**Investigating heat transfer by conduction**

**Levels:** 3-4 **NoS achievement aims:** Investigating in science   
**Topic:** Heat transfer **Contextual strands:** Material world, Physical world

**Rationale**

Heat energy moves from regions of high to low temperature and can be transferred by conduction from one object to another if they are touching.

While investigating heat transfer by conduction, students will make decisions about appropriate approaches and methods for gathering specific information.

**What you need**

* A range heat conductors and heat insulators, e.g., metals, glass, wood, ceramics, cardboard plastics. Each sample needs to be the same thickness & flat, approx 50 × 50 cm2.
* Thermometers (alcohol not mercury).
* Measuring cups (250 ml).
* A hot-water bottle, A ‘tin’ mug, a ceramic mug, and an insulated (tramping) mug.
* Heat Energy SLH resource - <https://www.sciencelearn.org.nz/resources/750-heat-energy>

**Focus**

* Can you think of situations when you might want to stop heat from escaping from somewhere?
* Are there times when you want something to heat up or cool down quickly?
* What are some different ways that we could investigate heating and cooling things?
* What do scientists need to consider when deciding how best to investigate something?
* Why do you think scientists use different methods to study the different parts of a big investigation?

**Exploration**

1. In groups, give students access to a range of the conducting and insulating materials.
2. Discuss with them whether each material is likely to let heat through quickly or slowly, and have them share their ideas about why this might be.
3. Tell them they will be grouping the materials into those that let heat through quickly (conductors), and those that let heat through slowly (insulators).
4. Ask each group to draw a table with two columns: hypothesis and observation. In the hypothesis column have them rank the materials from those that they think will let heat through quickly to those that they think will let heat through slowly.
5. Give each group a hot-water bottle full of very hot (but not scalding) water.
6. Ask students to take two materials at a time and hold them against the hot-water bottle.
7. Have them note which material is the better conductor (that is to say, heats up first).
8. Have them use this information to rank the materials in the ‘observation’ column.
9. Have the groups compare their ‘observation’ rankings and discuss why their rankings differ.
10. Have each group devise another method they could use that might provide a more accurate ranking.
11. Have the groups share their new methods.

**Reflection**

* Did all groups have the same order of conductors using the first method? Why/why not?
* How many different methods did the class suggest for improving the investigation? What were they? Were any very different to the others?
* What might be some benefits of investigating the same question in a lot of different ways?
* Why do you think scientists sometimes investigate the same issue using a range of different approaches and methods?
* How did you decide which methods were the most useful? What criteria do you think scientists might use to make the same decision?