

Ngā Matire — Rods

Approach: One to one

Focus: Predict and investigate the heat conductivity of different materials, and explain practical applications.

Resources: 5 rods, picture of saucepan, , timer, mug, paper towel, water (boiling), electric jug.

Questions/instructions:

In this activity you are going to find out and tell me about how quickly different materials let heat through them.

Show student the rods as you name them.

1. Here are 5 rods. They are made of wood, perspex, copper, steel and aluminium.

I am going to put them into this cup then pour in boiling water. Then I will get you to touch the end of each rod to find out how much heat they are letting through.

2. But before we start, can you tell me which rod you think will let the heat move through most quickly?

Prediction for first:

I tēnei mahi ka whakamātau koe i te tere o te kawewera a ētahi rauemi, ā, ka whakamārama mai ai ki a au.

Whakaaturia ngā matire ki te ākonga i a koe e whakaingoa haere ana.

1. Anei ētahi matire e rima: kua hangaia ki te rākau, te kiriaku puata [perspex], te konukura [copper], te tīra [steel], me te konumohe [aluminium].

E kuhua ana e au ki roto i te maka, ka riringi ki te wai wera. Māu e whāwhā ngā tōpito o ia matire kia mātau ai pēhea te nui o te wera kei te kawea.

2. Engari, i mua i te tīmatatanga, ka taea e koe te kī mai ko tēhea te matire tino tere ki te kawewera?

% responses

GED MI

copper	23	23
aluminium	18	25
steel	19	30
perspex	19	9
wood	21	13

3. Why do you think that rod will let the heat through most quickly? (not marked)

4. Now let's do the experiment.

I am going to pour boiling water into the mug, and I want you to test each rod.

When you test the rods, touch them like this:

Demonstrate how the rods should be touched — before the boiling water is added. Demonstrate use of timer.

I will get you to check them every 30 seconds, for two minutes.

With the rods already in the mug, pour boiling water into the mug, and get ready to time the 30 sec intervals.

Repeat the following instruction 4 times (every 30 seconds).

5. Feel each rod now, and tell me what you notice.

After 2 minutes of feel tests:

3. He aha koe i whakaaro ai koianā te matire tino tere ki te kawewera i te wera? (not marked)

4. Me whakamātautau ināianei.

E ringihia ana e au he wai wera ki roto i te maka, ā, māu e ārohi ia matire.

Ka ārohi koe i ngā matire, me pēnei te pā.

I mua i te ringihanga ki te wai wera, whakaaturia me pēhea te pā atu ki ngā matire. Whakaaturia te whakamahinga o te mata wātī.

Mō te 2 meneti, me ārohi e koe ia 30 hēkena.

Kua kuhua nei ngā matire ki roto i te maka, ringihia ki te wai wera, ka whakarite ai i ngā wā e toru tekau hēkena.

Hokia anō ngā tohutohu e whai ake nei mō ngā wā e 4 (ia 30 hēkena).

5. Whāwhātia ia matire ināianei, ā, ka kī mai he aha tāu i rongo ai.

Ka taha te 2 meneti o ngā ārohi whāwhā:

6. Now lift each rod out of the water and place them on the table in order, from the one that let the heat through most quickly, to the one that let it through least quickly. Be careful to lift them out with a paper towel so that you don't burn your fingers.

6. Tangohia ake ngā matire i te wai, ka whakatakoto raupapa ki runga i te tēpu, mai i te mea tino tere ake ki te kawē i te wera, ki te mea āhua pōturi. Kia tūpato, me tango ake mā te tauera pepa kei wera o ringaringa.

Observations:

	% responses	
	GE	MI
copper first	78	85
aluminium second	69	83
steel third	76	91
perspex fourth	76	64
wood fifth	76	64

7. Materials that let the heat travel through easily are called **good conductors**. Which rods were good conductors of heat?

7. Ko ngā rauemi hanga noa te kawē wera ka karangatia he **kawenga pai**. Ko ēhea ngā matire kawenga pai?

copper	96	91
aluminium	94	69
steel	55	32

8. When toffee is made, the ingredients are made very hot, a lot hotter than water. If we had spoons made out of each of these materials, which spoon would be the best for stirring the very hot toffee mixture?

8. Kia mahia he tawhi, ka kōhuatia, kia tino wera, kia wera noa atu i te wai. Mehemea i hangaia ngā koko ki ia rauemi, ko tēhea te koko tino pai hei kōrori i te ranunga tawhi tino wera?

wood and/or perspex	4	2
wood	56	83
perspex	10	6
copper	15	4

9. Why would you use that material?

9. He aha koe i tohu ai ko tēnā rauemi?

not good conductor of heat	60	80
----------------------------	----	----

Show student the picture of a saucepan.

The saucepan in this picture is made of stainless steel. It has a copper bottom, and a plastic handle.

10. Why do you think it has a copper bottom?

Whakaaturia te pikitia o te kōhua ki te ākonga.

He kōhua tīra kore waikura tēnei i roto i te pikitia nei. He kapa a raro, he kirihou te kakau.

10. Ki ōu whakaaro: he aha i kapa ai a raro

conducts heat well	81	89
--------------------	----	----

11. Why do you think it has a plastic handle?

11. Ki ōu whakaaro: he aha i kirihou ai te kakau?

conducts heat poorly	94	93
----------------------	----	----

Commentary:

Overall, the results achieved by GE (General Education) and MI (Māori Immersion) students were not statistically significantly different.