The Valley Primary School
Science Plan
Summer 2 Class 2
The Big Build!

Unit Overview: In this topic, children learn about building towers and bridges, starting with constructing tall towers, then exploring bridges, next they look at animals as builders and finally engage in researching famous engineers and architects and the structures they built. Children will already know many things about the materials they will encounter, how different materials stretch and their uses. They will use and develop working scientifically skills and understanding though comparative and fair tests, measuring, repeat readings and drawing and reading bar and line graphs.
STEAM (Science, Technology, Engineering, Arts, Maths) **Invite into class** Civil engineer, structural engineer, builder or architect. STEM ambassadors from the construction industry. Representative from the Local Authority Highways Primary Engineers https://www.primaryengineer. com/ **Visit** A local construction site. Local bridges to take photographs and study structures. A local quarry that takes visits from primary pupils.

Learning Sequence & Objectives	Working scientifically skills	Resources
To use results from a fair test to draw conclusions using data. **Key Vocabulary:** **bridge, strengthen, test, fair, records, results, improve, evaluate.**	Having made their first beam bridge and found out how much load it takes (which might be very limited), the children's challenge is to use the information on Slide 7 to strengthen their bridge. They test the different ways to improve the bridge and record their results. Ask children to discuss what they would want to improve next time they made this kind of bridge. How could they make it take more weight? How could they make the bridge longer?	A4 scrap paper or card Masses Scissors PowerPoint Slide 7
To carry out a fair test and use graph results to answer the question: Which shape is the strongest for bridge pillars? **Key Vocabulary: Bridge, fair test, investigate, experiment, record, table, graph, data, results.**	Show children Slide 8 which shows 3D shapes, e.g. triangular prism, cylinder, cube and a cuboid. Ask children to predict which would be the strongest and hold the greatest load (weight). Then get the children to vote for one of the 3D shapes, and ask one group to keep a tally chart on the board to record the votes. Then, working in pairs, children use this to create a simple bar graph on their individual whiteboards. At this stage, children are not expected to be able to make their own 3D shapes, however some children may be able to construct their own, otherwise provide each group with a set of ready-made card shapes to test. Tell each group that they are going to work together to plan how to carry out a fair test to find out which shape is the strongest pillar for a bridge. Emphasise that they will only get one chance because each group has only one set of shapes. Get children to share their plans, so that each plan is checked, this could be through peer assessment. Then explain that each person in the group is going to have a job when they carry out their test: Measurer – person who places weights on the pillars. Recorder – person who records the results using a table. Fair tester – person who makes sure that the test is carried out in a fair way. Resources manager – person who gets and makes sure the resources are used properly. Once children have negotiated roles, they carry out their fair test. Once completed, they should transfer the data from their table to a bar graph and use their data (evidence) to answer the original question. Was their prediction at the beginning of the lesson correct?	3D shape set for each group Masses PowerPoint Slide 8 Mini whiteboards and markers
To use observations from comparative tests to say why triangles are used in the bridge.	Show children Slide 9 of a Truss bridge. Give them about two minutes and ask them to count how many triangles they can see. Ask them to discuss why they think this bridge was built using so many triangles. Show children Slide 10 and ask them to use their spaghetti and mini marshmallows to make the different shapes to carry out comparative tests to find out which one keeps its shape best. They should use the marshmallows to attach the pieces of spaghetti. Children should observe that the triangle is the best shape.	Spaghetti Mini marshmallows PowerPoint Slides 9-11

Key Vocabulary: Measurer, comparer, recorder, fair tester.	Now show children Slide 11 and ask them to make the cube using their spaghetti and marshmallows. They should test it to see how strong it is and then make another using triangles to find out whether they can be used to make the shape stronger. Show children Slide 9 again and ask them to discuss what they think would happen if the engineer who built the bridge did not use triangles. Now ask them why they think so many triangles are used in the construction of the bridge. Challenge them to use their observations from their comparative tests in their answer. Now challenge children to use their knowledge of triangles as a strong structure to make a beam bridge which is stronger than the beam bridge they made in the Get started activity at the start of unit 4.1.	
To use results from a fair test to draw conclusions using data collected. **Key Vocabulary: Measurements, observations, conclusions, structures, strongest, tallest, design, results, graph, table, test, compare.**	Health and safety – if using metal masses, make sure that this activity is carried out on the floor and children keep fingers and feet out of the way if the mass falls. In this activity children are going to create the strongest tallest tower using only 1 sheet of A4 paper, by folding it or making shapes. Have children to reflect on their experience so far. What do they know about structures that they could use here? Make sure that children they have lots of scrap A4 paper to try out different designs and test them. Do stress that they are not allowed any scissors, sticky tape or glue and that they should make their towers by folding the paper. They should carry out a fair test to find the strongest and tallest tower. Focus their attention on: Making systematic and careful measurements using standard units. Recording their data using a table and converting the data into a bar graph. Using their results to draw simple conclusions using their scientific evidence (data). Suggest improvements to their test and raise further questions. When children have completed this activity, they could share and compare what they have found out about the kind of structures that made the tallest, strongest tower.	A4 scrap paper Masses
To apply understanding of structures and learn as they build. **Key Vocabulary:** **Knowledge, understanding, material, strong, weak, construct, tower, cause and effect, accurate, measure, height, improvements, experiment, fair test.**	Show children the dried spaghetti, mini marshmallows and a creme egg or a toy figure and a tower of building blocks about 60 cm high. Snap some spaghetti, ask if it is a strong material. Challenge children to build a tower from a weak material to hold the egg as high as or higher than the building blocks. Show children Slide 13. Then, working in pairs or groups of three or four, get them to make the structure using spaghetti and marshmallows. Each group should have the same materials and time to construct their tower. Make sure that they understand that there are no additional resources and that they should use their knowledge and experience of strong shapes to build their bridge. You could remind them of what they learned in the previous 'Terrific triangles' activity. Explain that you have set up QR codes around the classroom with pictures of the Eiffel and Blackpool towers. Explain that there are clues in the way these have been constructed that could help them build their own towers. For example, they are made using a wide base at the bottom and triangles to make the tower stronger. Prior to children beginning this task, explain that they must work carefully and learn as they go along so they will: Explore what does and does not work. Observe – cause and effect, what happens and why? Test their final structure to make sure it holds an egg and work out how to accurately measure the height. Work as a team listening to each other's ideas. Reflect and evaluate what they are doing, learn from it so that they can change and improve their tower. As children work, they should take photographs of what they are	50g of dried spaghetti (approx. 50–60 strands) per group Mini marshmallows Creme egg or toy figure Tower made from building blocks 60 cm high Measuring equipment PowerPoint Slide 13 QR codes with pictures of the Eiffel and Blackpool towers Camera

	doing so they can create a six-slide PowerPoint of their experiment explaining how they built it, what did and did not succeed and why, suggest improvements and provide new questions to answer. The winning tower will be the tallest and able to hold a creme egg or toy figure of a set size and weight and will be tested alongside all the other towers.	
To ask and answer own questions and present key information as a poster to show understanding of why their animal is a builder. **Key Vocabulary: Environment, habitats, materials, animals, build, poster, headings/subheadings, mammal, bird, insect, construct, research, sizes, shapes.**	Challenge children to find out how common animals in the local environment build homes, such as birds and bees. Extend the environment to include creatures such as badgers, a caddis fly larvae, beavers and termites. Show children Slide 14 which shows example of animal builders. Divide the class into groups and give each group a different animal to research. Get them to ask questions first so that they have thought about and planned what information they need. Children could use question stem cards and ask, for example: LET'S THINK LIKE SCIENTISTS Use these questions to develop research skills and speaking and listening: Think about where you live and the school grounds, which animals have built their home there? Why do animals build homes? Which animals build their home and carry it around with them? What kind of animal is it, e.g. mammal, bird, insect? Where is its habitat? What does the home look like? Why do they build it? What sorts of materials are used to build the home? How is it constructed? What size and shape structures do they build? Provide children with a wide range of information sources such as video clips, leaflets, books and QR code links to websites, pictures, etc. When they have collected their information, their task is to create a poster about their animal and its 'Big build'. Before starting they should plan their poster: What do they think children in the class need to know and will find interesting? What pictures / illustrations will they use? What key information to include? Why is the animal impressive as a builder? Explain to children that they need to use their literacy skills, e.g.: Proofread for spelling and punctuation errors. Compose and rehearse sentences orally before writing. Reread to check the meaning is clear. Organise paragraphs around a theme, e.g. materials for building. Use organisation devices, e.g. headings and subheadings. When children have completed their posters, give them time to engage in peer assessment for both science and literacy. Each group visits the other posters and leaves a sticky note with comments, e.g. Positives, Could Change, Interesting. Then display the posters in a public area in the school where other children, parents and visitors can learn about animal 'Big builds'.	'How beavers build a lodge' video clip (see Useful Websites list) Animal home information Poster-size paper PowerPoint Slide 14 Materials and equipment for making posters Sticky notes and pens
To ask and answer a range of questions and write up answers. **Key Vocabulary: Enquiry, scientific, collect, information, construct, collect, big build, strength,**	Show children Slides 15–17 which have photographs of famous buildings and bridges, and different styles of bridges. Explain to children that this is a 'Big build' challenge. They are going to work in groups and use what they know about building bridges and towers and using different shapes to build a bridge to span 50 cm between two classroom chairs and hold the most weight or to build a tower that is as tall as they are and can hold 1 kg. Give them time in their groups to discuss which structure they are going to make. Then, when they have chosen, tell them that it has to be made from newspaper and that they can only have 50 cm of sticky tape. Divide this activity into five sections: Research – Children use previous and additional research to help them decide what their structure will look like. Design – Children draw their design and annotate it to	'Amazing four-year time lapse of Shanghai Tower construction' video (see Useful Websites list) PowerPoint Slides 15–17

structure, evaluate, research, strongest, design, make, test, strengths, weaknesses.	show features, e.g. arches, use of triangles for strength. Make – In this section, children can make, test sections and redesign. Test – Carry out a fair test with the rest of the class to find out which structure is the tallest and can carry 1 kg, or the strongest bridge. Record the results as a whole class which children use to draw a graph and draw conclusions. Evaluate – Children evaluate each other's bridges, strengths and weaknesses. As children work, they could take photographs of their big build to communicate their work by creating, e.g. a poster, big book, Microsoft Photostory, PowerPoint, text, WordArt, Video. In this work, children should show an awareness of an audience when reporting their tests and results. Ask the children to discuss the question: 'If you could start from the beginning again, what would you keep the same (what worked best for you) and what would you change and why?' When they have completed their work, their 'big build' structures could be displayed somewhere so that the rest of the school can look at and read their work	Newspaper Sticky tape Masses Scissors

Activity Resources:

6.1: Bridges 6.2: Building towers 6.3: Animal big builds 6.4: Big builds project ACTIVITY RESOURCES: 6.1 Animal Homes investigation

ONLINE RESOURCES:

PowerPoint presentation: The big build Interactive activity: The big build Pupil video: The big build Word mat: The big build Editable Planning: The big build Topic Test: The big build.

Cross-Curricular Activities:

English:

Writing instructions for building bridges and towers. Following instructions. Using non-fiction to research information on bridges, buildings and record breakers. Using non-fiction to research bridge disasters, e.g. Tay Bridge 1879, Tacoma Bridge disaster 1940. Proofread for spelling and punctuation errors. Compose and rehearse sentences orally before writing. Organise paragraphs around a theme, e.g. materials for building. Use organisation devices, e.g. headings and subheadings. Non-chronological writing – science activities. Newspaper articles. Research careers, e.g. structural engineer. Persuasive arguments, write and deliver a speech for a for and against building a new bridge. Create fact cards on bridges and buildings.

Numeracy and mathematics

Measuring length. Repeat readings – calculating averages. Using tables. Drawing bar graphs. Decimals, e.g. length and weight. Calculating difference. Making 3D shape nets.

Computing / ICT

Image collage – bridges, construction, buildings. Creating an infographic on famous buildings and bridges – using statistics. Producing videos of testing, using slow motion. Photographs of testing, local structures. Safely using the Internet for research.

Design and technology

Classify bridge types. Make and test different shapes and structure. Design, make, test and evaluate a bridge for a specific purpose, e.g. river, gorge or railway crossing.

Geography

Classify types of bridges from around the world and reasons for construction. Locate using maps, Google maps or globe, famous buildings and bridges around the world. Using ordnance survey maps to find local bridges. What do they span, Why were they built?

History

History of bridges, first to latest. Timeline of bridges and tallest buildings with key information. Research famous engineers, e.g. Brunel, Gustav Eiffel. Research famous architects / builders, e.g. Antonio Gaudi, Sir Christopher Wren, Michelangelo (the dome of St. Peter's Basilica), Renzo Piano (the Shard, London).

Key Vocabulary

Vocabulary:

- structure: something built from different parts

tower: a structure that is much taller than it is wide

Christian Distinctiveness

Creation

Joseph – Carpentry

Noah's Ark