

## Investigation Report (Year 8): Coffee Cup Evaluation

### Which coffee cup is best?

#### Aim

To determine which coffee cup is the best choice for a coffee shop to use based on its cost, insulation ability and whether it is biodegradable.

#### Introduction

Insulators are materials that do not conduct heat very well. Conductors are materials that pass on heat quickly between objects.

#### Hypothesis

The Styrofoam cup will be the best insulator and may also be the cheapest cup. It may not be biodegradable though and so might not be the best choice for the environment.

#### Materials

- 6 different coffee cups with lids
- 6 analogue thermometers
- Electric kettle
- Stopwatch
- Measuring cylinder
- Beaker

#### Method

1. Collect six different types of coffee cups and their lids.
2. Label the cups 1 to 6.
3. Collect six thermometers.
4. Put some tap water into a beaker and place all six thermometers in there.
5. Check to see that all of the thermometers show the same temperature after about 5 minutes.
6. Use a pen to place a hole in the top of each coffee cup. Try to make the hole so that the thermometer fits into it tightly and so that there are no cracks in the plastic of the lid.
7. Fill an electric kettle with water and boil.
8. Measure 200 ml of water using a measuring cylinder and place it into the first cup.
9. Repeat for the other five cups and put their lids on with the thermometers through the holes, making sure that the thermometers are submerged in the water to the same depth.
10. Record the temperature of the thermometers after every minute according to the stopwatch for 20 minutes.
11. Repeat the experiment twice.

Clear title and section headings to identify the stages of the report

Third person used

Present and future tenses used in Aim and Hypothesis sections

No contractions

Bulleted list of required items

Verbs to begin each step of the procedure

Use of scientific terms (eg. *measuring cylinder, thermometers, depth*)

## Results

Table 1 – Cost and material

Cost and material

| Cup | Cup Cost (\$) | Lid Cost | Total Cost | Material                                    |
|-----|---------------|----------|------------|---|
| 1   | 0.15          | 0.04     | 0.19       | Styrofoam cup and plastic lid               |
| 2   | 0.49          | 0.14     | 0.64       | Biodegradable cardboard cup and plastic lid |
| 3   | 0.31          | 0.04     | 0.35       | Cardboard cup and plastic lid               |
| 4   | 0.46          | 0.05     | 0.51       | Cardboard cup and plastic lid               |
| 5   | 0.42          | 0.21     | 0.63       | Cardboard cup and plastic lid               |
| 6   | 0.12          | 0.21     | 0.33       | Cardboard cup and plastic lid               |

Recording of research results in appropriate format with observations (quantitative and qualitative data)

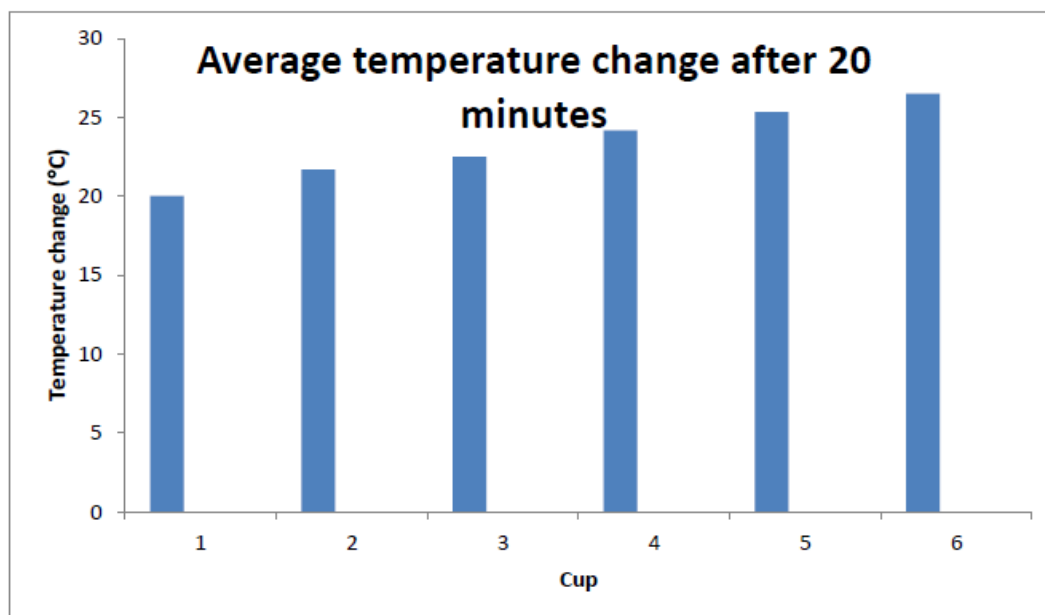
Clear labels for tables and figures

Table 2 – Temperature change after 20 minutes

Temperature change after 20 minutes

| Cup | Test 1 (°C) | Test 2 (°C) | Test 3 (°C) | Average (°C) |
|-----|-------------|-------------|-------------|--------------|
| 1   | 23          | 18          | 19          | 20           |
| 2   | 23          | 21          | 21          | 21.67        |
| 3   | 23          | 22.5        | 22          | 22.5         |
| 4   | 26          | 23.5        | 23          | 24.167       |
| 5   | 27          | 25          | 24          | 25.33        |
| 6   | 27          | 28.5        | 24          | 26.5         |

Figure 1 – Average temperature change after 20 minutes



|   |  |
|---|--|
| <p><b><u>Discussion</u></b></p> <p>Cup 1 was the best insulator. The temperature loss took place in all of the cups due to something called conduction. Conduction is the transfer of heat energy from one substance to another. In this experiment, heat was conducted from the water to the cups by conduction. This took heat energy away from the water which caused the temperature to drop. Styrofoam material does not conduct heat well and so is called an insulator. Cup 1 was a Styrofoam cup which allowed it to maintain the temperature of the water the best by losing the least amount of heat energy. The Styrofoam in cup 1 was also several times thicker than the materials the other cups were made of, adding to its insulating properties.</p> <p>Cup 1 maintained the temperature of hot water for the longest and so is the best insulator out of the six cups. It is also the cheapest so would be a good decision for the coffee shop based on money. The problem with this cup though is that it is the least biodegradable so a coffee shop might not want to use it. Cup 2 is totally biodegradable and was a good insulator but was quite expensive. So cup 3 might be the best choice. The cardboard cup would be biodegradable, even though the lid would not be, it is a medium insulator and is not too expensive.</p> <p><b><u>Conclusion</u></b></p> <p>Taking into account all of the variables, cup 3 is the best choice for the coffee shop because it has a good balance of the three properties of cost, insulation and biodegradability.</p> <p><b><u>Bibliography</u></b></p> <p>Milton, Chris, 2013, <i>Global Science in Action</i>, Oxford, South Melbourne, Victoria.</p> | <p>Mixture of past, present and future tenses</p> <p>Discussion features paragraphs</p> <p>Relevant scientific language adds authenticity analysis and conclusions presented</p> <p>Cause and effect language and phrases used when discussing results</p> |
| <p>Adapted from: ACARA, Work Sample 7, Work Sample Portfolio Year 8 Above Satisfactory. Retrieved 27 October, 2014.</p> <p><a href="http://www.acara.edu.au/curriculum/worksamples/Year_8_Science_Portfolio_Above.pdf">http://www.acara.edu.au/curriculum/worksamples/Year 8 Science Portfolio Above.pdf</a></p>  |  |