The Squashed Tomato Challenge

Challenge your students to take on a real-life problem affecting people in Nepal.

What's the challenge about?

A fun hands-on and brains-on challenge suitable for KS2–5 students based on a real transportation problem facing farmers living on the mountains of Nepal.

The challenge is flexible and can help you deliver:

- Enrichment activities – for STEM and National Science and Engineering Week
- CREST in a day
- KS3/4 science curriculum on forces, friction and levers
- Cross curricular opportunities

If you would like to use this as a fundraising opportunity please see our **squashed tomatoes fund-raising pack** for everything you will need.

Above: Farmer ready to transport tomatoes down the mountainside in the traditional way using a basket with a head strap.

Running the challenge

Introduce the challenge by discussing the various ways in which food is transported from where it is produced to the local market or shop. Talk about rail, lorries, boats, planes, bicycles etc.

The problem: Many farmers in Nepal grow their crops (including tomatoes) on the mountainside. To sell them at the local market they need to transport them to the bottom of the mountain, BUT it's a long and hazardous journey and they need to cross a river. Tomatoes are quite easily squashed so need to be transported with care. You can demonstrate this by dropping a few – the riper the better!

The challenge: Set the context of the challenge by introducing the problem faced by farmers in Nepal. You could show the students some of the **images** from Nepal. The students work in small groups to design and build a model that can transport as many cherry tomatoes at the same time without squashing them.

www.practicalaction.org/education/squashedtomatochallenge

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The challenge ground rules

- The tomatoes need to be transported a minimum of one metre along the ground starting from desk height. However, the challenge is more spectacular, and you are more likely to get squashed tomatoes if you set a height of more than two metres, and a horizontal distance of 2–2.5 metres. (This can be done by starting the run from the top of a metre rule standing vertically on top of a chair, desk, stool or lab bench, taking care to ensure it's safely set up and supervised.)
- The tomatoes cannot be touched whilst they are moving, catapulted or 'flown' in any way. They must be moved in a controlled way so they don't just crash into the ground and get squashed.
- You can also adapt the challenge by asking groups to either aim for the greatest weight of tomatoes transported in one trip, or go for speed of operation and ask them to aim for the greatest weight moved in five minutes. In both cases, the group that transports the heaviest weight of tomatoes wins.

Equipment and materials

Students will need a range of appropriate modeling material and equipment for the challenge. They include;

- Things to make a framework or basket from (e.g. Lego, Meccano, margarine tubs)
- A means to attach their basket/ framework to the mode of transport and pulleys, ramps or similar to allow everything to move
- Ways to stick everything together (e.g.string, tape)
- String

Equipment

Any equipment/material can be used, for example:

- ✓ K'Nex
- ✓ Meccano
- ✓ Lego
- ✓ paper straws
- ✓ pulleys
- ✓ split pins
- ✓ paper-clips
- ✓ sellotape
- ✓ newspaper
- ✓ plastic nets (that hold fruit)
- dowelling
- ✓ rulers
- ✓ card
- ✓ paper cups
- ✓ boxes
- ✓ dried spaghetti
- ✓ ramps with various surfaces
- ✓ string/thread
- ✓ cardboard tubes

...and don't forget the tomatoes and something to represent the river

After the challenge

Show these YouTube videos from Nepal:

How a gravity ropeway works

How a gravity ropeway can make life better for families in Nepal

Show students the information on ropeways from Nepal:

www.practicalaction.org.uk/transport/gravity_ropeways

Discuss how the system Practical Action has installed compares with the students' models. Would they be able to adapt their systems to a much bigger scale? If not, what would be the limiting factors?

Share your success stories!

We would like to feature some of these challenges on our website, so if you film your student's final attempts and put them on YouTube, please send us the link to **education@practicalaction.org.uk**

Left: Tomatoes at the bottom of a gravity ropeway

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Using the challenge as a 'CREST in a Day' project

CREST awards offer a way to help students learn to solve problems. They operate at three levels: bronze, silver and gold. An introductory "CREST in a Day" award is also available. If you wish your students to complete the Squashed Tomato Challenge as a 'CREST in a Day' award, there are several things you can do to ensure the challenge meets the criteria, though we always advise you to talk to your local CREST co-ordinator to get some advice.

To find your local CREST co-ordinator go to

www.britishscienceassociation.org/web/ccaf/CREST/gettingstarted

CREST requires students to demonstrate:

- Creativity
- Innovation
- Decision making

So to make the challenge robust you should:

- Ask your student teams to draw three possible designs
- Ask them to choose one to build and to justify their choice
- After they've built it, ask them the following questions:

  How well do they think it worked and why?

  What would they do differently if they had chance to do it again?

  Having done it, do they still think they made the right choice of design?
- If students then write up their experiences, possibly using the **worksheets provided**, they would be eligible for a 'CREST in a Day' award.

Above: Farmer taking produce off the bottom of the gravity ropeway

Your local co-ordinator can provide you with more advice, but essentially we'd like the students to:

- Stay on task all day
- Work as a team
- Contribute ideas
- Learn and apply previous learning and knowledge from the briefing
- Take part in testing and presenting their idea
- Work to fulfil the task

A teacher who is not delivering the challenge, or a STEM ambassador, should complete the assessment.

Extension Ideas

Extension Idea 1 – Communication:

In a real life situation the farmer needs to communicate to his colleagues at the bottom of the mountain when he has tomatoes ready to transport. Ask students to devise a communication method (other than verbal) that would be suitable for this, e.g. Morse code, traffic lights etc. In Nepal they use mobile phones or hit the wires to make them vibrate.

Extension idea 2 – Maths:

Use the record sheet to calculate the best or average weight of tomatoes each group transported. From this deduce the class average. Maybe extend into a competition between classes within a year group. Use the information to discuss averages, produce graphs etc.

If you reset the parameters of the challenge, so that students aim to transport the maximum weight of tomatoes with in a set time limit (e.g. 5 minutes) how would this affect the results? Can students work out how much they could move in 1, 5 or 10 hours (not forgetting the time needed to refill the containers and transport them back up the mountain)?

Extension Idea 3 – Payment:

Having transported their goods to the bottom of the mountain, how do the farmers receive payment for what they do? Students could be asked to include a way in which payment for the tomatoes can go back up the mountain.

Above: Nepalese mother with her children

Extension idea 4 – Costing:

Place a cost on labour, and on each different type of material used in construction, and ask students to calculate the cost of their design. Identify three ways to reduce the cost.

Extension idea 5 – Lateral Thinking:

Ask the students to think about other areas of the World, and other situations, in which the technology they have been using could be useful. Ideas might include cable cars, cliff railways and water-powered engines. Are there any of these near your school?

Extension idea 6 – Art:

One they have finished the challenge ask student to slice their tomatoes in half then draw or paint the inside. You could slice open a range of different fruits and vegetables to compare.

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