



Workshop:
Force & Motion: Science & Dance
Grades 3-5

Supplies: music, CD Player, cable sticks of various sizes for center of gravity
signs with dance and science vocab

Nametags

Introduction

Who am I
Clown trip with Newton's first law

I'm curious about invisible forces. Equal & Unequal forces. Gravity.
Before we start I'd like you to hold your arm or your leg out like this or this while I talk.

Who knows: what is gravity?
Who knows: how do we know it exists?
Who knows: what is weight?
Who knows: how do we know it exists?

Gravity is a force by which a planet or other body draws objects toward its center. Gravity keeps planets in orbit around the sun and the moon around the earth. Weight is a measure of the force gravity exerts on us.

Isaac Newton said things aren't held up; they are pulled down, and that pull is gravity. [All objects exert a pull or force attracting them to others. Why don't we all smack into each other like magnets? Because earth is the biggest heaviest object around with the greatest mass so its pull is hugely greater.]

To overcome gravity, we need to exert force.
Can you feel the force you have been exerting holding your arm or leg out? Can you touch or point to where you feel it?
Who can describe what is happening in your body?

Today we will be using some elements of dance to explore the invisible force we call gravity. I'm not going to be teaching you how do ballet (DEMONSTRATE these) or hip hop or the electric slide. We will be exploring and inventing movement.

To start: Find your own spot that is your personal space and lie down on the floor. Let gravity pull your body by relaxing your muscles. Let your neck relax so your head is fully resting, you're not holding it. Relax...

Soon, we will be moving around, and we will be partnering with others. I want all of us to work safely and respectfully. I'd like us to explore what we need to do to move safely and not hurt each other or ourselves. We'll be playing the Control Game to explore how to move safely & respectfully.

Rules of Control Game: no sound with voice, no bumping into people or things, when the music stops, freeze, move when you hear music. Sit down if you lose control. Can you do that?

When you hear the music, can you slowly sit up and pay attention to the amount of work your body does –what muscles are you using? Slowly stand up and pay attention to the work your muscles do.

SOME ELEMENTS OF DANCE: SPACE, SHAPE, FORCE, WEIGHT, PUSH, PULL

Non-locomotor movement—PUSH against gravity and fall: Can you experiment with moving up and down in one spot? When are your muscles working against gravity, when aren't they? Can you try jumping in different ways? Spin.

SHAPE: Can you make a low shape, a high shape, a strong shape and a weak shape with your body?

Locomotor movement— walk without bumping, with control. Be aware of the force you exert to propel your body forward. Who can tell me what are you pushing against? What parts of your body are pushing?

FORCE

How easily can you move?

LIGHT: Can you move as if you are light—as if you are in water, as if you weigh 1/6 of your earth weight—as if you are on the moon, as if you are lighter than air—made of helium? Let little gusts of air exert a light push on you. Dancers call this free flowing movement.

HEAVY: Can you move as if you feel heavy? as if you are 6 times heavier? as if you are made of lead?

BOUND & FREE: Dancers call this bound movement.

PUSH & PULL: Another example of bound movement is pushing or pulling. Can you move as if you have a heavy object attached to a rope that you are dragging behind you? Can you feel the force you are using? This is Pull. Can you move as if you are pushing a big heavy box in front of you? This is Push.

Reflect: what are you noticing?

We won't be playing the control game anymore, but I expect you to move with the same safety and respect.

Partners: I'm going to ask you to find a partner. I'll ask you to switch partners. I expect to see you quickly find someone nearby, without talking. You can show you have a partner like this. I don't want to see this: ugly face.

DEMONSTRATE: EQUAL FORCE DUET –PUSH

Are we exerting a lot of force now? We work together to gradually increase the equal force.

Quickly & silently find a partner. Face your partner. Raise your hands so palms are touching. Gradually increase the amount of force you exert so that it matches the force your partner is exerting. The object is not to push your partner over, but to work together to push equally. When you are pushing as hard as you can, note the shape your body is in. Then gradually decrease the force you are exerting till you are just touching.

Show the shape of the most force. Can you make that shape without your partner? Why or why not? Can you make that shape with less force? What are you noticing?

New partner

DEMONSTRATE: HUMAN SPRING DUET –PUSH WITH INCREASING & DECREASING FORCE, ACCELERATING & DECELERATING

Again the object is to work together. Hands touching palm to palm come in close and push away without moving your feet, like your arms are human springs—get a rhythm going with your partner—come in close and push away. Pay attention to when you are exerting force and when the force is moving you without your exertion.

Reflect: Who can say when are you accelerating, decelerating, not moving?

Reflect: What else are you noticing?

New partner

CENTER OF GRAVITY: TALL TRIANGLES --PUSH

Hands up high, touch palms. Gradually increase the distance between your feet and your partner's feet—an inch at a time, while keeping your arms straight. Pay attention to where in your body you are feeling the work.

Reflect: Where are you exerting force? What is the direction of the force? What are you working against? Where is the center of gravity of this shape?

CENTER OF GRAVITY: STICKS AND OTHER OBJECTS

WE WILL HANDLE THESE WITH SAFETY

(same as center of mass = the average location of the weight of an object)

Predict where it is first, then try to balance it at that point. Try more than one object.
Pencils, pens.

New partner

PULL—EQUAL FORCES: WRIST DANCE – SHAPE EXPERIMENT –

Find a secure way to hold onto your partner's wrists or hands. Can you take good care of your partner? Can you lean away from each other without either of you falling? Do not let go without telling your partner first. How many different shapes can you make together? Low, high, diagonal lines, parallel lines, horizontal lines.

New trios

MOON HOP ANTI-GRAVITY MACHINE

Person in middle hold hands firmly on waist or hips. Keep them there. Partners on either side hold wrist and elbow like so. Work together on timing so the middle person jumps and the anti-gravity machine pushes up at the same time.

Reflect: What are you experiencing? When are you working against gravity and when do you not feel gravity?

Trios Line up two lines

MOON WALK ANTI-GRAVITY MACHINE

Center person takes giant leaps with anti-gravity machine alongside assisting.

New trios

Collaborate to make a short movement piece that illustrates one of the scientific principles and uses one of the dance elements.

Audience etiquette

Show the pieces

What forces and dance elements do you see?

Juggle: what goes up must come down. Gravity is your friend. Gravity always wins. It's not just a concept, it's the law.