Subject: Science	Year Group: 2	Unit: Significant buildings around the World
First- hand experience:		

NC Objectives to be addressed:	Prior Learning required:
Objectives in this term (term 1-2): • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses ***Note: These materials objectives and those from year 1 will be addressed in term 5-6 of year 1 and term 1-2 of year 2***	**In Year 1 (term 5-6) children should:** • Distinguish between an object and the material from which it is made • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock • Describe the simple physical properties of everyday materials • Compare and group together a variety of everyday materials on the basis of their simple physical properties • Ask and answer simple scientific questions • Use simple equipment • Conduct a comparative test **Where next:** Rocks y3 States of matter y3

Biology	Chemistry	Physics		
Working scientifically				
Comparative and fair testing	**Pattern seeking**	**Observing over time**	**Secondary sources**	**Classifying and grouping**

Key Vocabulary:			
materials	The thing from which other items can be made	**stretchy**	A material that can be made longer or wider without breaking
wood	The usually hard material obtained from trees	**bendy**	A material that can be bent without breaking
plastic	The multi-use material made from oil	**waterproof**	A material that does not let water through
glass	A material made from sand that can be transparent	**Rough/smooth**	Rough - A material that has an uneven surface; smooth – the opposite
metal	A usually grey and shiny material that is usually strong	**absorbent**	A material that takes in water

water	A colourless odourless liquid that can be found in rivers, lakes and the sea	**elastic**	A material that when stretched returns to its original shape
rock	A mineral found in the earth that has not come from a living (organic) substance	**squash**	The act of squeezing an object so that it becomes flat, soft or out of shape
properties	An attribute about a material that is true	**twist**	When a material is caused to rotate around a still point, causing it to distort its shape
Hard/soft	Hard – not easily broken, bent or pierced (soft is the opposite)		
Shiny/dull	Shiny – reflects light (dull is the opposite		

Sequence of learning:

Lesson 1

All learning should be based on first hand experiences. Children should know examples of materials that match each definition based on the first hand experiences that can be offered. Eg. Cushions and teddies are soft

- Stretchy materials can be made longer or wider without breaking (y1 revision)
- Stiff materials are not easy to bend out of shape (y1 rev)
- Bendy materials are flexible and can be bent (y1 rev)
- Hard materials are not easily broken bent or cut (y1 rev)
- Soft materials are not firm to the touch (y1 rev)

- Fabric, paper, some metals, some plastics and some rocks CAN be easily squashed, bent and/or twisted (e.g. sock, sponge, plastic or metal coat hanger, balloon) and are therefore stretchy, bendy and/or soft.
- Some metals, brick, glass, wood, CANNOT easily be squashed bent and/or twisted (e.g. tile, metal knife, brick, glass), and are therefore stiff, and hard
- Some objects can be bent, twisted and/or stretched and retain a new shape.

Lesson 2:

- Durable materials last a long time. Examples include: wood, metal, rock, plastics, glass
- Materials that are often considered hard include: stone, concrete, metal, wood, some plastics
- Materials that are soft or flexible include: some plastics, paper, cardboard, fabrics

Lesson 3 and 4

Rocks, leather, clay, wood, metal, and cotton are all natural materials that come from plants, animals and rocks
Plastic, paper, glass, concrete, nylon and ceramics are man made materials that are made by people from natural materials after they have completed some sort of chemical process on them (usually in a factory, which is a big building used to change natural materials into something else, for example there is a big factory in Banbury used for making instant coffee from natural coffee beans near Tesco)

A material can be recycled if it can be melted down and remade into something useful
Oil can be dug up from deep underground, and is a black sticky material that can be made into petrol for cars and plastic
Plastic is made from oil (y1 revision) and can be recycled
Wood comes from trees (y1)
Rock is found underground, and has never been alive
Glass is made from sand, after heating it, and can be recycled
Metal is found inside rocks and can be recycled
Fabric is made from trees or plastic and cannot be recycled

Lesson 5:

- Thick paper is called cardboard, and can be recycled
- Card and paper is made out of trees
- A fair test happens when we change only one element of the investigation and keep all other things that could be changed (varied) the same, and we then see what impact that has on the results
- We perform fair tests so we can see the impact of just one thing on another
- We record data in a Science experiment in a data table by putting the numbers into the appropriate boxes
- We make a prediction about what might happen in an experiment to make us think about what might happen in an experiment and why, so that we can test if our ideas are correct

Lesson 6:

- Materials/objects can be shaped/changed to make objects stronger
- Revision of vocabulary and ideas from session one

Statements like these for each of the following materials depending on the first hand experiences the school is able to offer

- Children will be able to use their knowledge about the properties of materials to make suggestions as to what these materials might be used for, for example, brick is used for building because it is hard, strong and durable

- Wood is perfect for tables as it is strong and hard
- Metal is perfect for keys as it lasts a long time and can be melted and shaped
- Rock is perfect for the Pyramids as it lasts a long time
- Glass is perfect for windows as it is transparent (you can see through it, y1 revision, opaque materials cannot be seen through)
- Plastic is perfect for drinks as it is waterproof (will not soak up liquid, y1 rev) and durable
- Paper is perfect for books as it can be printed on easily
- Brick is perfect for houses as it is very strong
- Fabric is perfect for clothes as it is soft next to skin (Soft means not firm to the touch, y1)

It would be useful to explore opposing statements too like

- Fabric would be a bad material for spoons because it is so soft and flexible

Lesson 7 - 12: (the next few lessons should be spent applying the knowledge to new situations so as to further and deepen understanding. Suggestions are made below)

Children should be continually revising key knowledge taught in previous sessions, whilst always being given the relevant first-hand experiences the school is able to offer

Everyday materials have simple physical properties (wet, fluid, dry, powdery, soft).

- Children should be able to use their senses to find out information about a material, and so therefore group the material into certain categories (sort them into whether they are hard, stretchy, soft, stiff, shiny, rough, bendy, smooth, absorbent, transparent or opaque (y1 objectives) might tie in nicely to English work.)
- Materials can change their property when combined with other materials
- Children will be able to determine what properties new materials have, and what they might be made out of, by manipulating them themselves
- A material such as dough has the following properties: bendy, stretchable, twistable (y1 objectives revision)
- A material such as dough will retain the shape in which it is placed

(The below knowledge is based on the Sweets lesson below, which may link well into the English work)

- Children will make observations about various sweets/chocolates(or other alternative materials) using their senses, and be able to sort them into whether they are hard, stretchy, soft, stiff, shiny, rough, bendy, smooth, absorbent, transparent or opaque (y1 objectives)
- Solid materials do not flow, and keep their shape/structure when not touched (y3 obj)
- Liquid materials flow, and do not keep their shape/structure when not touch, they flow
- A solid can be melted into a liquid if it is heated

- Liquids can be mixed together to make new solutions
- Different solids need to be melted for a longer or shorter amount of time
- To make a comparative test, you only change one variable, and keep all others the same, to see the impact of that one variable on the results

A fair test happens when we change only one element of the investigation and keep all other things that could be changed (varied) the same.

Resources and teacher subject knowledge:

Useful websites and webpages:
https://www.youtube.com/watch?v=B_Df6X6qM3c (Squashing, bending and twisting explained and a putty making experiment)
https://www.tes.com/teaching-resource/bending-squashing-twisting-and-stretching-materials-11869758 (Good free PPT on twisting, squashing and bending)
https://www.bbc.co.uk/bitesize/articles/z4yw2fr (A good introductory video and join-in demo with a sock)
https://www.teachitprimary.co.uk/custom_content/free/22474_sample.pdf
https://www.pinterest.co.uk/pin/95771929556513542/
https://www.twinkl.co.uk/resource/t-t-2547295-investigating-bridges-activity-sheet
https://www.twinkl.co.uk/resource/build-a-bridge-activity-sheet-t-tp-6851
https://www.twinkl.co.uk/resource/t-sc-159-john-boyd-dunlop-information-powerpoint (History link)
https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=2d (materials for KS1 – NOT FREE)
https://www.twinkl.co.uk/resource/tp-sc-60-planit-science-y2-uses-of-everyday-materials-unit-pack (Twinkl Unit Pack)

Possible lesson ideas

Lesson 1
What are *materials* and what are *properties*?
Recap prior learning from term 5 and 6 of year 1. – Explore what the children can recall and the vocabulary they have to be able to describe.
Compare a range of everyday objects and examine them to establish their basic properties.
Use everyday objects – a glass, a **roof tile, a metal knife, a sock, a washing up sponge, a plastic coat hanger, a balloon, a metal coat hanger, a house brick** – Examine these objects and explore them on the basis of whether they can be squashed, bent or twisted. Children can sort pictures of the objects into 'CAN be squashed, bent or twisted' and 'CAN'T be squashed, bent or twisted.
Explore further to establish which materials hold their shape and which do not. Allow children to voice other properties such as waterproof vs absorbent or hard vs soft and regroup the materials on that basis. Explore similarities and differences between the yellow plastic hanger and the metal wire hanger.
Ensure the lesson is vocabulary-rich so that the children are better equipped to be able to describe materials and objects through this term.

Lesson 2

What if a bridge was made out of rubber?
Explore the range of shapes and structures to be found within bridges and towers (photos) and the different purposes of those structures. Look at ancient and modern structures and identify differences in the materials used. Compare the Great Wall of China and a medieval tower in the UK with equivalently large modern buildings such as a dam and the shard in London. Identify the materials used (**stone, concrete, metal, glass, rubber etc**) and the properties of those that made them a good choice for specific jobs. Look at the curved shape of the dam and the structural shapes within the Shard as a precursor to

Lesson 3 and 4

How tall is a tower?
Recap learning about strong shapes from lesson 2
Task: Build a lookout tower for a castle guard.
Children to work in pairs/small groups with fixed resources (art straws, masking tape for example) to construct a free-standing tower with a platform that a toy knight or princess can stand on.
Session 1: Set the challenge, show the resources, explain the time constraint and allow time for planning. Children handle the materials, think, discuss and draw their design.
Session 2: Construct, test, evaluate and improve.

Lesson 5 and 6
How strong is card?
Using a large rolodex contact card, plan how to test 4 different simple bridges that only use 1 contact card. Set the parameters – the bridge must span a fixed gap and cannot be attached to the table top. The card can be folded and/or cut and/or glued only. Explore how the card could be folded or cut and/or glued to create different designs. Agree on the 4 different designs that will be tested and make predictions of success

Test the 4 different simple bridges across a small gap (approx. 10-15 cm). Children test using small weights applied steadily until the bridge falls into the gap. Weights could be coins but children should recognise that each weight applied should be exactly the same so that the test is fair.
Fixed variables: distance to be spanned, material and amount of material used each time, weights to be used
Variable: the bridge design
Reach conclusions about the best design (this is likely to be one that is folded into the profile of a girder and this can be compared to photos of girders and RSJs used in construction.
Extension: Allow children to come up with and test their own design having made observations of the test – Can a combination of folding and laminating be even better?

Lessons 7 – 12: work that should tie in nicely with English work

This lesson provides an early 'taste' of changes of state which the children will address in detail at the end of year 3
Provide children with samples of the ingredients for play doh (or just show) – flour, salt. cream of tartar, lukewarm water, vegetable oil. Talk about the properties of each substance and allow time for the children to examine closely with simple equipment such as hand magnifiers. They should talk about the properties of the substances and any specifics about the particles etc. Do any of the materials bend or stretch? Do they flow? Are they wet or dry? Are they solid objects or not? Label the materials with their descriptive vocabulary. What could each of these materials be used for based on their properties?

This probably needs 2 lessons because play doh making will have to happen in small groups or half a class at a time with the TA.
PART 1 What is stretchy? Think about materials and/or objects that are stretch, bendy or twisty – show a selection of materials and discuss what machines or tools require materials that have these properties.
Show a coat hanger or piece of wire – Establish that it is made of metal
Show a large magnet and establish that it too is made of metal
ASK: Is metal hard or soft? Bendy or rigid? Twisty or straight?
This should generate some discussion about what might render a material able to bend, twist or stretch
You could do the same with a log of wood and a thin wooden skewer. The log is rigid but the skewer can be bent (up to a point). It could be made more bendy if soaked in water. Why would that be?
Children can write up this discussion and observations in some way

PART 2: Re-show the substances from lesson 7. Children will combine these materials (which are not bendy, twisty or stretchy) to create play doh
Follow an easily internet-searched play-doh recipe (link to instructions in literacy) so the children can experience change of state and manipulate a substance that is bendy, twisty or stretchy.

Use this session to explore and play with the doh that the children made. Challenges can be set that bring in maths:
e.g

- 1 minute to roll the longest 'worm'
- Make a worm exactly 20cm long. Divide it in half. Divide it into quarters. How long are the pieces? etc etc
- What is the tallest tower you can make with your play doh? What happens? Why is play doh not suitable for tall tower building?
- Can you bridge a gap with your playdoh?
- A force is a push or a pull. Roll your doh into a ball. Now roll a dice. If you roll an odd number, you can pinch and pull the playdoh. If you roll an even number you can push the playdoh. In this way and in a fixed number of dice rolls, can you make a model of a duck?

Note: The following lesson can be positioned anywhere within term 1 or 2 depending on the class teacher's use of the George's Marvellous Medicine Text. It uses the idea of George writing to the children to ask them to find out which of a selection of sweets will melt fastest into the medicine on the stove so that it tatstes nice and grandma doesn't suspect anything

Introduce a letter from George asking for our help to make the medicine taste nice. Grandma's favourite sweets are: marshmallow, white chocolate, dark chocolate, dairy toffee and jelly baby. Children will plan how to heat these sweets in a fair way and make observations of the speed and extent to which they melt. They then write a letter back to George to tell him what they have discovered