Year 5/6

Autumn Term: Second Half

Design and Technology

Programme of study:

Use research and develop design criteria to inform the design of innovt purpose, aimed at particular individuals or groups.

Generate, develop, model and communicate their ideas through discuss diagrams, prototypes, pattern pieces and computer-aided design.

Select from and use a wider range of tools and equipment to perform p finishing), accurately.

Select from and use a wider range of materials and components, inclu according to their functional properties and aesthetic qualities.

Investigate and analyse a range of existing products.

Evaluate their ideas and products against their own design criteria an

Understand how key events and individuals in design and technology

Apply their understanding of how to strengthen, stiffen and reinforce

Understand and use mechanical systems in their products (for exampl

Critique, evaluate and test their ideas and products and the work of ot

This is our very first Design and Technology topic!

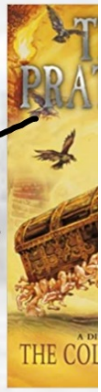
Tuesday 2nd November

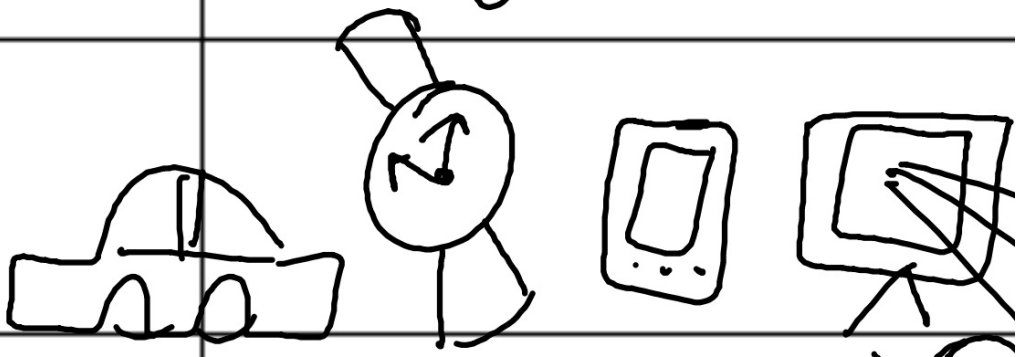
What I currently know

What I know now

Ca

It is a fantasy narrative set in a parallel universe.



Purpose	Job of object!
Function	
Innovation	New idea! 
Authentic	Not a copy! ✓ copy → ✗

Quirky Items!

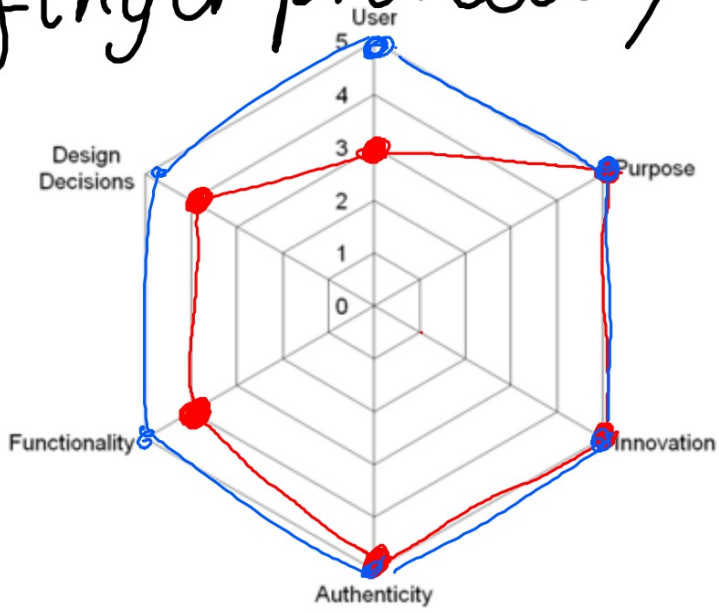
Have a look at the items on your tables!

- What do you think the item is?
- What do you think it is used for?
- Do you think it is *fit for purpose*?

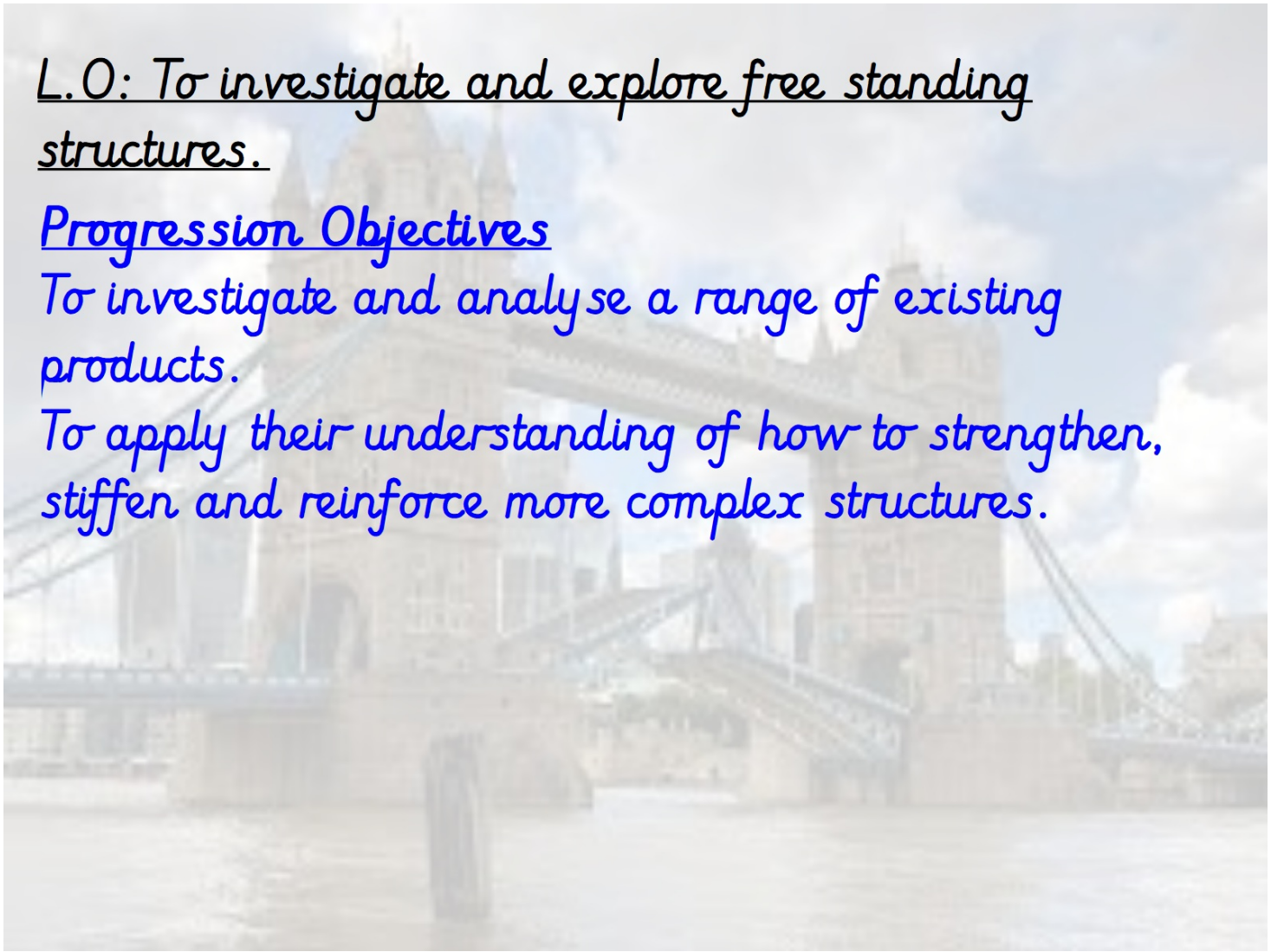
valuate the products using the star diagram...

Star diagram

baby snot sucker / banan
finger protector / eye prot




Memorable
Experience!



L.O: To investigate and explore free standing structures.

Progression Objectives

To investigate and analyse a range of existing products.

To apply their understanding of how to strengthen, stiffen and reinforce more complex structures.

Everyday Structures

Definition: Freestanding is defined as standing alone or on its own foundation, free of support or attachment.

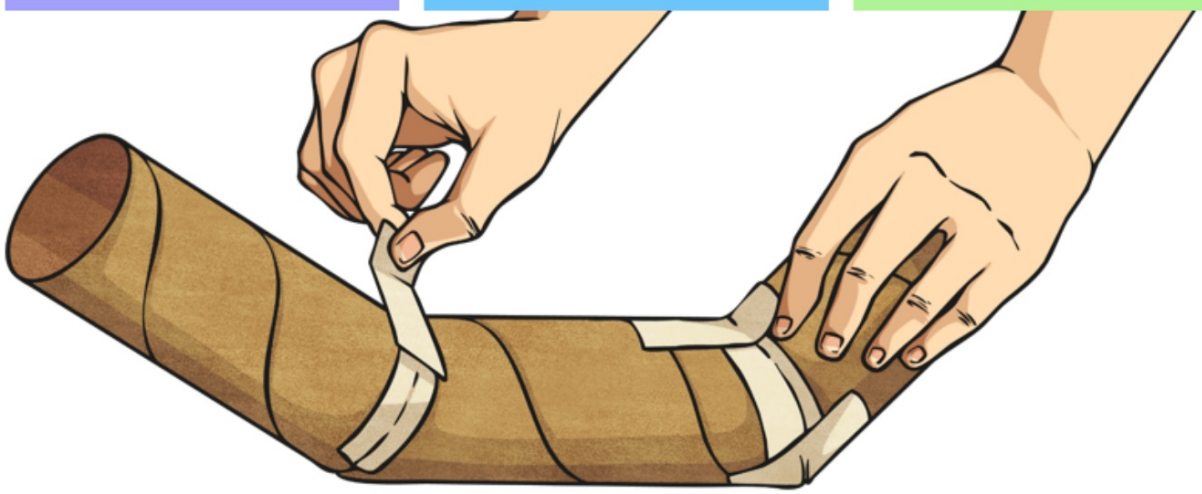
Why is it important that freestanding items are strong and stable?
How are different freestanding products designed to be strong and stable?

Cardboard Tube Challenge

Your challenge is to build the tallest free standing tower made out of cardboard tubes!

You can use other joining materials.

Be creative! Be innovative! Be amazed!

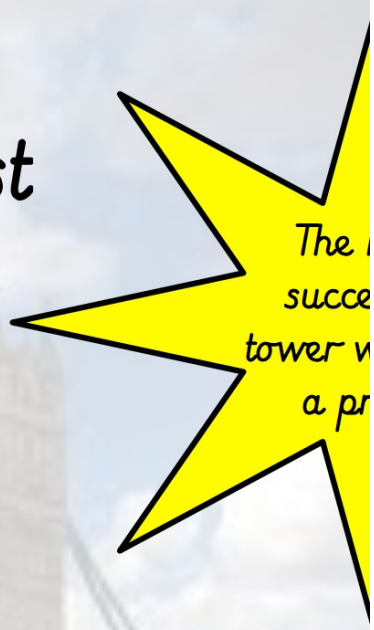


OH NO!

The weather forecast has just turned really, really windy!

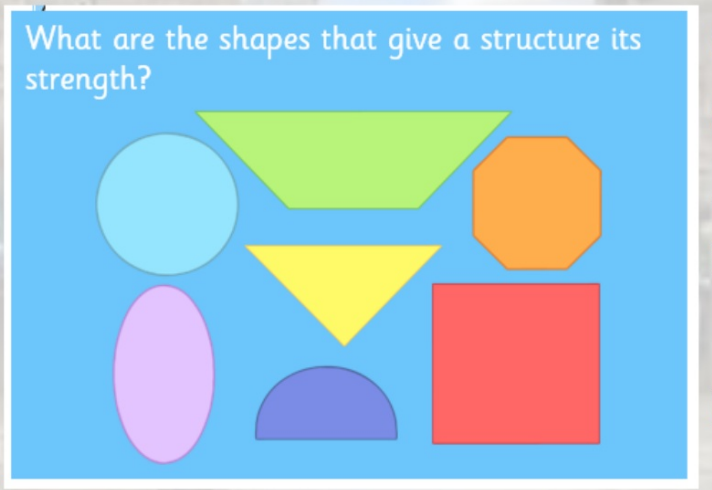
Can your tower withstand a gale?

Let's find out!



What can you do to your tower to strengthen it?

What shapes give a structure its strength?



Go back to your tower and strengthen it, so that it can withstand gale-force winds!


Can your tower withstand a gale now?
Let's find out!
What are the strengths
tower?
What are the weaknesse
How can you further im
the strength and stabilit
your structure?
Reveal for challenge 2...


Can your tower safely hold an egg for 1 minute?
Let's find out!

L.O: To use a wider range of tools and equipment to perform practical tasks accurately.

Progression Objectives

Select from and use a wider range of tools and equipment to perform practical tasks (for example, cutting, shaping, joining and finishing), accurately.

The Journey of the Marble

What makes a good marble run?

A good marble run allows the marble to travel slowly from the top to the bottom of the run. When making a marble run, designers try to make the journey as long as possible.

The Journey of the Marble

This marble run includes a 'bridge' between 2 towers.

Where do you think the marble starts?

Where will it end up?

In which part of the run does the marble travel the quickest?

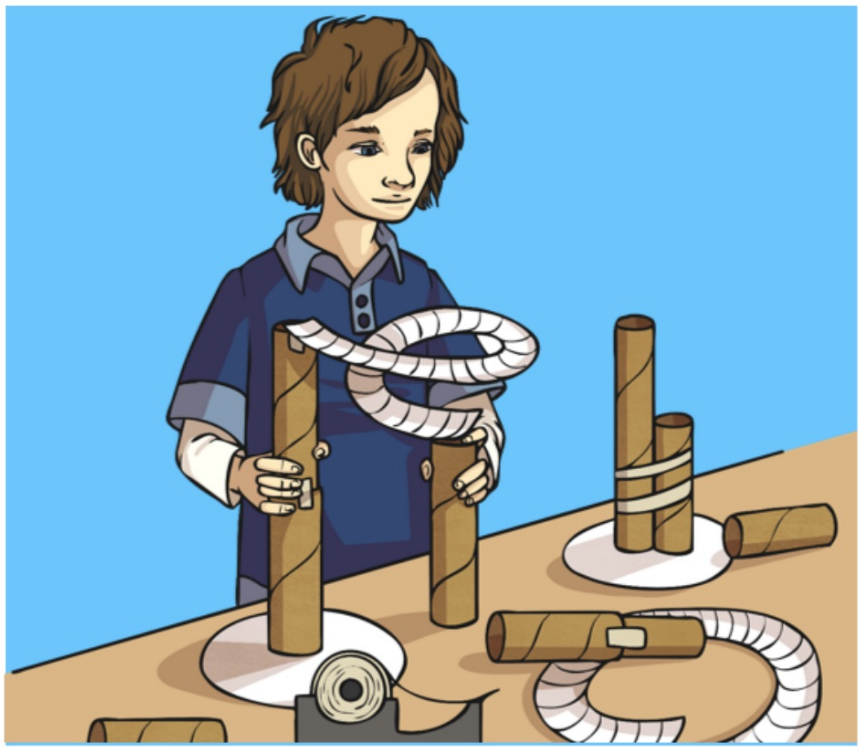
Where in the run is it travelling slowest?

The Journey of the Marble

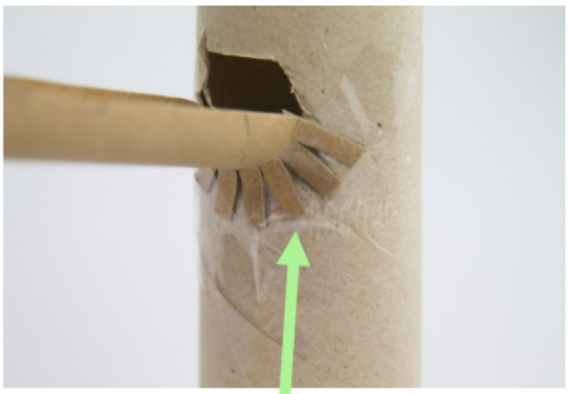
Your task today: design your own marble run!

It needs to include:

- 2 vertical towers
- 1 bridge that joins the 2 towers
- Joins that are strong, tidy and allow the marble to run

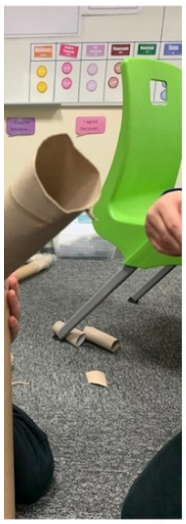


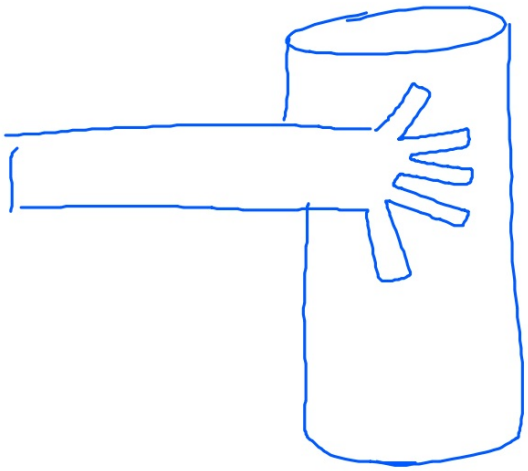
Joining

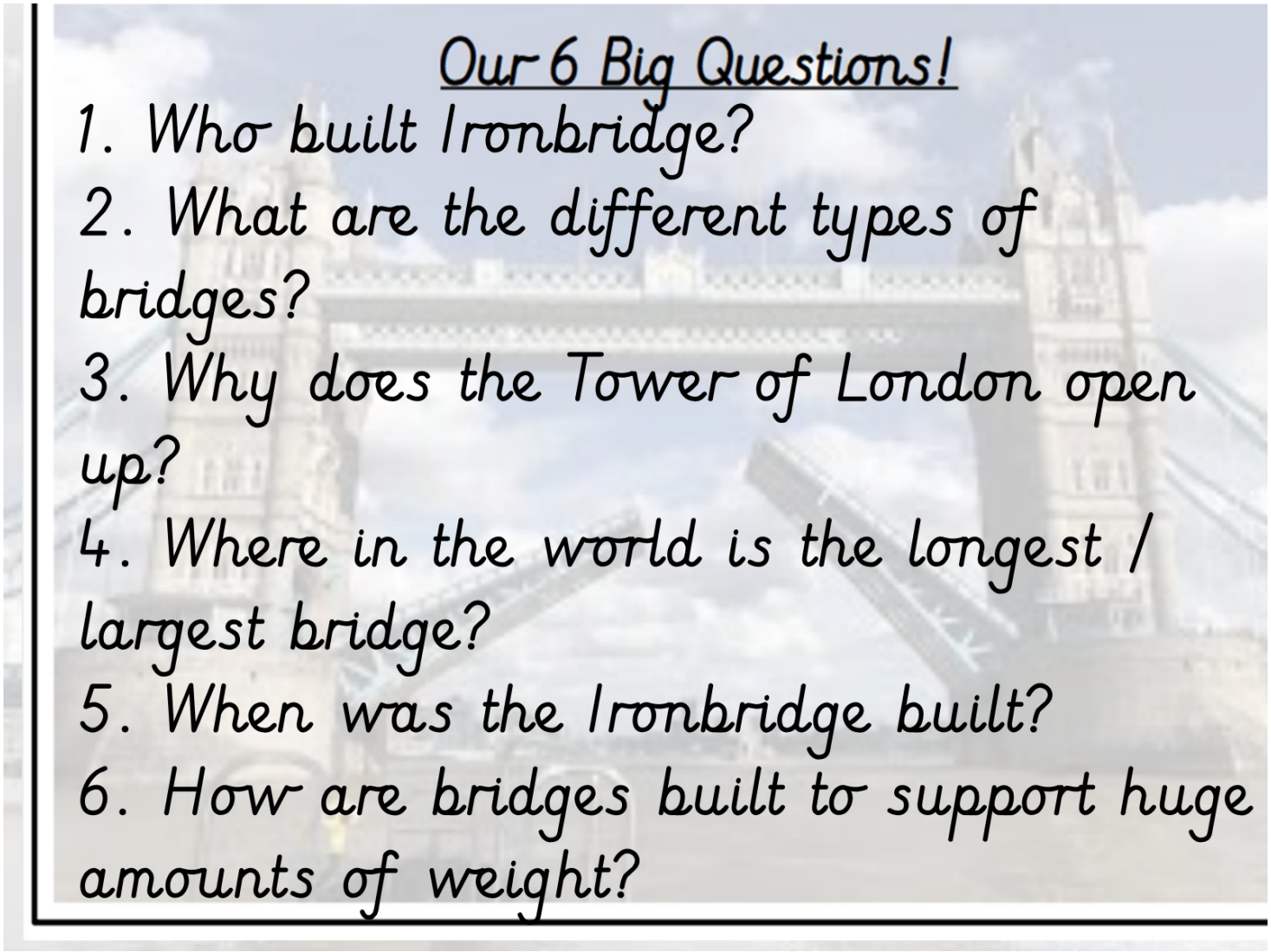


The ends of the cardboard tube are shaped and small cuts are made to help the tube to fan out and accurately fit the other tube.

A small, thin half tub catches the marble and directs it down the bridge.



Draw a picture of the most effective joining method you used.	Draw a picture of the least effective joinin
	
Describe the method (think about strength, functionality and aesthetics). strength = 9/10 functionality = 10/10 aesthetics = neat, smooth, strong, sturdy, secure	Describe the method (think about strengt strength = functionality = aesthetic = u m


Our 6 Big Questions!
1. Who built Ironbridge?
2. What are the different types of bridges?
3. Why does the Tower of London open up?
4. Where in the world is the longest / largest bridge?
5. When was the Ironbridge built?
6. How are bridges built to support huge amounts of weight?

Safety in Design and Te

Always wear safety glasses.

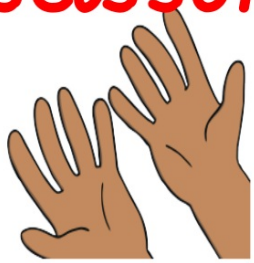
Stand back when someone is ~~sawing or hammering~~ cutting.

Listen to your adult.

Always look at what you are doing.

Always walk in the ~~Woodwork Area~~ classroom

Keep your fingers away from ~~saws and hammers~~.



Craft knife

[redacted]

- In[redacted]
- Ch[redacted]
- Close the blade when not in use
- Cut away from your body
- W[redacted]nt gloves
- Secure object you are cutting

scissors and craft k

Return to prior learning double page spread and add what you have learnt today!

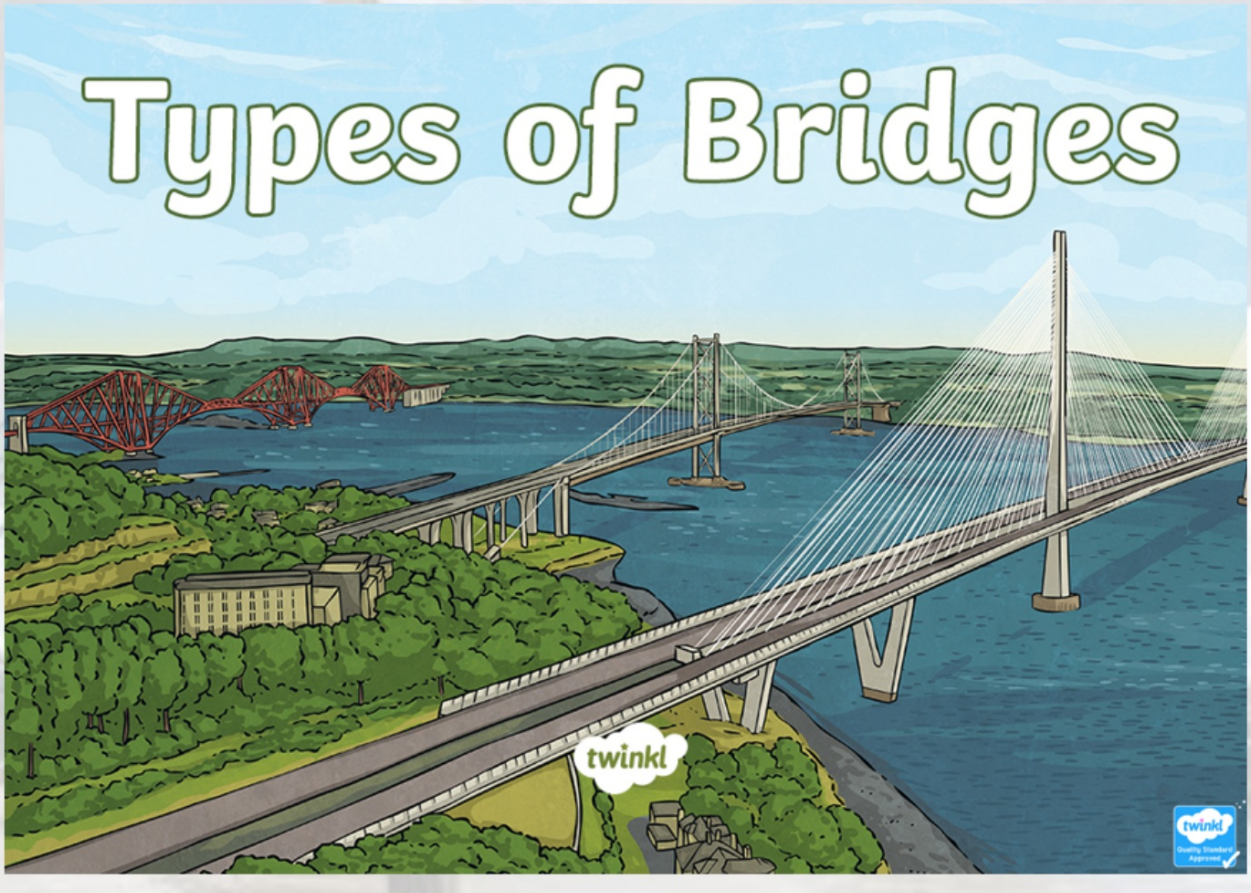
Lesson 1

IDEAS L.O: To investigate and explore famous bridges from around the world.

PROGRESSION OBJECTIVES

Create a detailed comparative report about two or more products or inventions. Products and inventions can be compared using a range of criteria, such as the impact on society, ease of use, appearance and value for money.

Go through powerpoint...



Here are some famous bridges from around the world, can you identify what type of bridge each one is?

- What is the purpose of each bridge?
- What materials have been used?
- Which materials are best for each purpose?
- What is the age of the bridge?
- Has the functionality / purpose of the bridge changed through time?

technical features

Annotate ideas on big paper in teams

Model comparative report..

Name of bridge:

Location of bridge:

Type of bridge:

Age of bridge:

Purpose of bridge (then and now):

Materials used:

Labelled diagram:

technical features of the bridge

Changes you would make to the design and why:

Choose 2 bridges and create a comparative report, using these criteria:

Name of bridge:

Location of bridge:

Type of bridge:

Age of bridge:

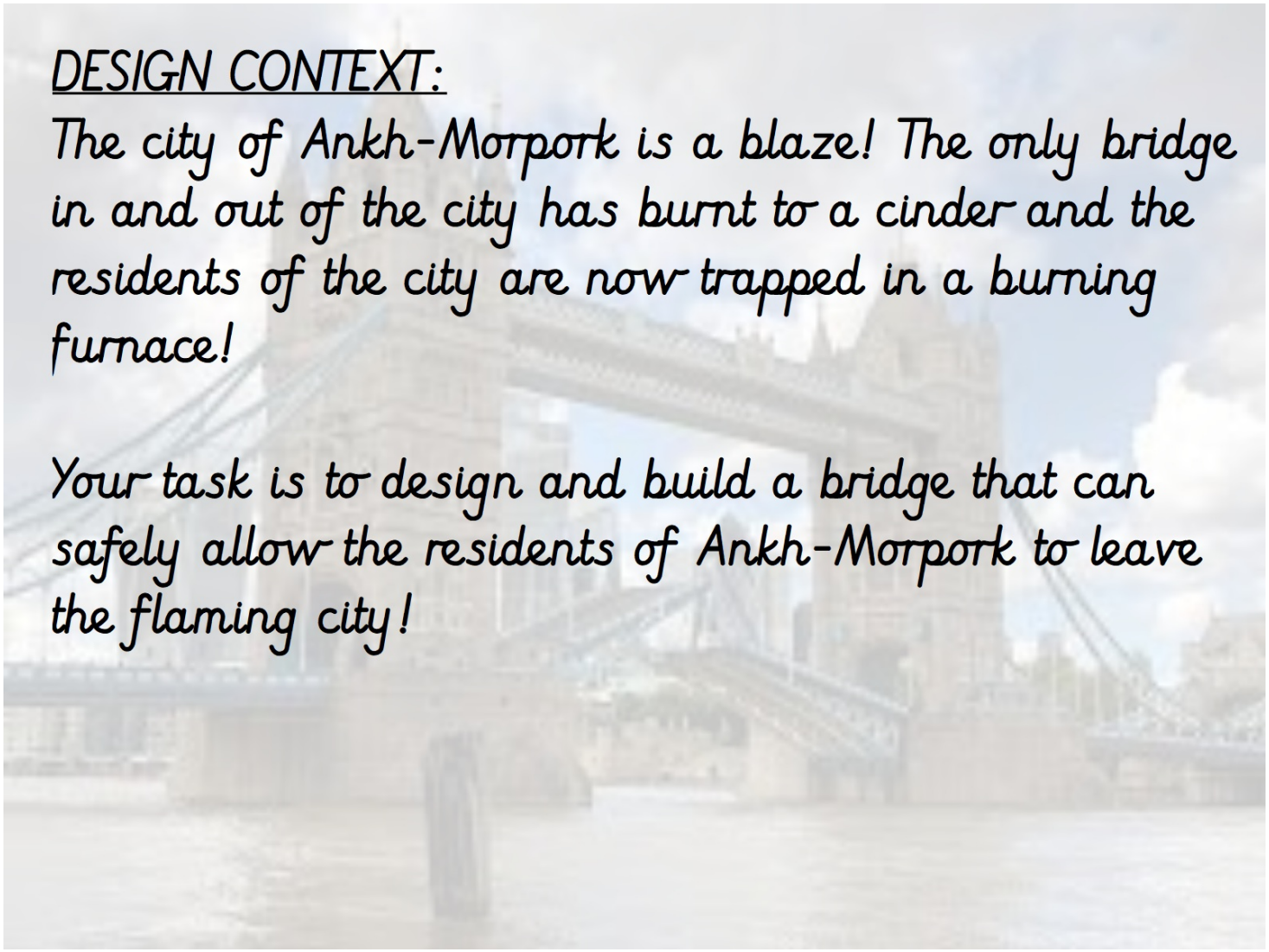
Purpose of bridge (then and now):

Materials used:

Labelled diagram:

technical features of the bridge

Changes you would make to the design and why:



DESIGN CONTEXT:

The city of Ankh-Morpork is a blaze! The only bridge in and out of the city has burnt to a cinder and the residents of the city are now trapped in a burning furnace!

Your task is to design and build a bridge that can safely allow the residents of Ankh-Morpork to leave the flaming city!

Who are the residents of Ankh-Morpork?

trolls

dwarves

What design features must your bridge have?

Create as a class, annotate and screen-print for books...

Project title:
Idea - what are you designing?
Who is the intended outcome for?
What is the intended purpose of your design?
What are the three most important design elements?

Return to prior learning double page spread and add what you have learnt today!

Lesson 2

IDEAS L.O: To investigate the work of Isambard Kingdom Brunel.

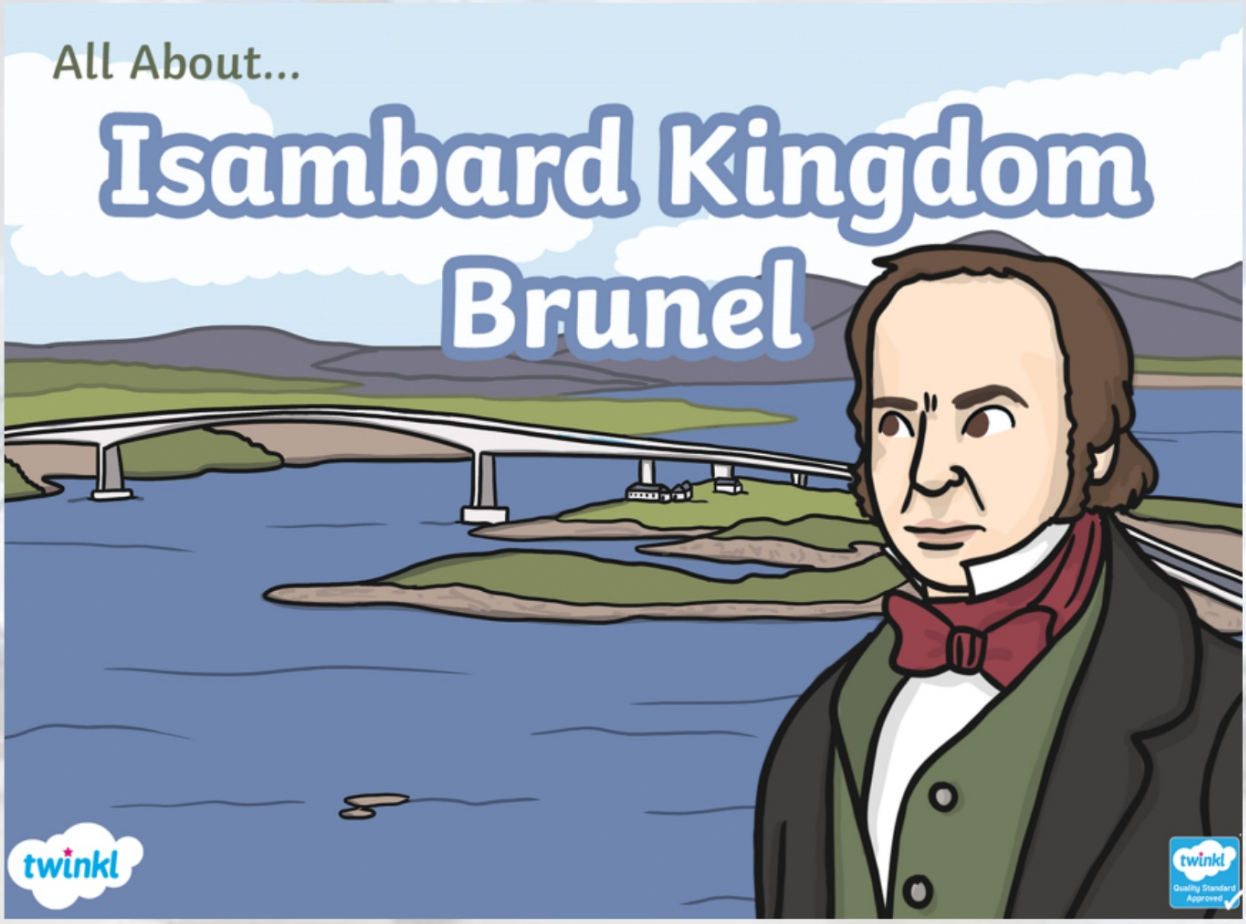
PROGRESSION OBJECTIVES

Understand how key events and individuals in design and technology have helped shape the world.

Analyse how an invention or product has significantly changed or improved people's lives. People's lives have been improved in countless ways due to new inventions and designs. For example, the Morrison shelter, designed by John Baker in 1941, was an indoor air-raid shelter used in over half a million homes during the Second World War. It saved the lives of many people caught in bombing raids.

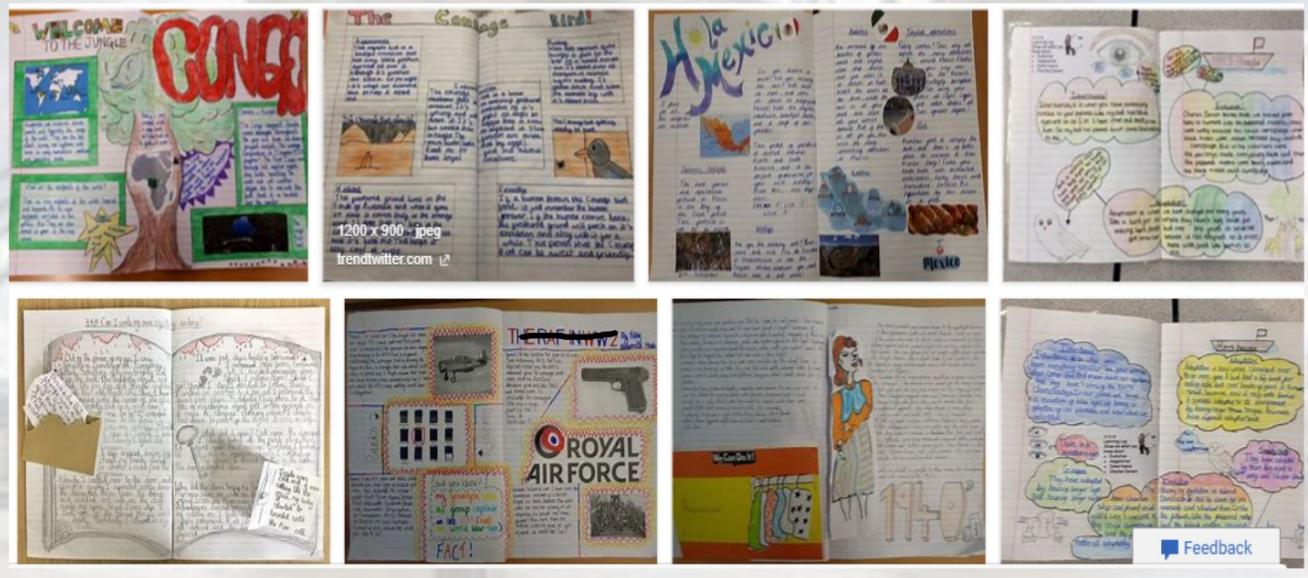
Present a detailed account of the significance of a favourite designer or inventor. The significance of a designer or inventor can be measured in various ways. Their work may benefit society in health, transport, communication, education, the built environment or technology. It may enhance culture in different areas, such as fashion, ceramics or computer games.

Read through...



Watch and annotate key facts around your image in your books...

Use your notes and the information to produce a beautiful double page spread about Isumbard like the ones below:



Return to prior learning double page spread and add what you have learnt today!

Wednesday 17th November

FTP L.O: To explore and create differer structures.

PROGRESSION OBJECTIVES

Select from and use a wider range of tools and equipment to perform practical tasks (for example, cutting, shaping, joining and finishing), accurately.

Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities.

Apply their understanding of how to strengthen, stiffen and reinforce more complex structures.

Emley Moor Tower in Huddersfield is 330.5m high and is the tallest freestanding structure in the UK.

Bridgewater Place in Leeds is 110m high and is the tallest building in Yorkshire.

making things work

Build the **tallest** tower you can from the mini bricks.

Is the tallest tower the best tower?

Is the tallest tower the best tower?

Why / why not?

Stability
height
aesthetics
} Our new design criteria!

	Stability	Height	Aesthetics
Team 1	5/10	8/10	4/10
Team 2	6/10	5/10	8/10
Team 3	8/10	9/10	8/10
Team 4	8/10	8/10	10/10

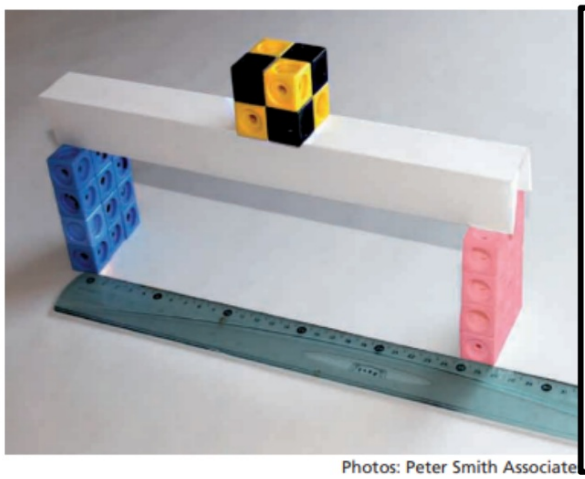
Bridges are everywhere; over roads, over rivers and canals, spanning estuaries and joining islands to the mainland.

Sometimes bridges have to span great distances.

The **Humber Bridge** held the world record, 1410m, for the longest single span suspension bridge for 17 years until 1998.

create maths

making things work



Photos: Peter Smith Associates

Build the longest bridge you can, using an A4 piece of paper and the mini bricks.

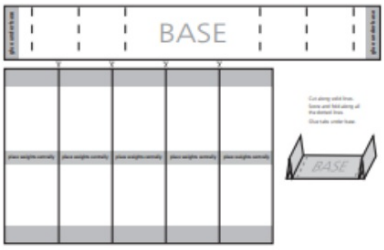
It has to support a block of **8 cubes** at its centre.

You may use **scissors** but no glue, sticky tape or other materials.

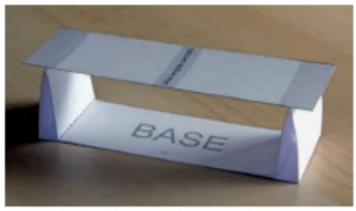
Engineers are challenged to make structures which are strong, light and efficient.

They use **triangulation**, **suspension** techniques and **arches** to achieve this.

Lendal Bridge



Make a bridge from card using the cut-out sheet



Photos: Peter Smith Associates

How many cubes can you place near the centre before the bridge collapses?

What happens when you change the number of layers of card?

Number of layers in span	Number of cubes supported
1	
2	
3	

Now bend one piece of card and use it as an **arch**.

How does this affect the strength of your bridge?

What have you found out today?

On a small piece of A4 paper, draw the structure that you have explored.

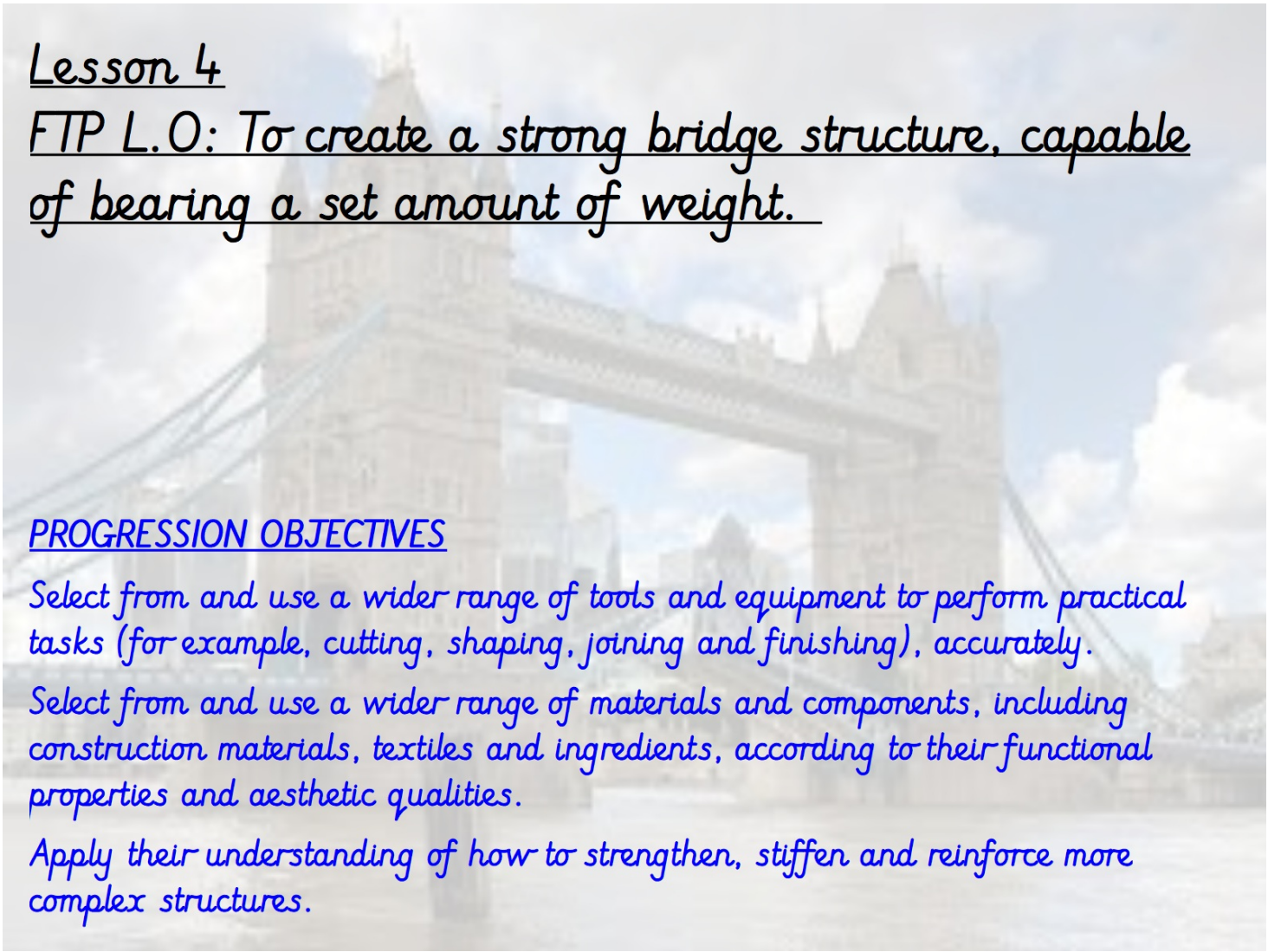
Annote your drawing with the following technical vocabulary:

base, arch, triangulation, height (cm), length of span (cm), folding, corrugating, box sections etc...

Draw a diagram of what didn't work and a quick explanation of why:

Draw a diagram of what did work and a quick explanation of why:

Return to prior learning double page spread and add what you have learnt today!



Lesson 4

FTP L.O: To create a strong bridge structure, capable of bearing a set amount of weight.

PROGRESSION OBJECTIVES

Select from and use a wider range of tools and equipment to perform practical tasks (for example, cutting, shaping, joining and finishing), accurately.

Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities.

Apply their understanding of how to strengthen, stiffen and reinforce more complex structures.

VOCABULARY

ncrease strength. Lollipop sticks make excellent struts.

are put on a bridge. On large bridges, this may be the number of cars; for ights available, such as pens or books.

marily of triangles to give them strength.

supported at each end by piers.

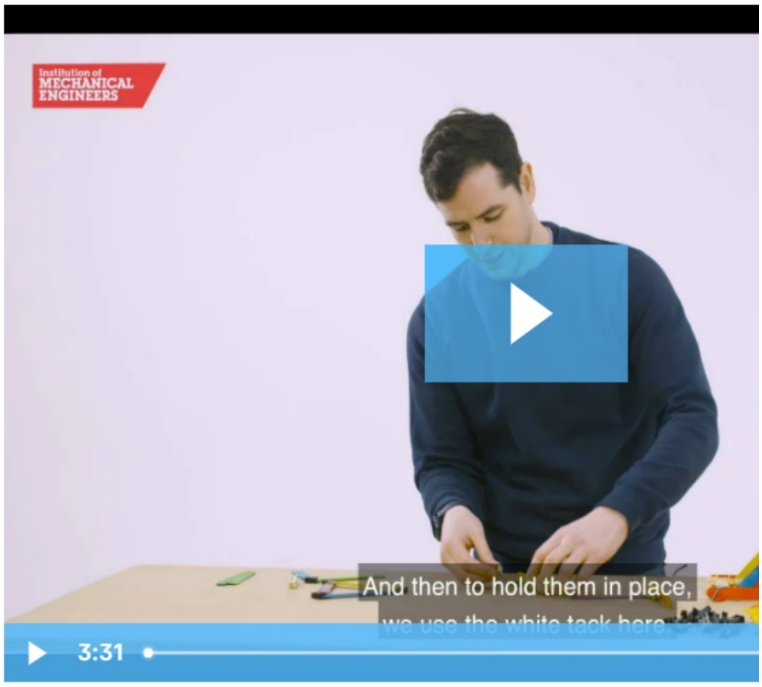
ped and have abutments, structures to support the arches, at each end.

antilevers, which are horizontal beams that are supported on only one

t are suspended from cables.

suspension bridges, as they are held by cables. However, the difference the towers holding the cables are proportionately shorter.

shape with straight lines. The name tells you how many sides the shape sides.

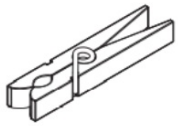


EACH TEAM WILL NEED

Lollipop Stick
30

Elastic Band
20

Bulldog Clip
16



Clothes Peg
10

White Tac

MAIN CHALLENGE

30-40r

The challenge is to work together as a team to build a strong bridge across the gap in front of you using the materials provided.

Great engineers always create designs of what their final masterpiece will look like. Sketch out different options and experiment with different approaches.

The bridges must span at least 45cm and hold each weight for at least 10 seconds.

Don't forget to think about the design princi you can find in the six main bridge types remember, if you can make the bridge symmet you're less likely to have weak points.

Once completed and tested, there will be a c discussion about your findings.

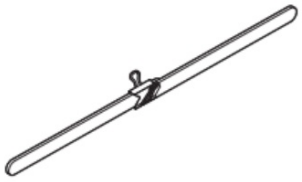
BUILDING YOUR BRIDGE

There are many ways to build a bridge using the materials provided. Use your creativity to form innovative, load bearing structures!

TECHNIQUES TO TRY

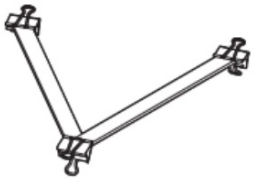
STRAIGHT JOINT

Join two lollipop sticks together in a line using a bulldog clip. Be sure there is an overlap between both lollipop sticks to ensure a strong joint.



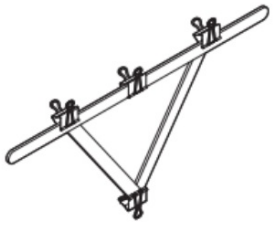
ANGLED JOINT

Angled sections can be joined together as shown below:



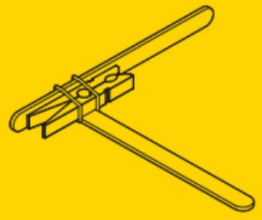
TRUSS

By combining these techniques, you're able to create a truss. Trusses are excellent at distributing the load applied to your bridge. Several trusses can be joined together using the provided materials to create strong, stable structures. Use these techniques to get building!



ADVANCED TECHNIQUE

Perpendicular faces can be created by fixing two lollipop sticks to a clothes peg using a rubber band, as shown here. This can be particularly useful when constructing the sides of the bridge.



RENGTH OF TRIANGLES

OF OF CONCEPT

the image to the right.
ough on one corner, it
nbus shape and could
ridge building!

However, if you push on one corner of a triangle, the force travels down the edges and keeps the shape rigid. This is why triangles are considered the strongest shape.

Got your heart set on a bridge that uses squares? Not to worry, you
square. Have a look at the ideas below to give you some inspiration.

dge that uses squares? Not to worry, you can use triangles to create a more stable
deas below to give you some inspiration.

In books, draw an annotate these techniques:

BUILDING YOUR BRIDGE

There are many ways to build a bridge using the materials provided. Use your creativity to form innovative, load bearing structures!

TECHNIQUES TO TRY

STRAIGHT JOINT

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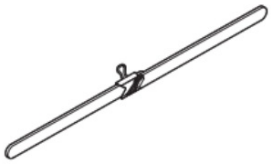

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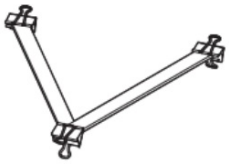

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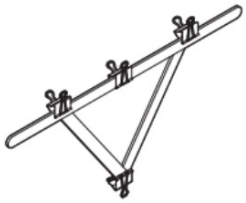

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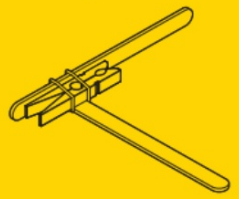
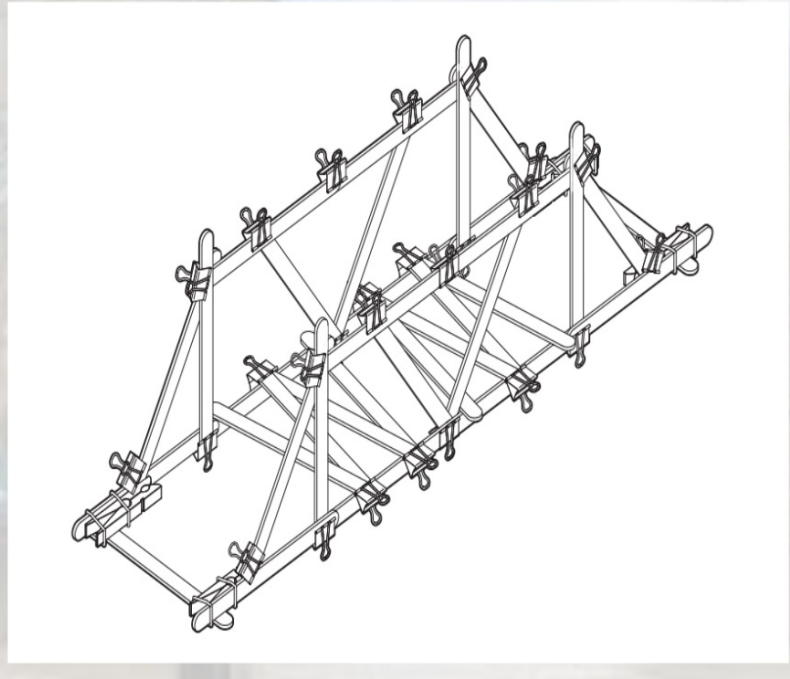
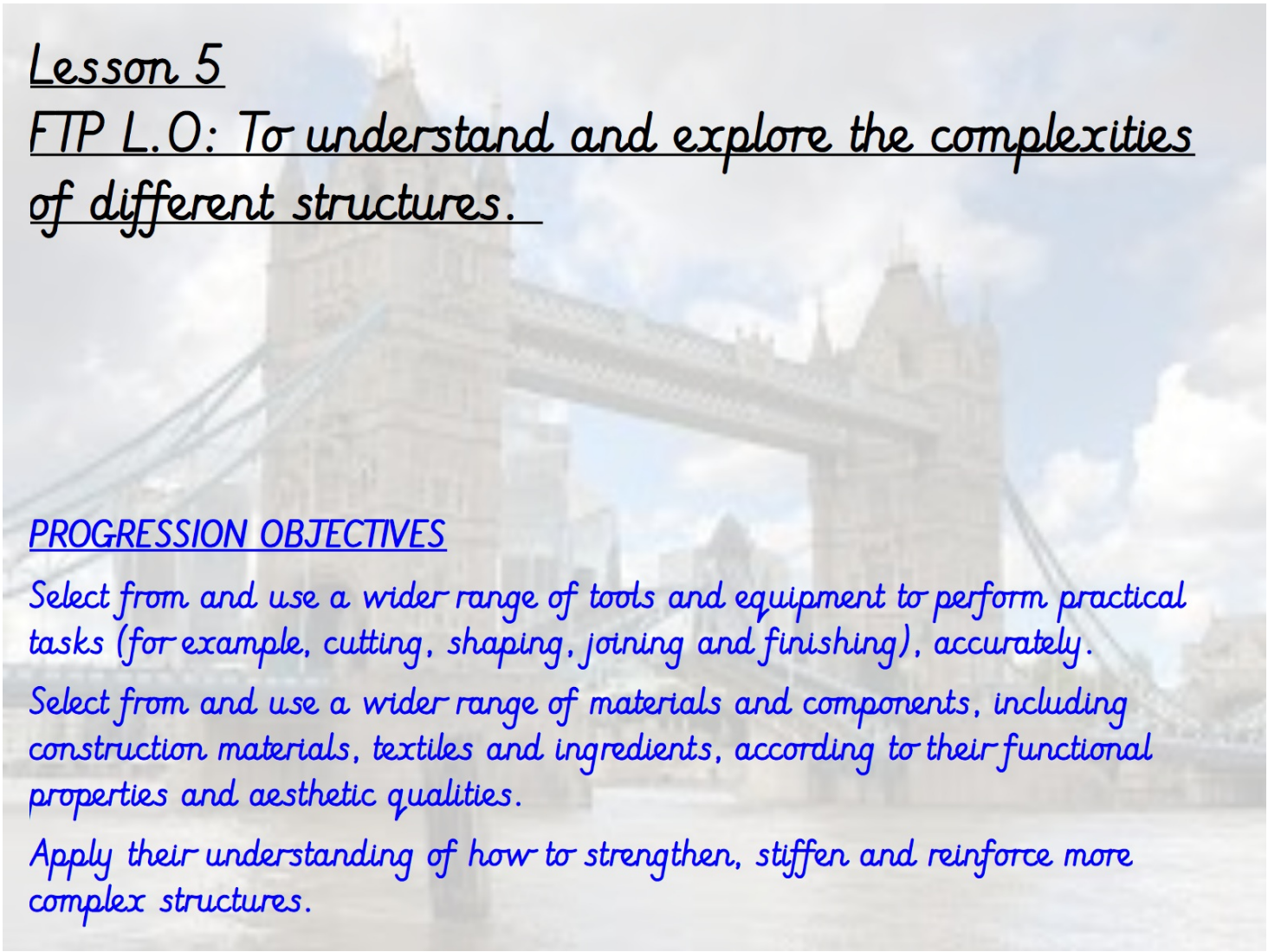


Draw and annotate your final bridge design, using the correct technical vocabulary:





Lesson 5

FTP L.O: To understand and explore the complexities of different structures.

PROGRESSION OBJECTIVES

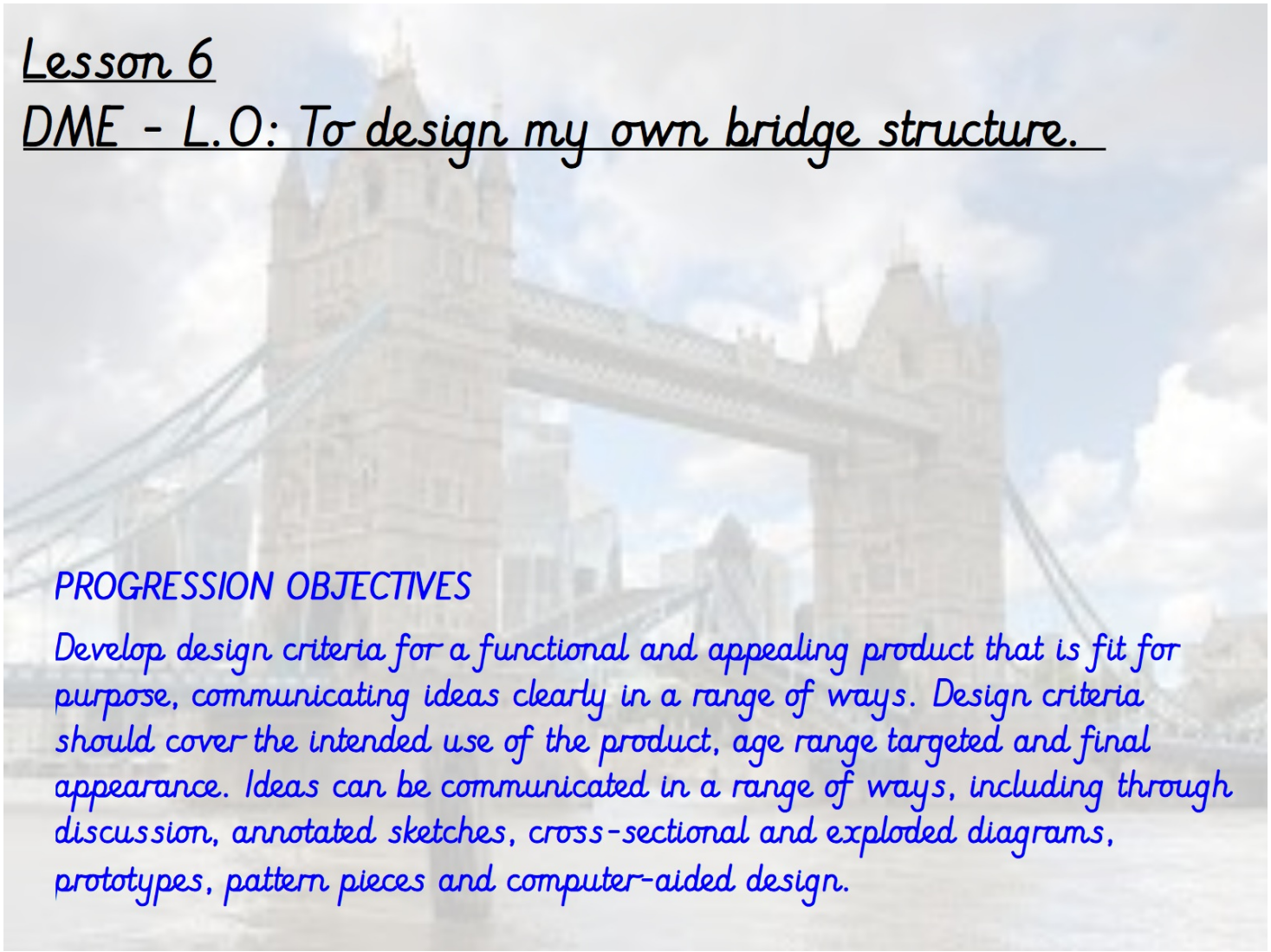
Select from and use a wider range of tools and equipment to perform practical tasks (for example, cutting, shaping, joining and finishing), accurately.

Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities.

Apply their understanding of how to strengthen, stiffen and reinforce more complex structures.


POLYDRON PACK LESSON

Return to prior learning double page spread and add what you have learnt today!



Lesson 6

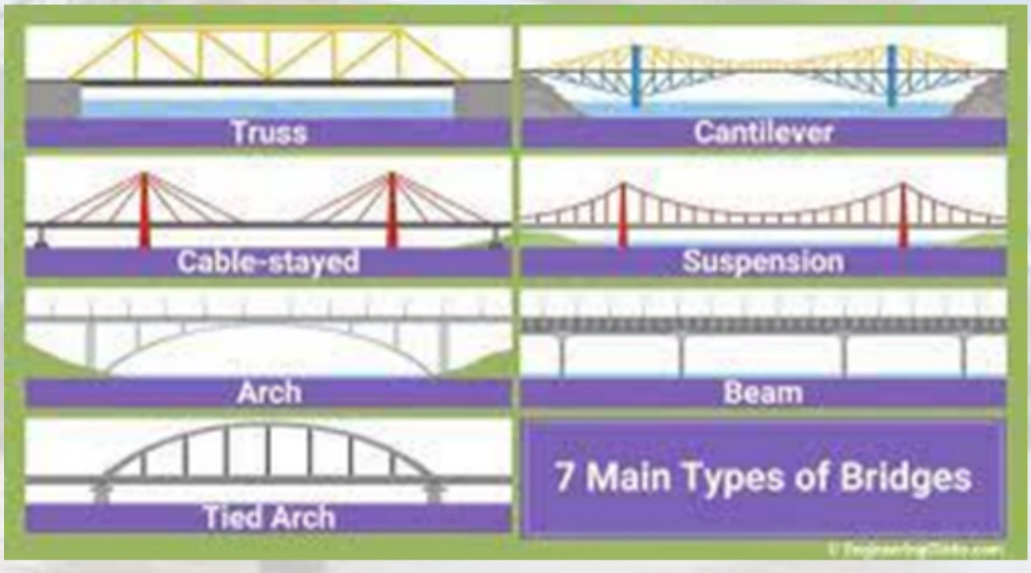
DME - L.O: To design my own bridge structure.

PROGRESSION OBJECTIVES

Develop design criteria for a functional and appealing product that is fit for purpose, communicating ideas clearly in a range of ways. Design criteria should cover the intended use of the product, age range targeted and final appearance. Ideas can be communicated in a range of ways, including through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design.

Today, we are going to design our Ankh-Morpork bridge!

What type of bridge are you going to choose to design and make?



To start with, we need a design brief!

This tells us what the aim of our project is.
What could ours be?

Our design brief is:

Write it clearly in your books.

Imagine your design.
Sketch an image of it on the small pieces of plain paper and label the technical features.

Write the subheadings and details below:

Type of Bridge:

Techniques I will use to make my bridge free-standing:

Strengthening techniques that I will use:

Additional design features:

What I will need in order to make my bridge:

When designing, we must use a design criteria:

CAFQUES	Questions to Spark Ideas	Design Criteria 1	Design Criteria 2
Customer	Who is the product intended for?		
Aesthetics	What appealing features will it have?		
Function	What are its functions?		
Ergonomics	How will the product relate to people's size, shape etc?		

CAFQUES	Questions to Spark Ideas	Design Criteria 1	Design Criteria 2
Quality	What design and manufacturing features will ensure a quality product?		
Usability	How easy is the product to use? Will a user guide be needed?		
Environment	How will the product relate to the environment - recycling parts, materials used in manufacture, the manufacturing process?		
Safety	How will you ensure that the product is safe?		

Return to prior learning double page spread and add what you have learnt today!

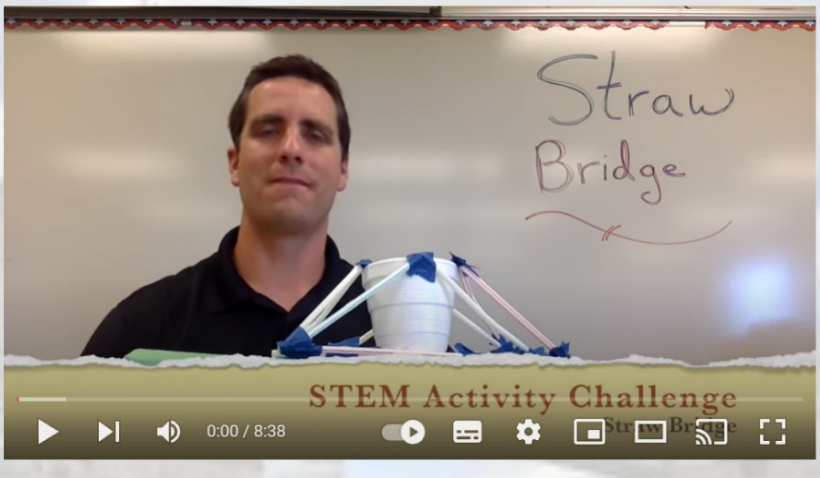
Lesson 7

DME - L.O: To evaluate and adapt my design.

PROGRESSION OBJECTIVES

Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work.

Develop design criteria for a functional and appealing product that is fit for purpose, communicating ideas clearly in a range of ways. Design criteria should cover the intended use of the product, age range targeted and final appearance. Ideas can be communicated in a range of ways, including through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design.



Annotate your image with the answers to these questions:

FUNCTION: What does it do and how does it work?
AESTHETICS: Is it attractive? Why? What makes it so?
CONTSTRUCTION: What is it made from? How? Why?

Discuss your design with a partner and think about these questions:

Does your design meet the design brief?
Does your design meet your design criteria?
How will you actually make your design?
What adaptations does your partner suggest for your design?

Write on a post it note what adaptations your partner suggested and stick in books.

Complete the rough draft sheet of your plan, ready to copy up as a beautiful double page spread in the next lesson!

Developing ideas...

Make a rough plan...

- Type of bridge
- I want my bridge to...
- How I will make my bridge free standing
- Strengthening techniques
- Aesthetics
- Environment
- Safety
- Additional design features
- Materials needed

Return to prior learning double page spread and add what you have learnt today!

Lesson 8

DME - L.O: To plan the sequence of my bridge build.

PROGRESSION OBJECTIVES

Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work.

Develop design criteria for a functional and appealing product that is fit for purpose, communicating ideas clearly in a range of ways. Design criteria should cover the intended use of the product, age range targeted and final appearance. Ideas can be communicated in a range of ways, including through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design.

Write up you plan as a double page spread. The most attractive will be sent to Ms Cartwright!

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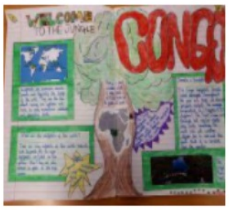

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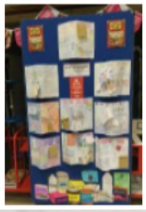


Return to prior learning double page spread and add what you have learnt today!

Lesson 9

DME - L.O: To make a free-standing bridge structure

PROGRESSION OBJECTIVES

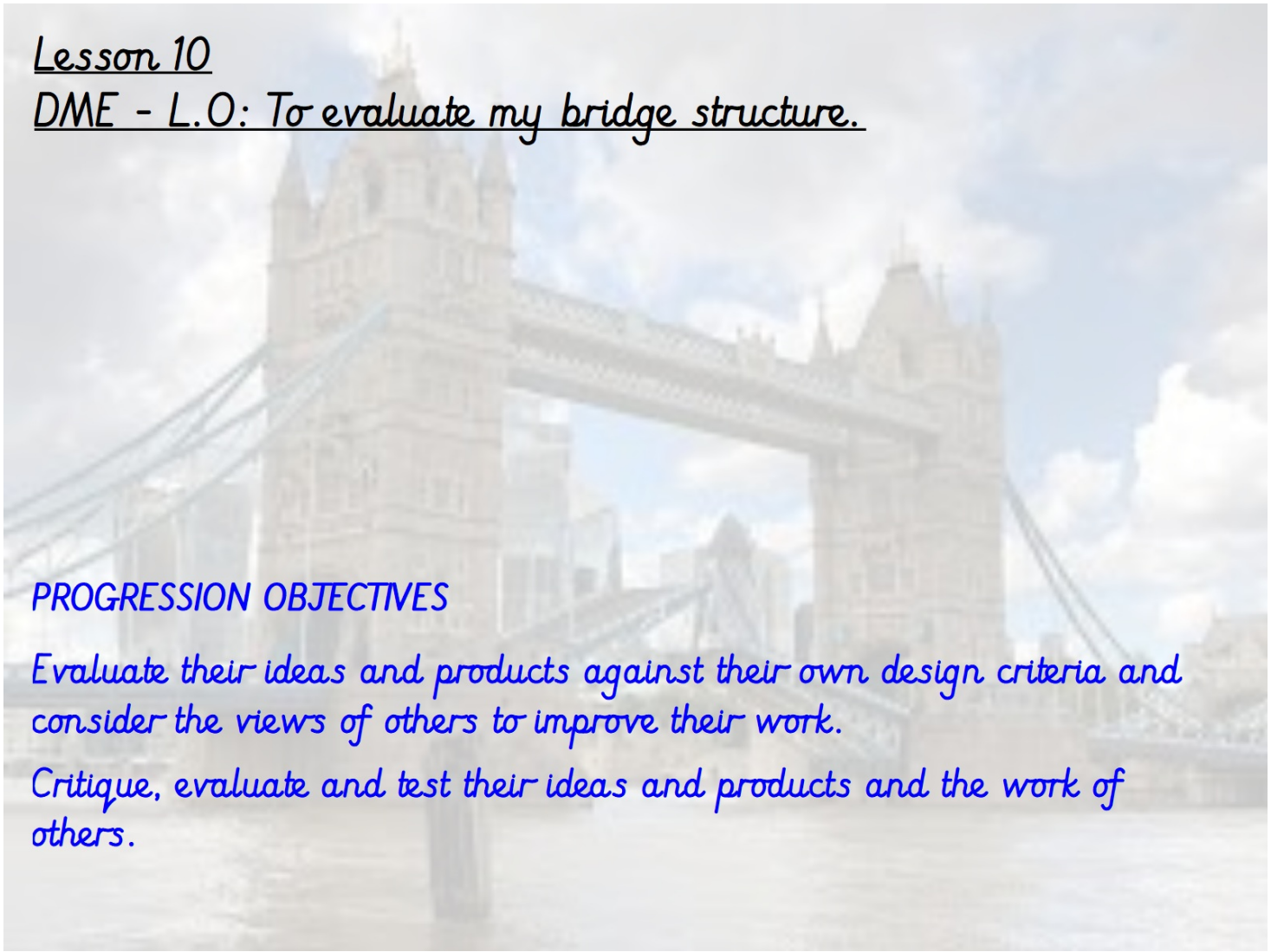
Select from and use a wider range of tools and equipment to perform practical tasks (for example, cutting, shaping, joining and finishing), accurately.

Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities.

Apply their understanding of how to strengthen, stiffen and reinforce more complex structures.

Take pictures of each element - annotate: what went well? what was tricky?

Return to prior learning double page spread and add what you have learnt today!



Lesson 10

DME - L.O: To evaluate my bridge structure.

PROGRESSION OBJECTIVES

Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work.

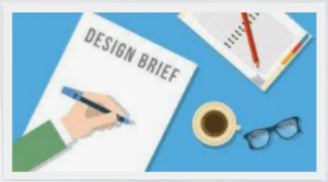
Critique, evaluate and test their ideas and products and the work of others.

Look at everyone's finished bridges and take finished photos!
Annotate with what you are most proud of about it.

Complete the final evaluation grid and write a short paragraph explaining how well the design brief has been met and why.

teria	What I did well	How I could impro

How well was your design brief met?



To create a strong, inflammable and eye-catching bridge that will allow the creatures of Ankh-Morpork to safely leave the city.

Return to prior learning double page spread and add what you have learnt today!