

# The Amazing Coffee Keeper

Whether you are designing a building, a winter jacket, or a lunch bag, the choice of materials and their arrangement affect the final function of the product. Understanding how energy transfer works allows you to design a product that efficiently manages the transfer of energy.

## SKILLS MENU

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| <input type="checkbox"/> Identify a Problem/Need           | <input type="checkbox"/> Designing     |
| <input type="checkbox"/> Planning                          | <input type="checkbox"/> Testing       |
| <input type="checkbox"/> Selecting Materials and Equipment | <input type="checkbox"/> Modifying     |
|  | <input type="checkbox"/> Communicating |

## Scenario

Every Saturday morning, your dad pours himself a cup of coffee, and then he gets busy around the house. By the time he has a chance to drink his coffee, it is cold. Your dad has asked you to design a device that will keep his coffee warm until he has time to drink it.

## Design Brief

You are to build a device that will keep 300 mL of hot water warm for at least 30 min. The device must fit easily on a kitchen table, cannot include any form of heater, and must allow water to be easily poured in and out. Use materials efficiently to keep costs low. All materials must be safe for use in the classroom and home.

## Research and Consider

Research similar devices, such as a Thermos. Find out how a Thermos is constructed. How does each component help to prevent energy transfer?

Go to Nelson Science



With your team, brainstorm possible solutions to this problem, following the design brief. Draw sketches for three different designs.

## Plan and Construct

1. Select the best design. Complete a scale drawing of the selected device.
2. Write a list of materials and tools that you will need. (Reduce, reuse, recycle!)

3. Write a step-by-step plan for creating the device. Ask your teacher to approve both the list of materials and the plan.



Use care when cutting materials and when handling hot substances.

4. Once you have approval, build your device.

## Test and Modify

Test how well your device keeps just-boiled water hot for 30 min. How much did the temperature of the water change during that time? Note any problems, and then modify your design to correct these problems. Continue correcting your design until it meets the design criteria.

## Evaluate

- (a) Describe how your device prevented energy loss by (i) conduction, (ii) convection, and/or (iii) radiation.
- (b) What were some of the design challenges that you encountered? How did you overcome them?
- (c) If you were to do this project again, what would you do differently? Explain.

## Communicate

Prepare a short presentation to a potential investor to explain how your device works. Your presentation should demonstrate how your device is used, explain how it prevents heat transfer, and include the results of the testing.