

The Backpack That Felt Lighter

A story about mass and weight



Noor heaved her backpack onto the table and groaned.

‘Why does this feel so heavy?’ she asked.

Eli laughed. ‘Maybe you packed a rock collection in there.’

Ms. Bennett smiled. ‘Today’s science lesson can answer that question,’ she said. ‘We’re going to learn about mass and weight—and why the same backpack would feel very different on the Moon.’



Topic: Mass and Weight

What Is Mass?

The amount of matter in an object



Ms. Bennett placed the backpack on one side of a balance scale. On the other side, she added books until both sides balanced. ‘Mass tells us how much matter is in something,’ she explained. ‘Your backpack has the same mass wherever it goes—on Earth, on the Moon, or anywhere else.’ Noor blinked. ‘So mass is about how much stuff is inside it?’ ‘Exactly,’ said Ms. Bennett.



Topic: Mass and Weight

Science Element

Mass and weight are not the same



Mass is the amount of matter in an object.

Weight is the force of gravity pulling on that object.

Mass stays the same no matter where the object is.

Weight changes when gravity changes.

Earth's gravity is stronger than the Moon's gravity, so the same object weighs more on Earth and less on the Moon.



Topic: Mass and Weight

What Is Weight?

The pull of gravity on an object



Next, Ms. Bennett hooked the backpack onto a spring scale.

‘Weight is different from mass,’ she said.

‘Weight is the force of gravity pulling on an object.’

Eli leaned closer. ‘So weight depends on gravity?’

‘Yes,’ said Ms. Bennett. ‘If gravity pulls harder, something weighs more. If gravity pulls less, it weighs less.’

Noor looked at the scale. ‘So my backpack feels heavy because Earth is pulling on it!’



Topic: Mass and Weight

Earth or Moon?

Same mass, different weight



Ms. Bennett showed the class a picture of the Moon.

‘The Moon’s gravity is much weaker than Earth’s,’ she said.

‘That means the same backpack would weigh less there.’

Noor imagined lifting it on the Moon with one hand.

‘So the mass stays the same, but the weight changes?’ she asked.

‘That’s right,’ Ms. Bennett said. ‘On the Moon, the backpack would feel about six times lighter because the Moon pulls with much less gravity.’



Topic: Mass and Weight

A Backpack on Earth and the Moon

Why the numbers can change



‘Let’s use an example,’ said Ms. Bennett.

‘If this backpack has a mass of 6 kilograms, its mass is still 6 kilograms on Earth and on the Moon.’

Eli nodded. ‘But its weight changes because gravity changes.’

Ms. Bennett smiled. ‘Exactly. On Earth, it weighs about 59 newtons. On the Moon, it weighs only about 10 newtons.’

Noor grinned. ‘Same backpack. Same mass. Different weight!’



Topic: Mass and Weight