WHY DO THINGS FALL?

A Physics 11 lesson about models, gravity, and a very useful wrong answer.

A formula is coming. It just does not get to be the first thing students see.

INTEL

TIME: 65-75 minutes
WHERE IT FITS: Physics 11 - dynamics / gravitation
MATERIALS: board, paper, pens, projector
GROUPING: alone -> groups -> class
CORE QUESTION: Why do objects fall?

WARNING - WRONG ON PURPOSE

After students meet Aristotle, tell them the deal clearly: their group is going to reconstruct an explanation for why objects fall that they already know will not be the modern answer. Their job is not to guess Aristotle's exact answer. Their job is to make a model that could have been convincing.

WHY THIS MATTERS

This changes the emotional job. Students are not trying to look smart or find the answer first. They are trying to reason from what they can observe, defend an idea, and notice what would make a model more or less believable.

Historical note: Aristotle's natural philosophy remained influential for roughly two thousand years. The point is not that everyone simply believed something silly. It is that a serious model can make sense for a long time before new observations and new questions reveal its limits.

THE THINKING ARC

STEP 1 – OPEN WITH THE QUESTION

5 MIN

Ask: “Why do objects fall?” Let students answer freely. When someone says “because gravity,” acknowledge it, then ask: “Explain it without using the word gravity.”

STEP 2 – MAKE THE QUESTION BIGGER

7 MIN

Add: “Why does the Moon not fall to Earth? Why does the Sun not fall?” Give quiet thinking time first. The point is not to catch students out. It is to make the question worth thinking about.

STEP 3 – MEET ARISTOTLE

5 MIN

Tell students about Aristotle: an ancient Greek philosopher and scientist who tried to explain why objects fall. His model was influential for roughly two thousand years. We now know it was incomplete, but it was not a silly idea. Given what people could observe, it made sense.

TEACHER MOVE

The constraint is the whole move. Knowing their model will be wrong removes the pressure to be correct. Students can focus instead on making careful, creative connections from the evidence they do have.

STEP 4 – RECONSTRUCT THE MODEL

15 MIN

Before revealing Aristotle's exact explanation, ask groups to create the kind of model he might have found convincing. No Newton. No modern technology. No invisible-force vocabulary. Ask: “What does your model explain well? What would it expect the Moon to do? What question does it leave behind?”

GROUP MISSION

Each group hands in: (1) the explanation it thinks Aristotle could have used, (2) what that model says about the Moon or Sun, (3) one observation it explains, and (4) one prediction it would make. The model may be wrong. The reasoning cannot be empty.

FROM A PLAUSIBLE MODEL TO A BETTER ONE

STEP 5 - REVEAL ARISTOTLE

8 MIN

Explain that Aristotle distinguished the earthly realm from the heavens. In his account, earthly materials moved toward their natural place, while the heavens followed different, circular motions. Ask: “Given what people could observe, why might this have felt convincing?”

STEP 6 - INTRODUCE NEWTON'S SHIFT

10 MIN

Newton proposed that Earth and the heavens follow the same laws. The gravitational interaction that pulls an object toward Earth also curves the Moon's path around Earth. The Moon is continually falling toward Earth while moving sideways.

STEP 7 - BRING IN THE EQUATION

12 MIN

Now introduce the law of universal gravitation. Connect the symbols to the story: mass matters, distance matters, and the same relationship applies here and in space. The equation now answers a question students have already had to sit with.

FORMULA

Newton's law of universal gravitation

$$F_g = \frac{Gm_1m_2}{r^2}$$

STEP 8 - EXIT REFLECTION

5 MIN

Ask students to explain why Newton's model was a major change from Aristotle's. Require one sentence about what Aristotle's model was trying to explain, not only why Newton's is accepted now.

TEACHER LANGUAGE

If a student says “because gravity”: “Yes, that is the word we use now. But what would count as an explanation?” When Aristotle is revealed: “He was not foolish. His model was a serious attempt to make sense of real observations with the evidence available at the time.”

EXIT TICKET

In 2-3 sentences, explain why Newton's model of gravitation was a major change from Aristotle's model. Include one thing Aristotle's model was trying to explain. Optional: What observation or question would make you want to test either model further?