Tablecloth Trick

You can be a magician too!

Grab this stuff:

- A Shiny tablecloth
- B 2 cups
- C Teapot
- D Smooth table

Tablecloth Trick

1

Place the shiny tablecloth on the table, leaving half of the cloth hanging over the side (make sure the table has no rough edges). Put the cups and teapot on the tablecloth at the end opposite the overhanging part of the cloth.

2

Grasp the overhanging tablecloth in your hands tightly, but make sure you do not pull the cloth into the middle or create air bubbles under it.

3

Pull the tablecloth towards you and down in one fast movement. The cups and teapot should stay where they are!

Tablecloth Trick notes

Aims

- Predictions – think and pose questions. Can you remove the tablecloth without breaking the teapot and mugs?
- Observation skills – discover the importance of friction.
- Investigation – learn how friction can change the outcome of an experiment.

Practicalities and preparation

- Ensure that the cups and teapot have a smooth base. We recommend using fine sandpaper on the bases to remove any rough edges. This will reduce friction and stop the cloth catching on the base of the cups and teapot.
- Make sure the table you are using has no rough edges. If it does the cloth is likely to snag, causing damage to the cloth. Once the cloth has been damaged the experiment will be hard to do.
- Put the teapot and cups in a triangular formation on the tablecloth, near the far end of the table and close to the tablecloth edge. This means you will have to pull less of the tablecloth out from underneath the cups and teapot.
- Make sure the edge of the tablecloth that is near the cups and teapot has no hem or is the selvage edge of the cloth. If this edge has a hem on it, it will not slip easily under the cups and teapot, and most likely knock them over.
- Before you pull the tablecloth, make sure it has no wrinkles or air pockets under it, which will tend to disturb and knock over the cups and teapot when you pull the cloth.
- If the cups and teapot you use are too light, they will not exert enough force on the table to remain in place. You can overcome this problem by weighting the cups and teapot with sand.
- The trick is to grab the ends of the tablecloth with both hands and quickly pull it straight down and away from the table. The key is the quick, downward motion – almost like whipping or yanking the cloth away. Also make sure your pull is perpendicular to the table and not at an inclined angle.

Safety information

Make sure when performing the trick you have plenty of room around you so you do not knock into anything.

The science – an introduction

The tablecloth and the table are both smooth. There is not much friction between the two, and when you pull the tablecloth away it can slide out from under the crockery. The only force acting on the cups and teapot is gravity, pulling them down. As there was no force from you, pushing or pulling on the cups and teapot, they stayed where they were.

This demonstrates the first part of Newton's first law of motion (objects remain at rest or travelling at constant speed unless a force acts on them to change their motion) and helps

us understand inertia. Inertia is the tendency for an object at rest to remain at rest until a force acts on it. In terms of the Tablecloth Trick, inertia is important because, according to the law, the objects (the cups and teapot) will not move unless an outside force moves them.

Discussion

- Why do the cups and teapot not move?
- What is friction?
- Is there any friction taking place in this experiment?
- What happens if you use a rough tablecloth?
- What happens if you use heavier or lighter objects? Is it easier or harder to whip off the tablecloth?
- Who was Sir Isaac Newton?

  Sir Isaac Newton (1642–1727) was an English scientist.

  He admired a scientist who died shortly before he was born called Galileo Galilei. He believed (like Galileo) that the world was similar to a machine and that a few mathematical laws could explain how it worked.

  We all know Newton for discovering the theory of gravity after watching an apple fall in an orchard (it never really fell on his head!).

Extensions

- Can you do the trick with a piece of paper?

  Place a piece of paper under a heavy object on the table. The object should sit at one end of the paper, with the rest of the paper sticking out over the edge of the table. Hold the edge of the paper in one hand, and with a quick downward motion (think karate chop!), use your other hand to 'chop' the paper and pull it out from under the object.
- Can you go bigger?

Links to real life

Inertia can be experienced in lots of everyday situations. When you are standing in a moving bus you lean forward when the brakes are applied suddenly. This is because your body is in motion along with the bus. When the bus stops quickly, the lower part of your body comes to rest along with the bus, whereas the upper part of your body continues to move forwards.

Links to the Science Museum

Galleries:

- Launchpad

Further information

- Gravity-Defying Water
- Alka-Seltzer Rocket
- Stupid Egg Trick