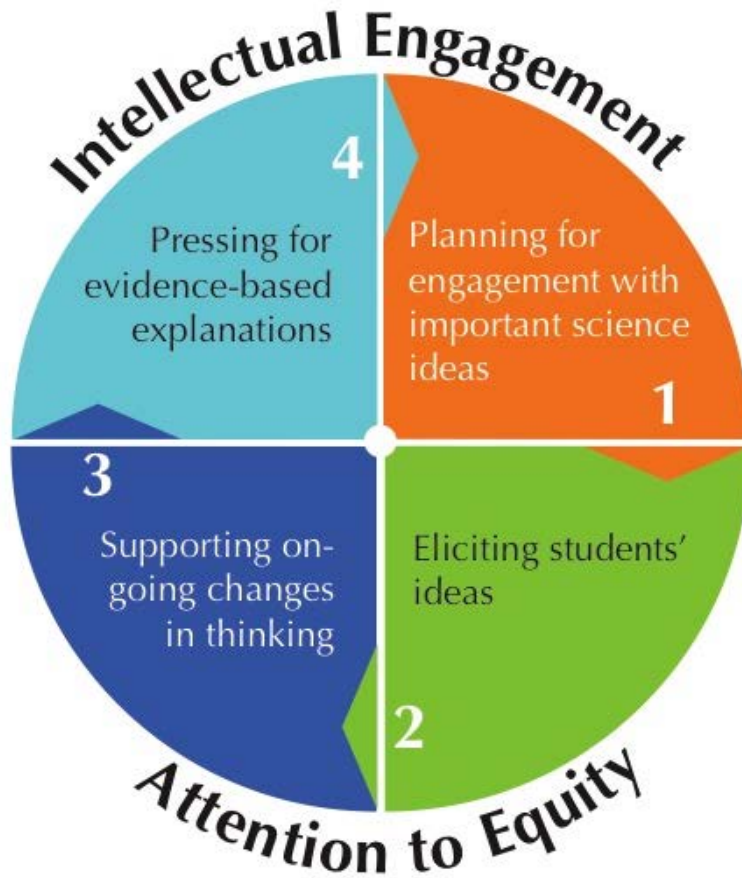


Building a repertoire of literacy support practices

Lindsay Berk & Mark Windschitl



The bigger picture: What do students need in order to participate in knowledge production?



Ambitious Science Teaching

- **Relevant and compelling contexts** for seeking out and evaluating new information
- **Skills with variety of public representations** that make their ideas visible and show how new information is being made sense of
- **Scaffolds and specialized routines** for reading texts, preparing to write about explanations and evidence
- **Time and opportunity** for all learners to participate in the on-going refinement of ideas.



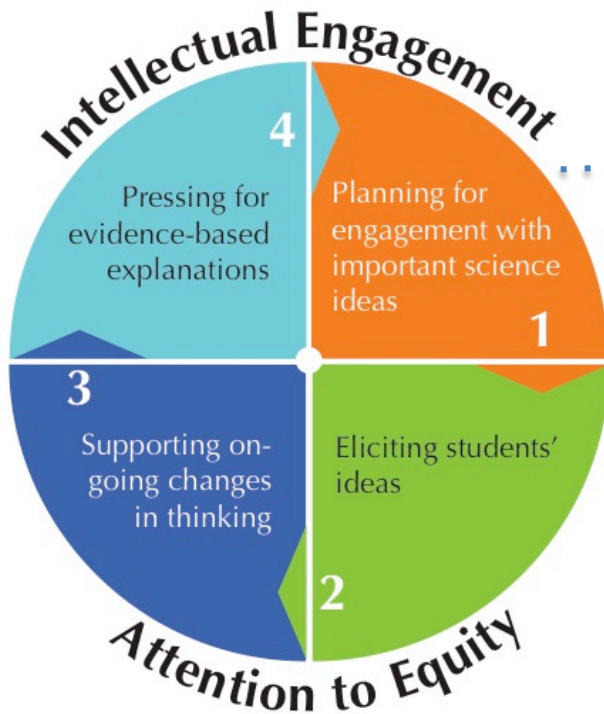
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Planning for engagement with important science ideas

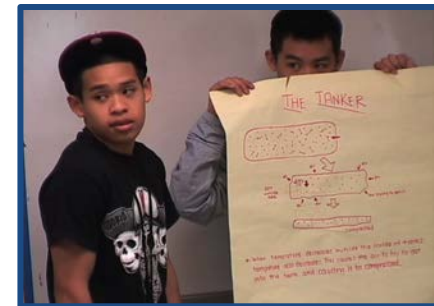
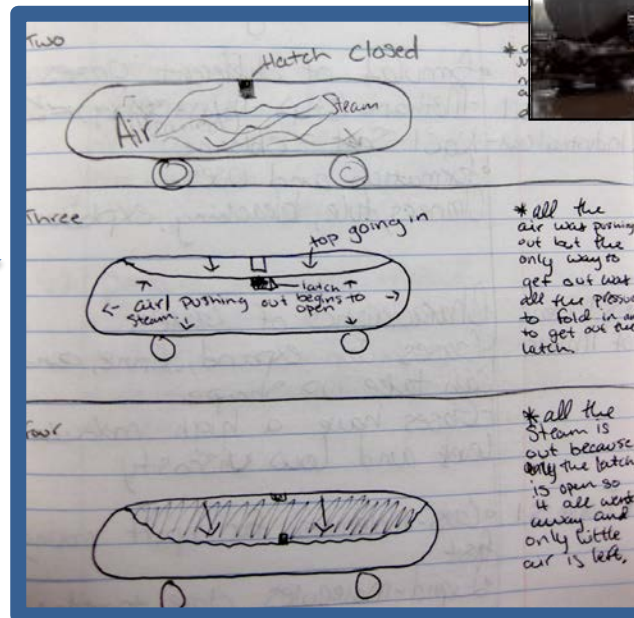
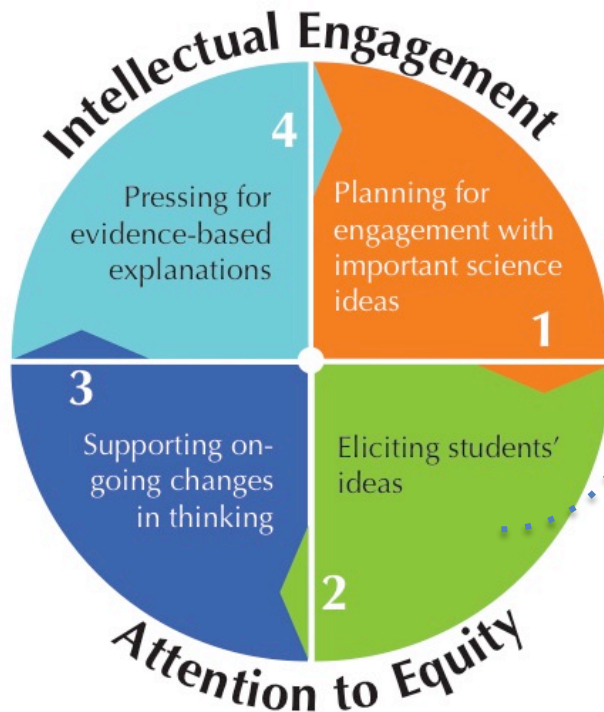


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Relevant and compelling phenomena – complex to explain



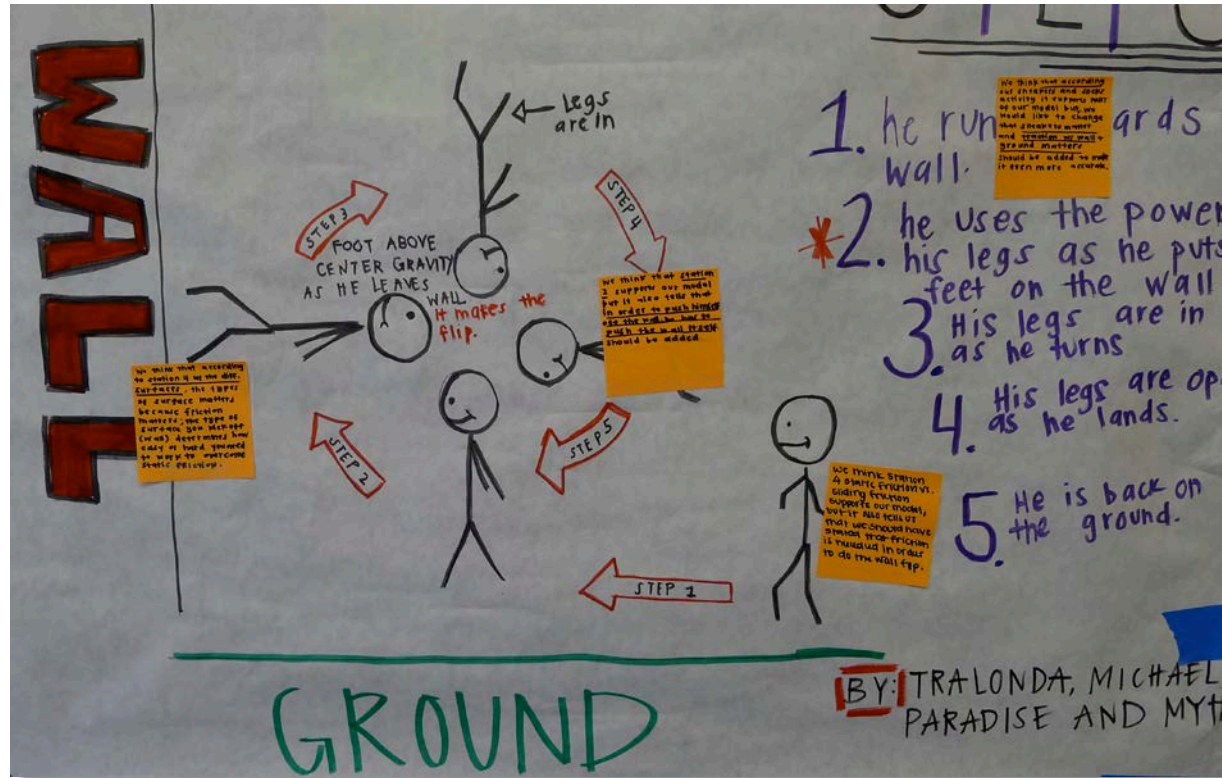
Helping students communicate in forms distinctive to science (and making thinking visible)



Eliciting students' ideas and adapting instruction

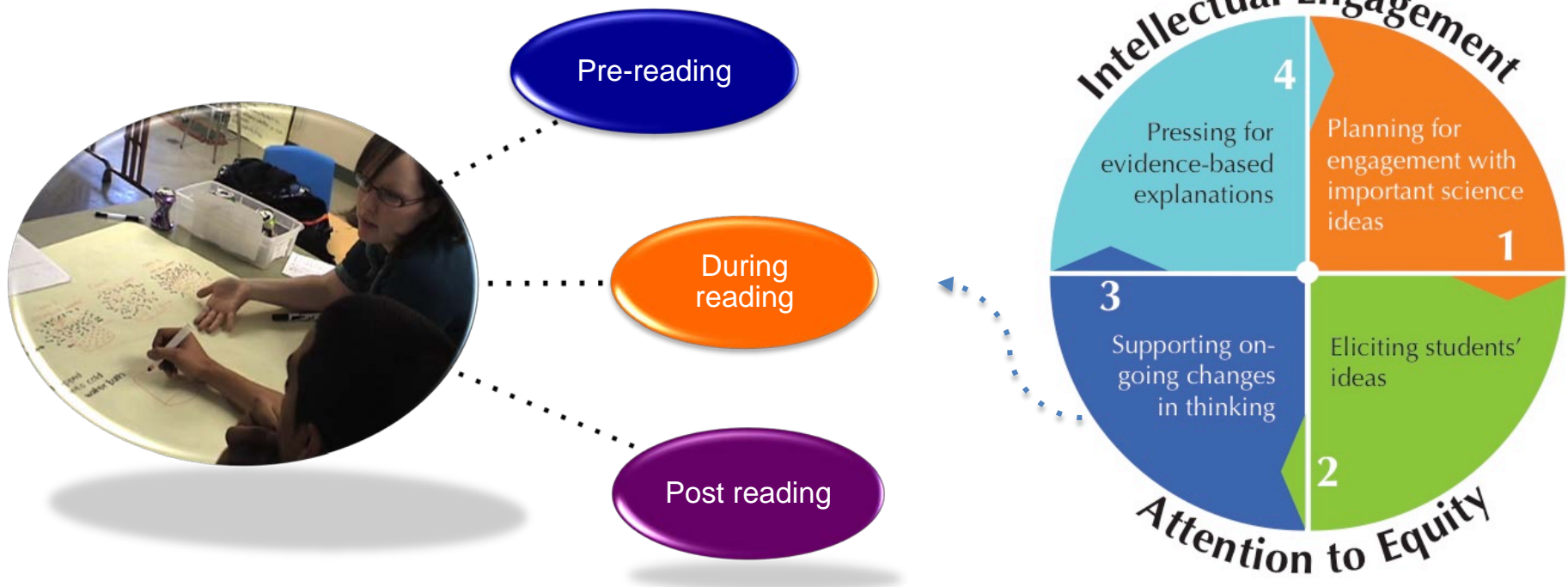


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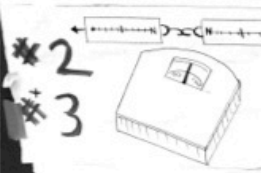
Scaffolded reading experiences—“Dear science colleagues, this is do-able”



Supporting on-going changes in thinking



After reading, activity, investigations—
returning to models and explanations

Activities	Observations	WHY?	How Do These HELP US EXPLAIN a WALL FLIP?
VS.  SHOE + Sock RACE 	- Socks person fall - Shoes went faster - bent forward, pushed off against ground w/ feet	- Slicker → No traction interaction between surfaces, socks less stable - Better start, sturdier, traction/friction → rubbings - Because more Bumpy - Sliding Friction = Force to keep moving - Static Friction = force to start moving - More mass, more gravity pulling on it. Static friction takes you past harder, takes more to get it started. $W = M \cdot G$ $F = M \cdot A$	- how a person can step up wall - footwear is important - Condition type is important & wall/floor friction/friction?
#4  COARSE  FINE TABLE WAX	- The block required more force for the coarse sand paper - Less force to move on waxing - It requires more force to start - More mass equals more force	- Force to keep moving - Static Friction = force to start moving - More mass, more gravity pulling on it. Static friction takes you past harder, takes more to get it started. $W = M \cdot G$ $F = M \cdot A$	The force needed to determine the acceleration you need to get on/off the wall depends on your wall-spread The surface of the wall depends on your capability of the friction of the surface. traction/friction a force that acts in the opposite direction, while pulling
#2 #3 	- equal force - same reacting for both - pull towards each other - did not happen w/ on ground	Law of Motion equal & opposite friction → stops feet started	push on wall, force equal cracks on you - pushing w/ leg to get on wall

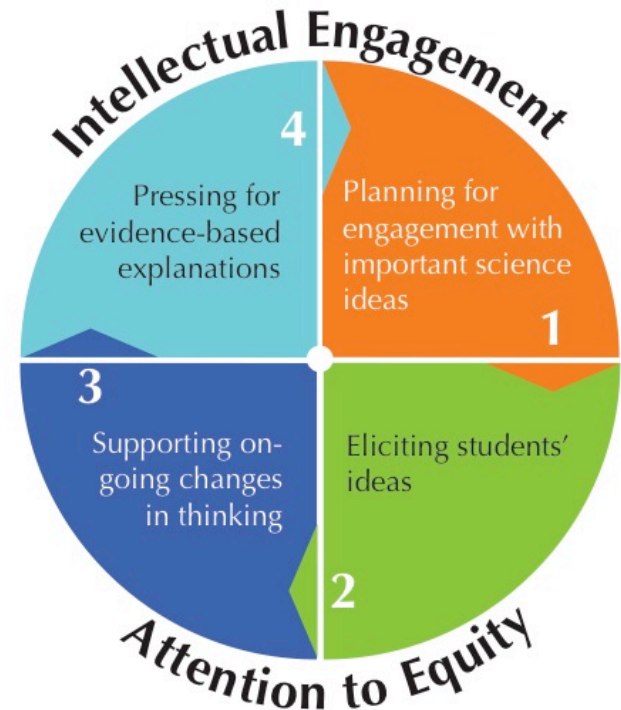
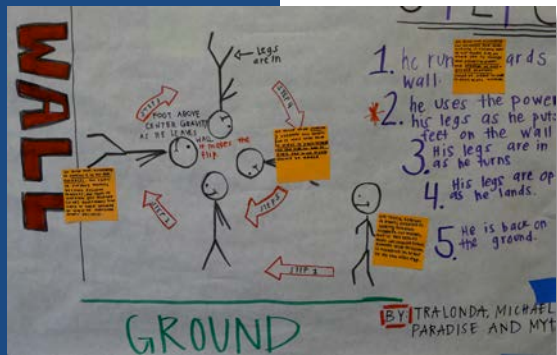


Figure 6c. Students' summary table to make sense of and coordinate D2 activities



Scaffolding writing about model revisions



REVISE

Part of an idea:

"We think _____ (evidence from summary table) supports PART of our model, but we would like to change _____ to make it more accurate."

ADD

a New idea:

"We think _____ (evidence from summary table) supports our model, but it also tells us that _____ should be added to make it even more accurate."

REMOVE or
find out more:

"We think _____ (evidence from summary table) Contradicts _____ in our original Model, and that we need to remove or find out more about it."

QUESTIONS:

"We still have questions about _____."

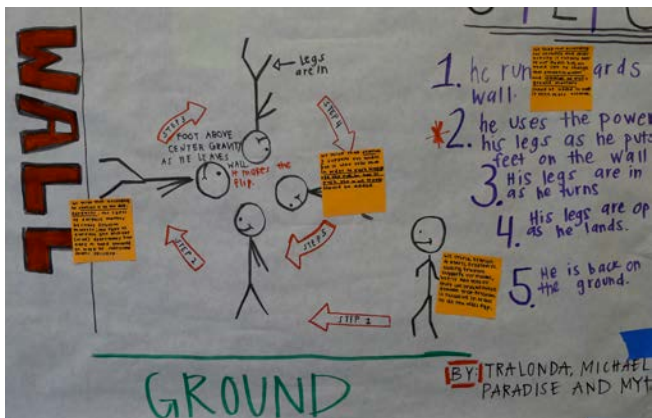
Slowing down, providing time to think and compose feedback to peers



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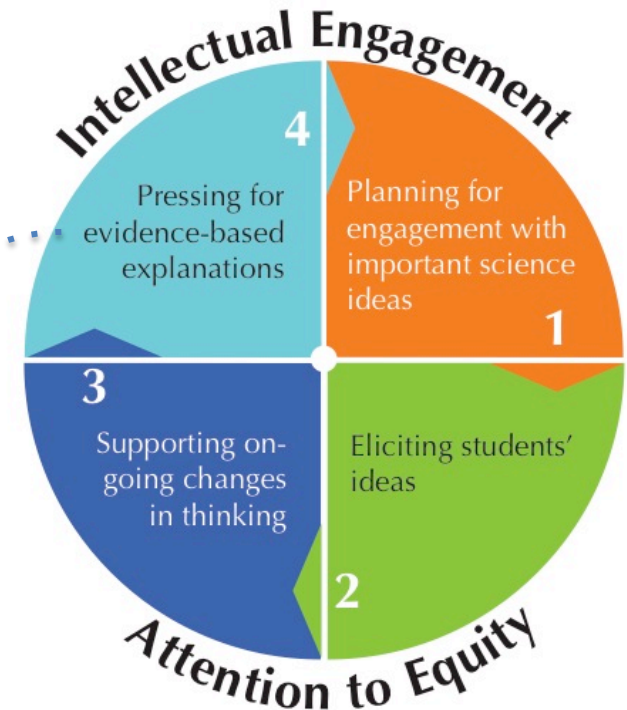
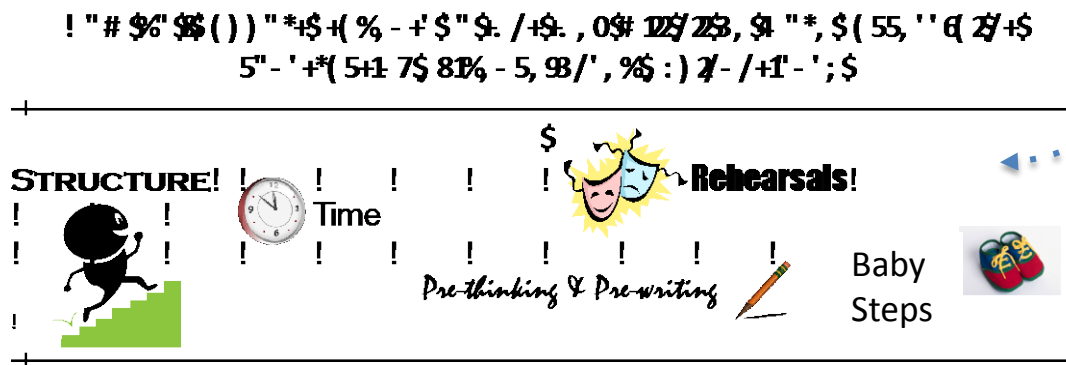
We would like to change our idea of needing enough force & gravity to get in the air, to the idea of friction, the person doing the wall flip needs to overcome initial static friction to get started up the wall

We think that according to our sneakers and socks activity it supports PART of our model but we would like to change that sneakers matter and traction w/ wall + ground matters should be added to make it even more accurate.





Scaffolds for writing about causal and evidence-based explanations—drawing in multiple ideas and activities to fashion arguments



Supportive structures to encourage explanatory writing



Static friction is needed to get started

good job static friction at a microscopic level

Explain!

in your people understanding wings.

Where's gravity?

<p>1 Get Started</p> <p>microscopic level</p> <p>static friction</p> <p>evidence: block activity</p>	<p>2 Get onto the Wall</p> <p>Jumping activities</p> <p>Law of Gravitation</p> <p>Push against force pulling you down</p>
<p>3 Stay on the Wall Momentarily</p> <p>evidence: shoe/sock race</p> <p>static friction</p>	<p>4 Get Higher up the Wall</p> <p>evidence: shoe/sock race</p> <p>block activity</p> <p>Need friction to temporarily keep foot on wall</p>
<p>5 Complete the Flip</p> <p>evidence: skate activity</p> <p>opposite equal forces</p> <p>push off the wall and in the air</p> <p>if force is not opposite force while</p>	<p>6 Return to the Ground</p> <p>Jump activity</p> <p>Law of Gravitation</p> <p>person attracted to the ground</p>

EXPLAINING FORCES & MOTION

- Static friction: the material at the bottom of the person's shoes and the material at the ground has friction and is only to keep the person moving through opposite directions. (connecting opposite forces. Apply Newton's 3rd law.) shoes surface is better on bumpy surface, sliding friction is used to keep the person moving.
- Law of gravitation: you need to apply force to jump because gravity is pulling on you, which is your weight and $W = (m \cdot g)$.
- Newton's 1st law of motion: because the person needs to continue running to stay in motion, the only way a clay on the wall is to stay in motion.
- To get higher on the wall, your motion needs to accelerate. In order to do this, you must apply more force. Apply Newton's 2nd law $F = MA$.
- In order to complete the flip, you must push off the wall. you must apply Newton's 3rd law of motion. If you push off the wall, the wall will apply the same force on you.
- Law of gravitation: the person has weight. their weight has gravity pulling on them. If the person has weight, gravity makes them go down. The person is attracted to the ground.

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