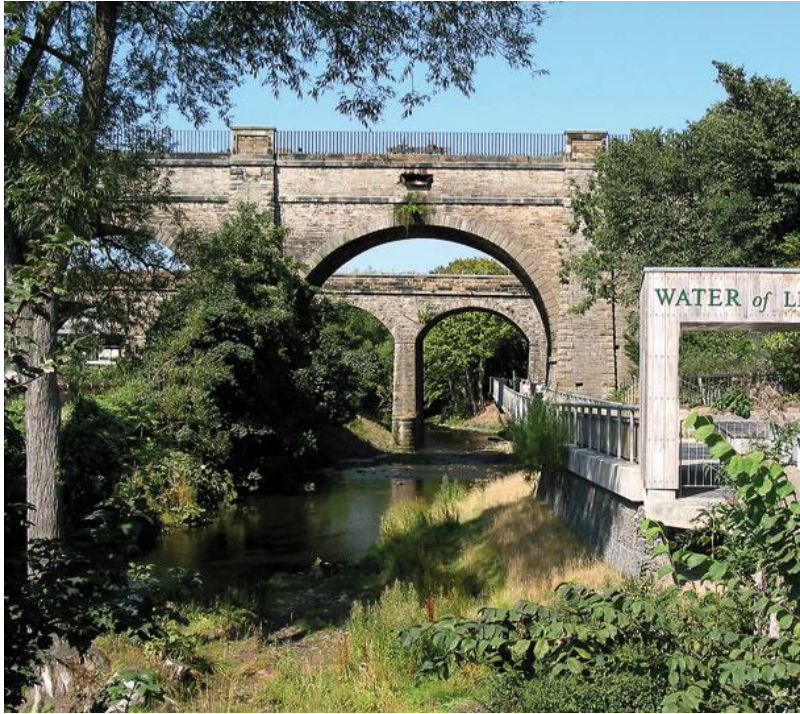


# Teaching notes

- In this STEM Challenge, learners are asked to design and build an aqueduct – a waterproofed bridge to carry water. They will need to consider how to create a slope to allow water to run gently from one end to the other.
- In modern engineering, an aqueduct can refer to any artificial method of transporting water; however for this Challenge, learners are asked to create a bridge.
- Local context - This STEM Challenge refers to an aqueduct on the Union Canal (Falkirk to Edinburgh). The aqueduct shown is a bridge carrying the Union Canal over the Water of Leith river in Edinburgh. However you may wish to replace this with a different example: [https://en.wikipedia.org/wiki/Category:Navigable\\_aqueducts\\_in\\_Scotland](https://en.wikipedia.org/wiki/Category:Navigable_aqueducts_in_Scotland)
- You could provide a piece of paper/card to represent a road/railway/river that the aqueduct needs to carry the water across
- You only need 2 or 3 jugs of water to test this. Each group only needs a tiny amount of water e.g.  $\frac{1}{4}$  of a cup, plus an empty cup to catch it in.
- Be prepared for spills.
- In Part 1, allow children to try waterproofing paper using sticky tape if they want to – lots of children think this will be fine. Refer to this in Part 2 and link to waterproof materials. Sticky tape is not waterproof once it gets wet!

# STEM Challenge Project



Aqueduct  
challenge



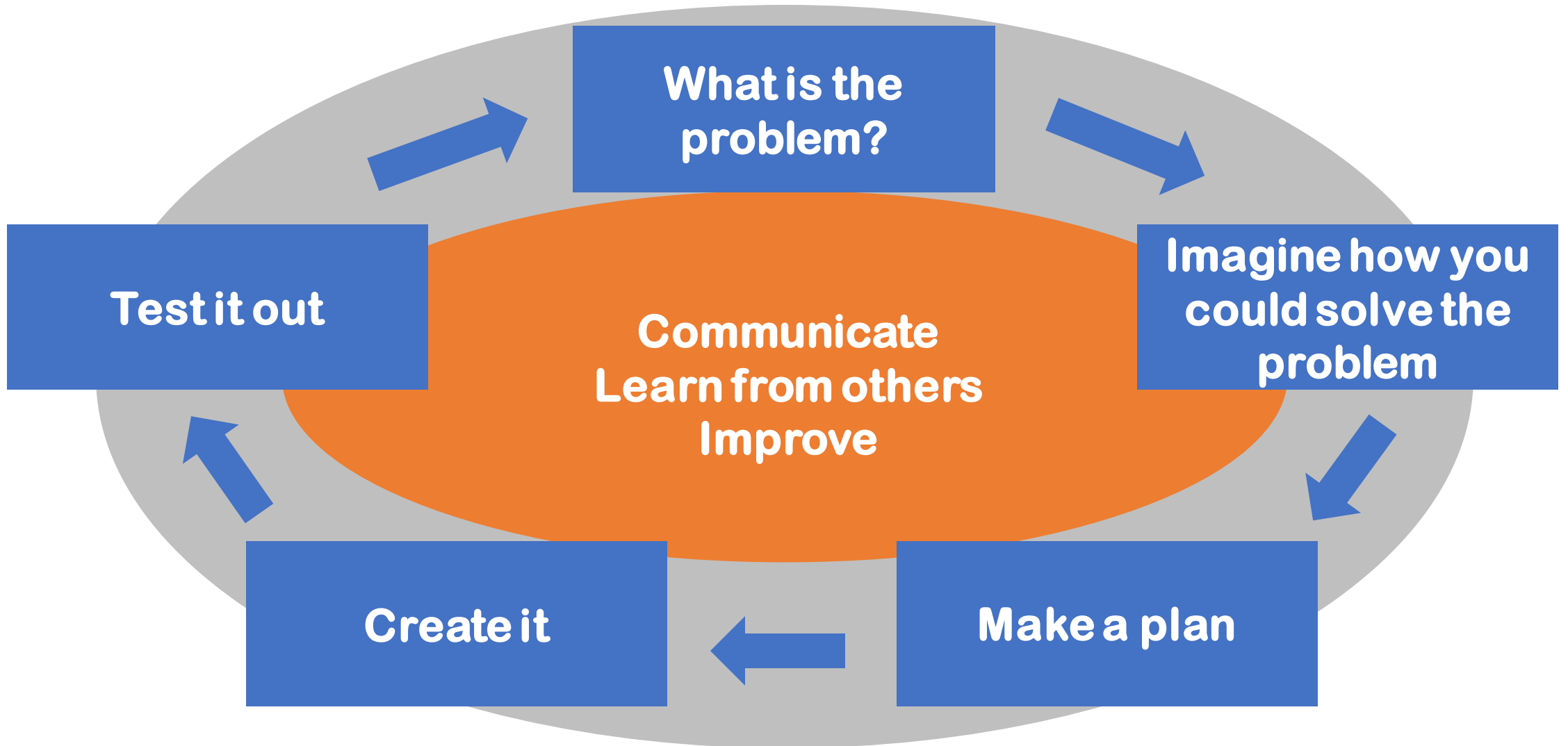
# Learning Intentions

- To build up our **skills**:
  - Teamwork
  - Communication
  - Creativity
  - Critical Thinking
  - Resilience
  
- To use the **engineering design process** to solve a problem

# What are your success criteria for this project?

- I would like to get better at
  - teamwork
  - communication
  - creativity
  - critical thinking
  - resilience
- How can you get better at this? Write down some strategies for yourself.
- At the end you will decide if you have been successful.

# The Engineering Design Process



# Aqueduct challenge

- You are a bridge engineer who has been given the challenge of redesigning the Union Canal Aqueduct at Slateford, Edinburgh, to carry water across a bridge.
- The water must travel safely from one end of the bridge to the other.



# STEM Challenge

- Design and build an **aqueduct** which can safely carry water from one end to the other
- The aqueduct must be at least 25 cm long and 15cm high
- You will be given a choice of materials:
  - **A4 paper – 4 sheets**
  - **Foil – 1 x 30cm piece**
  - **Sellotape**
  - **Cup of water to test your aqueduct**
  - **Empty cup to catch your water**
- Test your aqueduct and try to improve it



# Aqueduct challenge

- What are the problems with this task?
- What can you predict being difficult?
- Imagine how you could solve each problem.
- What have you learned previously about bridges?



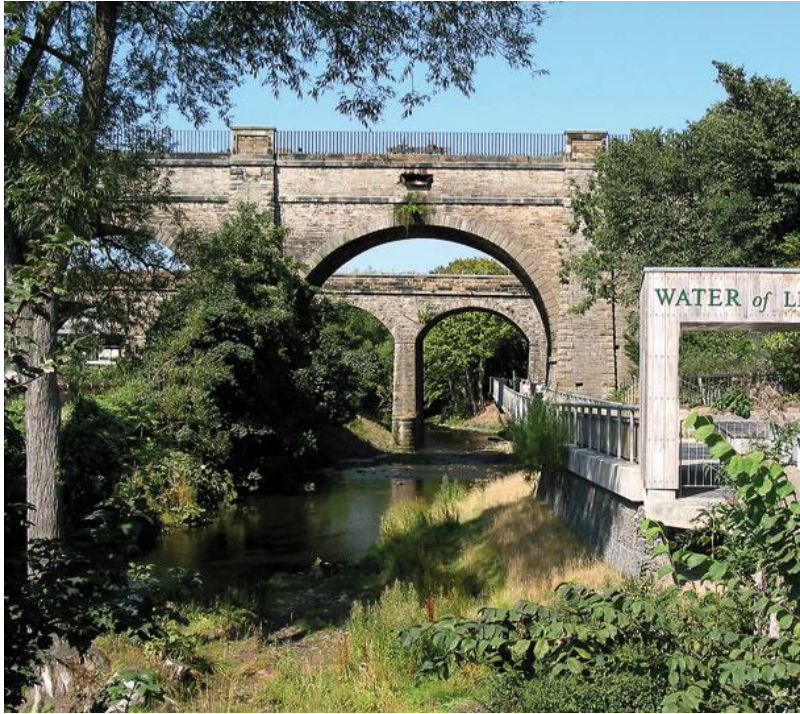




# What can you learn from others?

- **Learning loop** – look at other people’s work.
- How did other groups tackle the STEM challenge?
- Which ideas did you see that were successful?
- What did you see that hadn’t worked, or that you wouldn’t use?

# STEM Challenge Project



## Aqueduct challenge



Part 2

# Learning Intentions

- To build up our **skills**:
  - Teamwork
  - Communication
  - Creativity
  - Critical Thinking
  - Resilience
  
- To use the **engineering design process** to solve a problem



# What did we learn last lesson?

- Which ideas were successful?
- What didn't work?
- What could you improve about your structure?
- How did other groups tackle the STEM challenge?

# Ideas to consider

- Pillars – wide, layered, pairs, perfect rectangles, roll up carefully so edges match
- Bridge deck – layered, sides folded up
- Angle of the slope – can water run down your slope?
- Using waterproof materials – sellotape on paper is not waterproof
- Does the height of the aqueduct matter?

# STEM Challenge

- Design and build an **aqueduct** which can safely carry water from one end to the other
- The aqueduct must be at least 40 cm long and 15cm high
- You will be given a choice of materials:
  - **A4 paper – 4 sheets**
  - **Poster or A3 paper – 1 sheet**
  - **Foil – 1 x 45cm piece**
  - **Sellotape**
  - **Cup of water to test your aqueduct**
  - **Empty cup to catch your water**
- Test your aqueduct and try to improve it





# What can you learn from others?

- **Learning loop** – look at other people’s work.
- How did other groups tackle the STEM challenge?
- Which ideas did you see that were successful?
- What did you see that hadn’t worked, or that you wouldn’t use?

# Evaluation

- Discuss how your team approached the STEM challenge today
  - What did you learn today?
  - Which skills did you develop?
- How could you improve your design?
- Can you think of another similar STEM challenge you could set yourself to try at home?