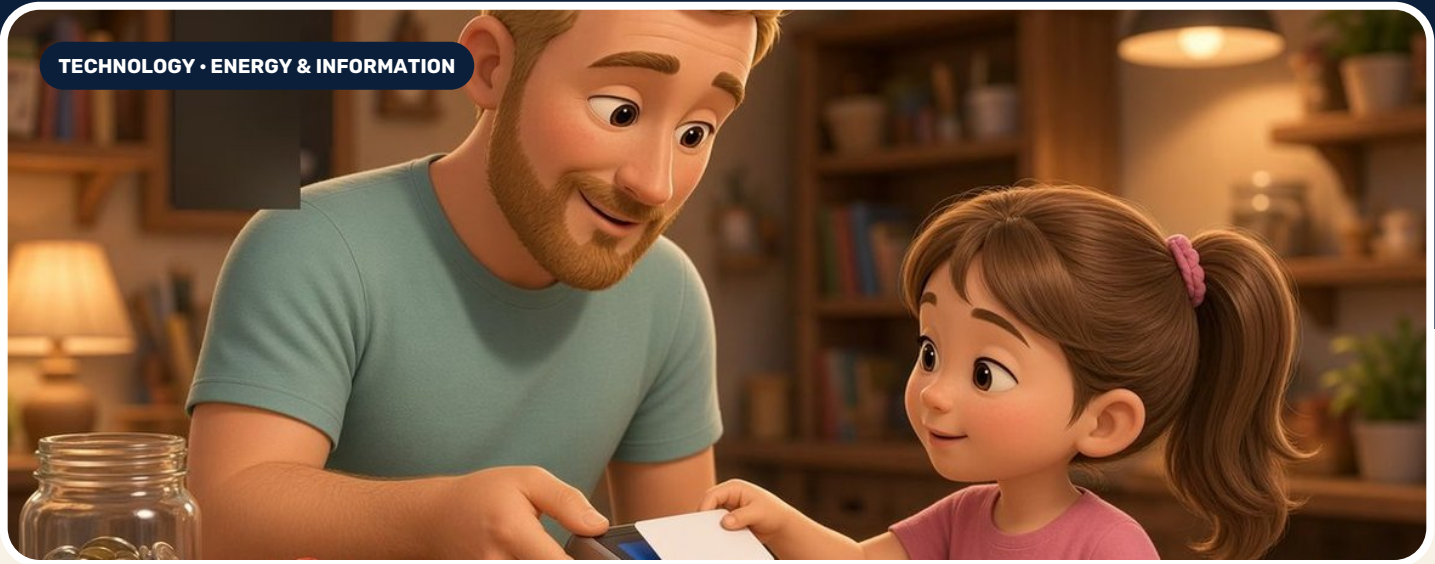
DAD, HOW DOES IT WORK?
A science podcast for curious kids

EPISODE 45

LISTEN & DISCUSS • TEACHER GUIDE

How Does Tapping a Card Actually Pay?

Beep! A grown-up taps a card and the shopping is paid for. But did any money actually move?



GRADES	TIME	FORMAT	STANDARDS
K–4	**~40 min**	**Listen + do**	**NGSS**
Ages 5–10	incl. 5-min episode	Talk · activity · exit ticket	4-PS4-3, 4-PS3-2

INSIDE THIS GUIDE

2 **Lesson overview** objectives · science background · vocabulary · standards

3 **Lesson plan** step-by-step timing · discussion · hands-on activity

4 **Student page** printable exit ticket

5 **Answer key & extensions** answers · differentiation · Try it at home

Scan to listen
Free transcript on the episode page

BEFORE YOU TEACH

Lesson overview

Learning objectives

Students will be able to…

1. Explain that the card has no battery; its chip gets a tiny bit of energy from the reader when very close.
2. Describe paying as a chain of messages: card → shop's reader → bank → "yes" back to the shop.
3. Explain that the beep means a promise to pay, and the money moves later.

The science in 60 seconds

Background for the teacher, drawn from the episode.

- Inside the card are a tiny computer chip and a thin loop of wire around the edge that works like an **antenna**. There is no battery.
- The reader makes a small, invisible energy field. Only when the card is very close (within an inch or two) does the field give the chip enough energy to wake up, so you can't pay by accident from across the shop.
- The chip makes a brand-new secret **code** for each tap. It doesn't just hand over the same account number, so a copied code won't work again.
- The message races to the bank, which checks: Is the card real? Is there enough money? Was it reported lost? If all is OK, a "yes" races back, all in about two seconds.
- That "yes" is a promise to pay (an authorization). The real money moves to the shop later, often overnight, which is why apps can show a purchase as "pending."

BEFORE CLASS: PREP CHECKLIST

- ☐ Test the episode audio (QR code on the cover).
- ☐ Gather the activity materials (page 3).
- ☐ Print the student page (page 4), one per student.

THE BIG IDEA

A tiny chip in the card wakes up using energy from the reader, sends a secret one-time code, and the bank sends back a fast "yes": a promise to pay. The real money moves later.

Key vocabulary

Chip
A tiny computer inside the card.

Antenna
A thin wire loop that picks up energy and signals.

Contactless
Paying by holding a card very close to a reader.

Code
A secret message. The card makes a new one every tap.

Promise
The bank's "yes": it agrees to pay the shop later.

WATCH FOR THIS MISCONCEPTION

Students may think: "Money flies out of the card into the machine."

Actually: The card sends a message, not money. The bank promises to pay, and the money moves later.

NGSS CONNECTIONS (PERFORMANCE EXPECTATIONS)

4-PS4-3 — **Generate and compare multiple solutions that use patterns to transfer information.** How this lesson connects: The card sends a coded pattern to share information safely. Students invent and compare their own codes.

4-PS3-2 — **Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.** How this lesson connects: The reader passes a tiny bit of energy across a small gap to power the chip.

This short lesson builds toward these expectations; it does not fully assess them on its own.

STEP BY STEP · ABOUT 40 MINUTES

Lesson plan

ENGAGE 5 min

Spark curiosity

Ask: "When a grown-up taps a card in a shop, where does the money go?" Give students 30 seconds to sketch their idea, then share a few.

LISTEN 5 min

Play the episode

Play the episode from the QR code on the cover or the episode page. Give students two things to listen for:

- How does the chip wake up without a battery?
- When you hear the beep, has the money moved yet?

DISCUSS 8 min

Talk about it

Use think-pair-share: 30 seconds to think, a minute with a partner, then share. Model answers are on page 5.

1. The card has no battery inside. How does its little chip wake up?
2. When you hear the beep, has the money moved to the shop yet? What happened instead?
3. How is the lemonade-stand promise like paying with a card?

EXPLORE 15 min

Hands-on: Permission-note relay

1. Set up the Shop (Reader) at one desk and the Bank across the room.
2. The Shopper "taps" the paper card on the Reader. It only works if the card is very close: a short range, like the real thing.
3. The Shopper writes a new secret code (3 symbols) on a sticky note. The Runner races it to the Bank.
4. The Bank checks: card real? enough money? not reported lost? It writes YES and the Runner races back. Reader says "Beep!" Did any coins move? Not yet! At the "end of the day," the Bank moves the coins to the shop's jar. Bonus: try reusing an old code. The Bank says no!

MATERIALS

- Paper "cards" (one per shopper)
- Sticky notes and markers
- Pretend coins and a jar for the shop
- A toy or picture to "buy"
- Role signs: Shopper, Reader, Runner, Bank

Safety: Use pretend cards only. Never share real card numbers, PINs, or codes.

WRAP UP 5 min

Exit ticket

Hand out the student page (page 4). For K–1, read each item aloud and let students circle, point, or draw. Return to the guesses from the start: what changed?

Name _____ Date _____

How Does Tapping a Card Actually Pay?

Show what you learned! Circle, write, or draw.

1 **Where does the chip get its energy?** Circle one.

- **a)** a battery inside the card
- **b)** the reader's energy field, when very close
- **c)** the shopper's hand

2 **True or false? Circle T or F.**

The card sends the same code every time. **T** **F**

The beep means the bank said "yes." **T** **F**

3 **Fill in the blanks. Use the word bank.**

Word bank: **chip** **code** **promise**

The _____ wakes up near the reader. It sends a secret _____ to the bank. The bank sends back a _____ to pay.

4 **Draw the path of the message: card → reader → bank → back to the shop. Use arrows.**

Label your drawing!

FOR THE TEACHER

Answer key & extensions

Talk about it: model answers

1. The card has no battery inside. How does its little chip wake up?

> The reader makes a tiny invisible energy field. When the card's wire loop comes very close, the field gives the chip just enough energy to wake up.

2. When you hear the beep, has the money moved to the shop yet? What happened instead?

> No. A secret one-time code raced to the bank, the bank checked it and sent back "yes": a promise to pay. The real money moves later.

3. How is the lemonade-stand promise like paying with a card?

> You hand over lemonade because you trust a promise to be paid later. At the shop, the bank's "yes" is that promise, and the money comes later.

Exit ticket answers

1. b) the reader's energy field, when very close

2. F: The card sends the same code every time. · T: The beep means the bank said "yes."

3. chip, code, promise

4. Look for: arrows in the order card → reader → bank → back to the shop.

Quick-check rubric

Got it	Getting there	Not yet
Explains the big idea in their own words and uses 2+ vocabulary words correctly.	Explains part of the idea, or needs a prompt or the word bank.	Can't yet explain it. Revisit the activity, then retry the exit ticket orally.

Differentiation

Grades K–1: Whole-class role play with the teacher as the Bank. Focus on one idea: the card sends a message, not money.

Grades 2–4: Time the relay and compare it with "about two seconds." Draw the steps as a flow chart with arrows.

Keep wondering

- Invent a secret code (colors, claps, or symbols) that changes every time. How could the bank tell it's really you?
- What else works by tapping? Many bus cards and door key cards use the same idea.



TRY IT AT HOME

Listen for the beep

Next time you shop together, listen for the beep and ask: "Has the money moved yet?" If you like, show a "pending" purchase in a banking app (no card numbers needed). Remind kids that card numbers and codes stay private.

Listen together