Lesson 1: How do microwave ovens function, and why does their structure affect wireless signals?

Safety Precaution

Safety Precautions

This lesson requires the use of a microwave oven, which can pose safety risks when used improperly. Before teaching this lesson, please review the safety precautions in the front matter and the *Teacher Guide* for setting up and running each investigation, as well as taking down, disposing of, and storing materials.

Exploring a New Phenomenon

On your own

1. Read about how some people are using microwave ovens for functions other than cooking.
    - Why would someone want to put their phone or car keys in a microwave oven?

Turn and talk

2. What do you predict will happen when we try to connect to the device **in the microwave oven** (when it is off)?

3. What experiences or ideas support your prediction?

On your own

4. Make a T-chart on a sheet of paper for your notebook, and record your noticings and wonderings.

Turn and talk

5. What do you know about how microwave ovens function to heat food that could help explain why the structure of a microwave oven affects wireless signals?

With your class

6. What experiences or ideas do you have that suggest microwave technology might pose a risk?

7. Where could we find more information about how to use this microwave oven safely?

Read the Microwave Oven Manual

With a partner

8. Read the *Microwave Oven Manual.*
   - In red, underline the safety precautions we should always follow when using the microwave oven.
   - In blue, circle ideas that could help us figure out how the microwave oven functions, and why it affects wireless signals.
   - Record any wonderings that the manual raised for you on your Notice and Wonder chart.

Prioritizing Safety

With your class

9. What precautions do we need to consider before we run the microwave oven?

Debrief the Manual

With your class

10. What ideas could help us figure out how the microwave oven functions, and why it affects wireless signals?

11. What else in the manual do you notice/wonder about?

Exploring a New Phenomenon

On your own

12. Record your noticings and wonderings about running the microwave oven.

Create an Initial Model

On your own

13. Make a model of the **parts** and **interactions** in the system that will explain:
   - how the microwave oven heats up food/liquid
   - why the music was affected when the device was inside the microwave oven, especially when the speaker was farther away

Provide Feedback on Initial Models

On your own

14. Switch models with a partner.
    - What frames (matter, energy, forces) did your partner use to develop their model? Do you agree with the way your partner applied these frames?
    - Where you agree, place a small check to indicate a change in matter (✓), a transfer of energy (✓), or evidence of forces (✓).

On your own

15. How well does your partner's model explain how the microwave oven functions to heat liquid and food?

16. How well does your partner's model explain why the music was affected when the device was inside the microwave oven?

17. Use sticky notes to indicate the areas where you have questions, and write your specific questions on the sticky notes.

Incorporating Peer Feedback

With a partner

18. Discuss your feedback on your partner's model, and listen carefully to your partner's feedback on your model.

On your own

19. Use your partner's feedback to revise your own model.

Building a Consensus Model

With your class

20. Develop a consensus model to explain:
    - how the microwave oven heats food/liquid
    - why the music was affected when the wireless device was inside the microwave oven, especially when the speaker was farther away

Gathering More Experiences

Home learning

21. Ask your friends and family about their experiences with microwave ovens and wireless technology.
    - What ideas or questions do they have about microwave technology?
    - Do they prefer to cook with a microwave oven or with a different device? Why?
    - What other experiences have they had of a wireless signal being deleted?

Broadening to Related Phenomena

With your class

22. What related phenomena have we experienced or heard about in which a wireless signal is distorted?

23. What other phenomena related to microwave ovens have we experienced or heard about?

What is unique about a microwave oven?

Turn and talk

24. How are microwave ovens different from other cooking devices?

25. Would another type of cooking device affect the signal the same way as the microwave oven? Why or why not?

26. Add any wonderings that come up to your Notice and Wonder chart.

Broadening to Related Technology

On your own

27. What are some other human-made technologies that you think might use similar structures or mechanisms to function?
    - How do you know?

Developing Questions for the DQB

On your own

28. Consider the resources you have gathered over the past few days, including:
    - your Notice and Wonder chart
    - the *Microwave Oven Manual*
    - our class consensus model
    - conversations with friends/family
    - our Related Technology and Phenomena poster

Building the Driving Question Board

With your class

29. Choose a volunteer to go first. This student reads their question and then posts it on the DQB.

30. Raise your hand if you have a question that is related or the same. The first volunteer selects the next student whose hand is raised. The student who is called on reads the related question, says why or how it relates, and then moves it onto the DQB with the original question.

31. That student who added the sticky note selects the next student, who will read another related sticky note and move it, and then call on the next student.

32. Continue until everyone has at least 1 question on the DQB.

Ideas for Investigations and Data

On your own

33. What additional **investigations** could we carry out and what **data** could we collect to figure out the answers to our questions?

Exit Ticket

On your own

34. What is an investigation we could do that could help us understand more about the **structure** of a microwave oven? What could this investigation tell us?

35. What is an investigation we could do that could help us understand more about the **function** of a microwave oven? What could this investigation tell us?