Teaching notes – Marble ramp project

- This project is all about prior learning – before children start to design, get them to reflect on what worked well and what didn't in the previous attempt. There are two sections to the Marble ramp project, for First and Second Levels.

- The challenge is to get the marble to take as long as possible to travel down the ramp so this brings in lots of Maths and Science concepts – time (you could use timers if available), distance (make measurements), speed (measure using an app, video in slow motion), angles, gradients, steep vs shallow slopes, height, length (they could use string to measure the length of unusually shaped ramps eg U shape), 2D shapes, 3D objects, forces, gravity, friction, materials…

- Materials are limited so children will have to plan carefully so they don't waste materials

- Children could investigate steep vs shallow slopes using ramps and cars before starting this project, or create a simple marble ramp and investigate different angles created by different heights of the starting point

- Children can investigate adding speed bumps, flaps etc to their designs

- They need to engineer a strong and stable structure – how will they support the ramp so that the marble travels down as slowly as possible, and the structure is not wobbly?

- Technical drawing – children could plan a bird's eye view and side view(s) to show how the structure will be supported

- This project is a starting point but as children start to wonder what else might slow the marble down, they could experiment with different materials, try their own designs…

- This project can be differentiated easily – allow an extra sheet of paper or use card for younger classes and give them more time for having second attempts at the same challenge, use budgets or add additional rules (eg a minimum length for the ramp or a minimum time the marble must take) for older classes, children could work on their own if they really struggle with teamwork, children can be grouped strategically for support from other children, or to support other children, children can give advice to others and become "experts" who could create marble ramp guidance materials to help others, learners could create slow motion videos of their marble runs…
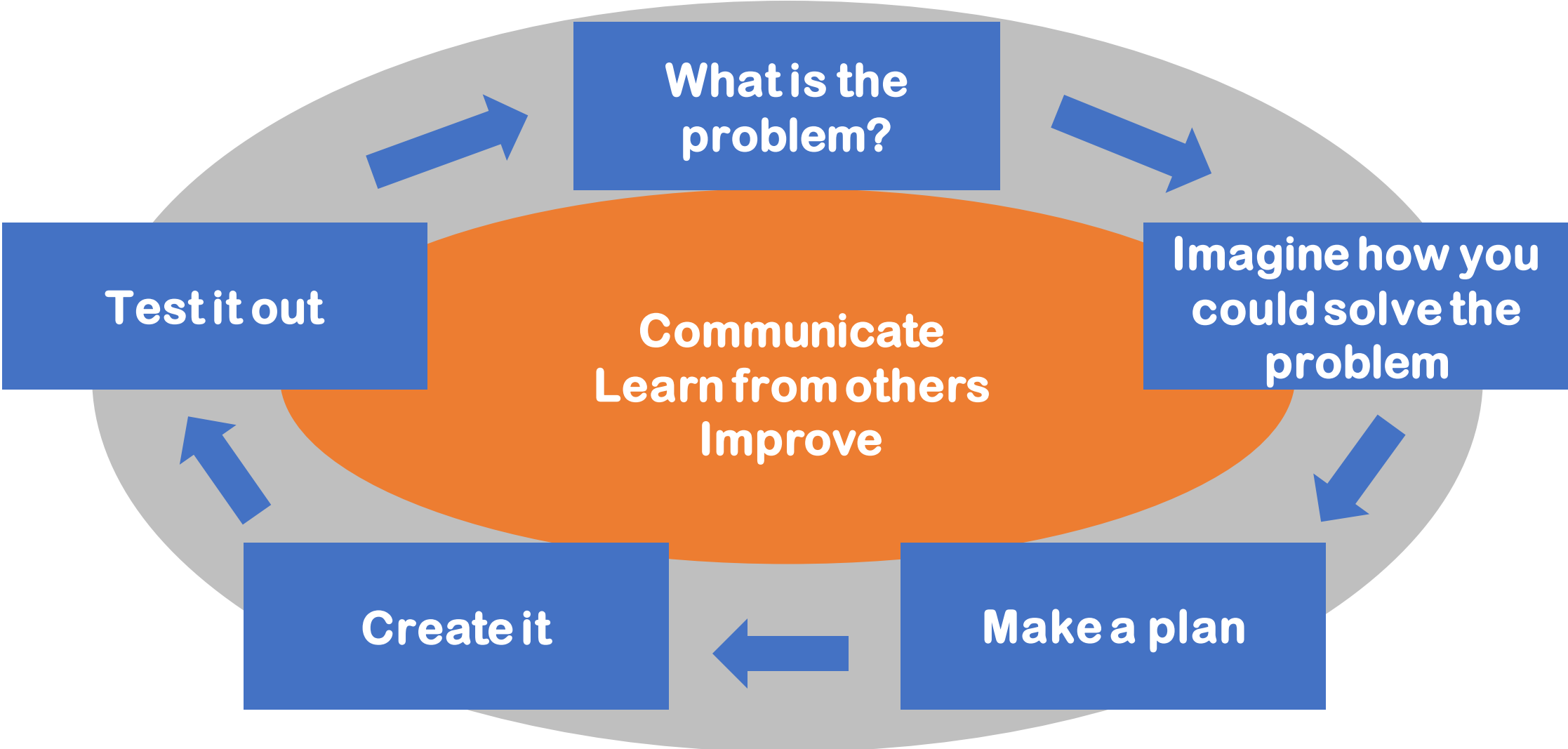
STEM Challenge Project

Marble ramps

Learning Intentions

- To build up our skills such as **teamwork** and **communication**

- To use the **engineering design process** to solve a problem

How will you be successful today?

- What does successful **teamwork** look like?

- What can you do to be a good **communicator**?

The Engineering Design Process

Marble ramp challenge

- Design and build a **straight marble ramp** on your desk
- You must include a **marble catcher** at the end to stop the marble rolling away
- The challenge is to make the marble take **as much time as possible** to travel from the start to the marble catcher
- The top of the marble ramp must be **less than 10 cm** above the desk
- You **cannot stick anything to the desk**
- **No tubes**, only ramps – you must be able to see the marble as it travels down

- You will be given the following materials:
  - **2 x A4 paper**
  - **Sellotape**
  - **Marble in a pot (you cannot use the pot)**

- **Test** your marble ramp and try to **improve** it

Bird's eye view

Marble ramp challenge

- What are the problems with this task?

- What can you predict being difficult?

- Imagine how you could solve each problem.

- What have you already learned that might help you?

Evaluation

- On a pink post-it, write down what you are Tickled Pink about – what is good about your design?

- On a green post-it, write down what is Green For Growth – what needs to be improved about your design?

- Or you could use pink and green highlighters to draw straight on to your design!

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?

- **Feed back to your group**

Marble ramp challenge

- Design and build an **improved straight marble ramp** on your desk
- You must include a **marble catcher** at the end to stop the marble rolling away
- The challenge is to make the marble take **even longer** to travel from the start to the marble catcher – what did you learn in your last attempt?
- The top of the marble ramp must be **less than 10 cm** above the desk
- You **cannot stick anything to the desk**
- **No tubes**, only ramps – you must be able to see the marble as it travels down

- You will be given the following materials:
  - **1 x A4 paper**
  - **1 x A4 card**
  - **Sellotape**
  - **Marble in a pot (you cannot use the pot)**

Bird's eye view

- **Test** your marble ramp and try to **improve** it

Marble ramp challenge

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- What can you predict being difficult?

- Imagine how you could solve each problem.

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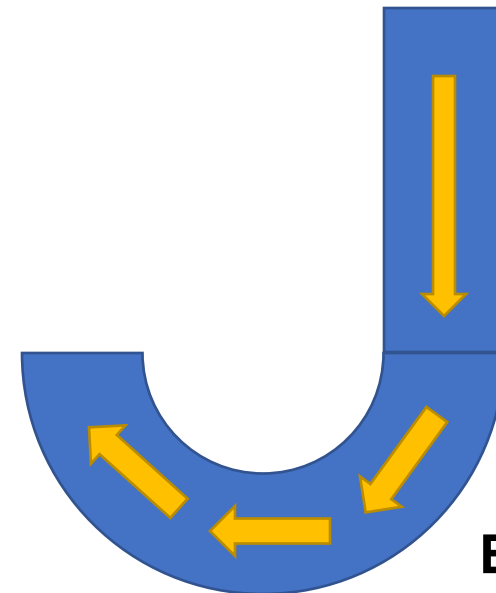
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- **Feed back to your group**

Marble ramp challenge

- Design and build a **J-shaped marble ramp** on your desk
- You must include a **marble catcher** at the end to stop the marble rolling away
- The challenge is to make the marble take **as much time as possible** to travel from the start to the marble catcher
- The top of the marble ramp must be **less than 10 cm** above the desk
- You **cannot stick anything to the desk**
- **No tubes**, only ramps – you must be able to see the marble as it travels down

- You will be given the following materials:
  - **1 x A4 paper**
  - **1 x A4 card**
  - **Half a paper plate**
  - **Sellotape**
  - **Marble in a pot (you cannot use the pot)**

- **Test** your marble ramp and try to **improve** it

Bird's eye view

Marble ramp challenge

- What are the problems with this task?

- What can you predict being difficult?

- Imagine how you could solve each problem.

- What have you already learned that might help you?

Evaluation

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Evaluation

- Discuss how your team approached the STEM challenge today
  - What had you learned from last week?
  - What did you learn from working with different team members?

- How could you improve your design?

- Can you think of another similar STEM challenge you could set yourself to try at home?

Self-assessment

- How did you get on with
  - Teamwork
  - Communication

☺ **Yes** – I was successful

😐 **Almost** – I need some help

☹ **Not yet** – I need to keep working on this

Instructions

- Write or draw instructions so someone else could build your design

- Number each step

- You could draw labelled pictures to show how to build your design