suitable properties for the task. For example, a water bottle is made of plastic because it is transparent allowing you to see the drink inside and waterproof so that it holds the water. I also know why (most) clothes are opaque. PLAN: Ask questions and plan enquiry: WATERPROOF MATERIALS DO: Record: MATERIALS HUNT	a) I know why it is important that rope is flexible and why bricks are rigid. b) I know why some materials are reflective and some are not reflective. c) I know a material can be suitable for different purposes and an object can be made of different materials. REVIEW: Evaluate: BOAT MATERIALS
2) I know that John Boyd Dunlop was an inventor who used his imagination and resilience to create rubber devices.	a) I know that John Boyd Dunlop invented the pneumatic tyre in 1888. b) I know that Dunlop invented the pneumatic tyre for his son’s tricycle. c) I know that the tyre works because rubber is so bendy and stretchy and can change shape to fit around a wheel.
3) I know that to change the shapes of some solid objects I can squash, bend, twist, and stretch. I know that changing shape changes its properties. DO: Set up enquiry: ROCKET MICE	a) I know objects made of some materials can be changed in shape by bending, stretching, squashing and twisting. For example, clay can be shaped by squashing, stretching, rolling, pressing etc.

Possible ‘higher order’ questioning	
Remember	What is a ‘property’? What needs to happen to make sure an experiment is fair?
Understand	Why do some objects need to be opaque? Transparent? Can you give any examples?
Apply	Why is it that clay can be moulded? How is this useful?
Analyse	Why are bricks used for building houses? Why not straw? What properties do these have which mean they are suitable/not suitable?
Evaluate	What would happen if the foundations of our houses were bendy or stretchy rather than rigid?
Create	Can you plan an experiment to test…?



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DESIGN AND TECHNOLOGY

National Curriculum	Additional Skills	Knowledge	Key Vocabulary
Developing, planning and communicating ideas			
• *Design purposeful, functional, appealing products for themselves and other users based on design criteria* • *Generate, develop, model and communicate their ideas through talking, drawing, templates, mock-ups and, where appropriate, information and communication technology*	• Generate ideas by drawing on their own experiences. • Develop their ideas through discussion, observation, drawing and modelling. • Identify a purpose and target group for their product and a simple design criteria. • Make simple drawing s and label parts.	• Know that a product has to be designed for a reason/ purpose and audience • Know that the chosen design is always discussed and improved before the final design is chosen. • Know that products are usually made in factories, often by machinery but sometimes by hand (people). • Develop, model and communicate ideas through talking, mock-ups and drawing.	designed, design, designers, reason, purpose, product, audience, improved, final design, factories, machinery, manually
Working with tools, materials and components to make products			
• *Select from and use a range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing]* • *Select from and use a wide range of materials and components, including construction materials, textiles and ingredients, according to their characteristics*	• Begin to select tools and materials, using vocabulary to name and describe them. • Measure and cut with some accuracy. • Learn to use hand tools safely and appropriately. • Cut, shape and join fabric. • Assemble, join and combine materials to make a product. • Start to choose and use appropriate finishing techniques based on own ideas.	• Know that product designs can be made out of a range of materials. • Know that certain materials are used for a specific purpose and are chosen for those reasons. • Know that tracing (of simple lines, shapes and patterns using pencil) can be used to make a template. • Know how to create differently shaped templates (using tracing and scissors). • Know how to cut accurately along lines and around template shapes using scissors.	product, designs, materials, purpose, tracing, simple lines, shapes, patterns, template, create, cut, scissors, investigate, methods, joining, equipment
Evaluating processes and products			
• *Explore and evaluate a range of existing products* • *Evaluate their ideas and products against design criteria*	• Evaluate against their own design criteria, and, with more confidence, talk about what they like and dislike. • Begin to record. • Start to evaluate their products as they are developed, identifying strengths and possible changes they might make. • Look at a range of existing products - explain likes and dislikes about products and why.	• Know that it is important to evaluate a product to learn and make it better next time. • Know that we can learn by listening to others' ideas and opinions.	Evaluate, strength, improve, product
Structures			
• *Build structures, exploring how they can be made stronger, stiffer and more stable*	• I can deconstruct and assemble the net of basic 3D shapes. • I can use materials to make simple joints, glue, tape and paper clips, masking tape.	• I know how to investigate different methods for joining materials. • I know how to make a structure more stable.	Structure, stable, rigid, cut, fold, join, fix structure, wall, tower, framework, weak, strong, base, top, underneath, side, edge, surface, thinner, thicker, corner, point, straight, curved, metal, wood, plastic circle, triangle, square, rectangle, cuboid, cube, cylinder.
Project			
Bridge Making			