

The Spring Fair Cup Decision: Score It, Then Defend It

Investigation question: Using eight information cards of unequal credibility, which of four cup materials should the school's spring fair buy for 600 cold drinks, and what trade-off does that choice force the school to accept?

Data-driven decision

Groups of 4

1 session

Setup 5 · Activity 42 · Cleanup 3 min

MS-PS1-3 · assesses

MS-ETS1-2 · practice

Name _____

Group _____

Date _____

Your role today

- ☐ **Card reader:** Reads each card aloud in full before any discussion, and rereads any sentence the group wants to rely on.
- ☐ **Fact checker:** Leads the credibility rating of each card using the four questions, and flags any claim the group is about to use from a low-rated card.
- ☐ **Scorer:** Fills the decision matrix cell by cell, writing the card number that supports each score, and adds the totals.
- ☐ **Spokesperson:** Writes the group's decision and the trade-off paragraph, and presents the choice to the class in under one minute.

Safety

- Paper cards only; no chemicals or equipment are used. Sample cups are for looking at, not for drinking from, since their history is unknown.
- Keep the discussion about materials and evidence, not about any student's family food, drink or money choices.

Procedure

1. The card reader reads all eight cards aloud before anyone scores or argues. Each person privately writes a first choice of cup in q1 and one reason.
2. Rate the cards. For each card, the fact checker asks the four credibility questions and the group records a rating of high, medium or low in the credibility table with a one-phrase reason. Any card rated low may be used only as an example of a claim to test, not as evidence for a score.
3. Read the three criteria and the constraint on the recording sheet. Agree as a group on what each score of 0, 1 and 2 would look like for each criterion, using the rubric callout.
4. Score the matrix one criterion at a time across all four cups, not one cup at a time; this keeps the comparison fair. Beside each score write the number of the card that supports it.

5. Check the constraint: compute what 600 drinks would cost with each cup from the budget card and mark pass or fail. For the reusable cup, work out how many cups you could buy within the budget and how many times each would need to be refilled to serve 600 drinks.
6. Add the scores. A cup that fails the constraint cannot be chosen no matter its total; mark it out.
7. Decide. If two cups tie or sit within one point, the group decides which criterion matters most for this event and says why. The spokesperson writes the decision and the trade-off paragraph: the cost or problem the school accepts by making this choice.
8. Post the decision and trade-off on the board. Listen to the other groups; if two groups chose differently from the same cards, note in q2 what they weighed differently.
9. Answer the analysis questions individually.

Record your observations

Lab 2 recording sheet: The spring fair cup decision

What is real and what is invented on these cards — Cards 1 to 5 describe real materials and real landfills; the facts on them are accurate in general terms. Cards 6 and 7 describe an invented school, invented prices and an invented event so that every group works from the same situation; they are a teaching scenario. Card 8 is an invented advertisement written to be rated, not believed.

Information cards (teacher prints and cuts apart; 8 cards)

Card 1

CARD 1. PET plastic cup. Source type: a material fact sheet published by a packaging trade association. PET (polyethylene terephthalate) is a polyester plastic. Its two building-block molecules are made from petroleum and natural gas by cracking and other chemical reactions, then joined into long chains. The chains make a clear, tough plastic that bends a little without shattering. PET carries the recycling code 1, and most U.S. curbside programs accept PET bottles; recycled PET is made into new bottles, fleece fabric and carpet. Even so, government figures show that under a third of PET bottles and jars in the United States were recycled in 2018, and the rest went to landfills or incinerators. PET does not biodegrade on any useful timescale; pieces that reach rivers or the ocean last for decades.

Card 2

CARD 2. Paper cup with a plastic lining. Source type: a state university extension fact sheet. A paper cold cup is made from wood pulp, a renewable resource when the forest is replanted, and lined on the inside with a very thin layer of polyethylene, a plastic made from petroleum or natural gas, so the drink does not soak through. The lining is what makes the cup hard to deal with afterward: most paper mills cannot separate it from the fiber, so most U.S. recycling programs do not accept lined cups, and the plastic lining does not break down in compost, so composting programs usually reject lined cups. Lined paper cups usually end up in a landfill. Over an hour or two, a cold drink softens the rim and seams of a paper cup.

Card 3

CARD 3. PLA cup. Source type: a state university extension fact sheet. PLA (polylactic acid) starts as corn starch. Enzymes break the starch into glucose, microbes ferment the glucose into lactic acid, and a chemical process joins lactic acid molecules into long chains. The cups are clear and stiff and look almost exactly like PET. PLA is certified compostable, but only at an industrial composting facility that holds it hot (around 58 °C) and moist for weeks; the standard it is tested against requires 90 percent of its carbon to be turned into carbon dioxide within 180 days. In a backyard pile, a landfill or a lake, PLA lasts for years. PLA carries the code 7 and must not go in with PET recycling, where it can spoil the batch. It softens above about 55 °C, so it is for cold drinks only, and it can crack when squeezed hard. Growing the corn for it uses farmland, water, fertilizer and fuel.

Card 4

CARD 4. Reusable polypropylene cup. Source type: a material fact sheet published by a packaging trade association. Polypropylene (PP, code 5) is made by joining propylene molecules, which come from petroleum and natural gas, into long chains. A thick-walled PP cup is tough, survives being dropped, and lasts through hundreds of trips through a dishwasher. Reuse is what changes its environmental footprint: studies that follow a cup through its whole life generally find that a reusable plastic cup must be used dozens of times, and washed efficiently, before it comes out ahead of single-use cups on energy and waste; washing each cup under a running hot tap can cancel the advantage. Fewer recycling programs accept PP than PET. A PP cup does not biodegrade.

Card 5

CARD 5. What happens inside a landfill. Source type: a county solid-waste agency web page. Trash in a modern landfill is compacted and covered with soil each day. Within about a year the buried layers run out of oxygen, and the bacteria that break down food, paper and yard waste there give off landfill gas, roughly half of which is methane, a greenhouse gas far stronger than carbon dioxide over its first decades in the air. Many large landfills collect part of this gas and burn it for energy; smaller or older ones may not. Plastics in a landfill mostly do not break down; they take up space and stay there. So a material that breaks down quickly in a landfill is not automatically a benefit, and a material that does not break down is not automatically harmless.

Card 6

CARD 6. Our school's situation (teaching scenario). Source type: a note from the custodian and the parent council. The fair runs for three hours on a Saturday in April, and 600 cold drinks will be served. The school's recycling bin takes items marked 1 and 2 (bottles, jugs and PET cups); the hauler has sent back loads with other plastics mixed in. The nearest industrial composting facility is 140 km away, and the hauler does not collect food waste or compostable packaging from the school. Trash goes to the county landfill, which collects some of its gas. The cafeteria has a three-basin sink and dish soap, and four parent volunteers have offered to run a wash station for the whole event. Water use is metered and the town is under drought rules this year.

Card 7

CARD 7. Budget memo (teaching scenario). Source type: the parent council treasurer. The council can spend at most \$75 on cups. Supplier quotes: PET 16-ounce cold cup, 7 cents each; lined paper cold cup, 9 cents each; PLA cold cup, 11 cents each; reusable polypropylene cup, 60 cents each. Reusable cups can be bought in any number, refilled during the event after washing, and kept for next year's fair. Soap and washing tubs are already owned by the cafeteria and cost nothing extra.

Card 8

CARD 8. Advertisement (invented, for rating). Source type: the website of a cup seller. EarthSip Cups: made from plants, not oil! Our cups are 100 percent natural and earth-friendly. When you are done, just toss them away and nature takes care of the rest. Chemical-free. Trusted by families everywhere. Choose the cup the planet would choose.

Credibility rating (complete before scoring)

Card	Who wrote it, and do they gain if you believe it?	Are the claims specific and testable?	Is evidence or a condition given?	Rating (high / medium / low)
1				
2				
3				
4				
5				
6				
7				
8				

Scoring rubric: 0, 1 or 2 for each criterion – Criterion A, renewable origin: 2 = made mostly from a resource that regrows within years; 1 = partly renewable, partly from petroleum or natural gas; 0 = made from petroleum or natural gas. **Criterion B, sturdy for the event:** 2 = holds a cold drink for the whole event with no softening or cracking; 1 = works but softens, cracks when squeezed or needs care; 0 = fails. **Criterion C, handled responsibly after use at this school:** 2 = reused, or recycled or composted by a program this school actually has; 1 = could be recycled here in principle but much of it will still be thrown away; 0 = goes to the landfill. **Constraint, budget:** 600 drinks served for \$75 or less, counting washing and refilling if the cup is reusable. Pass or fail; a fail cannot be chosen.

Decision matrix (write the score and the card number that supports it, for example '2 (card 3)')

Cup	A: renewable origin (0-2)	B: sturdy for the event (0-2)	C: handled responsibly here (0-2)	Total (0-6)	Budget: cost for 600 drinks and pass/fail
PET plastic cup					
Paper cup with plastic lining					
PLA cup					
Reusable polypropylene cup					

- Before rating or scoring: which cup would you pick, and why, in one sentence?

2. Our group's decision and the trade-off we accepted (what the school gives up or has to deal with because of this choice). If another group chose differently from the same cards, what did they weigh more heavily than we did?

Analysis questions

3. Complete the trace for each cup: the natural resource it comes from, one chemical process on the way, and what happens to it after the fair at this school.

Natural resource	One chemical process	After use at this school
PET cup		
Lined paper cup		
PLA cup		
Reusable PP cup		

4. Which card did your group rate lowest, and which two of the four credibility questions did it fail? Quote or describe one specific claim on it and explain what you would need to see to test that claim.

5. The PLA cup is certified compostable, yet it should score low on criterion C at this school. Explain why, using two cards, and describe what would have to change at the school for PLA to score a 2.

- 6.** Card 4 says a reusable cup must be used dozens of times before it beats single-use cups. Use the numbers from cards 6 and 7 to work out how many reusable cups the budget allows and how many times each would be used at this fair. Does the fair alone reach 'dozens'? What else would have to happen?

- 7.** Every material choice moves costs and benefits between groups of people. For the cup your group chose, name one group that benefits and one group that pays something (money, time, water, landfill space or risk), and explain.

- 8.** A classmate says, 'The paper cup is natural, so it is obviously the best choice for the environment.' Respond with evidence from at least two cards, and finish with a sentence about whether 'natural' by itself tells you how a material affects the environment.
