



**Unit on Force and Motion: February 28th
Newton's Law Jigsaw Groups Present Posters--
(starting to see the pay-off of helping students have sense-making conversations about their text instead of just reading & answering questions on their own)**



To understand the language in these commentaries...

It is important to have read our Discourse Primer, found at:

http://tools4teachingscience.org/tools/discourse_tools/primer.html

The commentaries also draw upon the language of our Discourse Tools, which should also be reviewed first:

http://tools4teachingscience.org/tools/discourse_tools/index.html



As you watch this video episode...

Keep track of where you are by noting the time codes in the left-hand column. In the right-hand column are important features of the classroom discourse.

In one or more of the time segments, we ask you to do more than follow along—we leave the discourse commentary section blank. Here we ask you to listen closely to the video and fill in the commentary yourself.

The teacher's commentary for these sections can be found at the end of the document. Compare what you heard with what the teacher noted.

Summary of Episodes:

1. Jigsaw groups finish their work on their posters about Newton's Laws of Motion
2. The group in charge of becoming experts about Newton's 1st Law of Motion presents their ideas.

Time points	Commentary
0:00 → 0:43	Instructions about what's going to happen today & a "take home" quiz about solving physics calculations.
0:44 → 3:36 Clayton's group is finishing up their poster for Newton's 3 rd Law	Important ideas/language I heard: Clayton and Jadyn are doing some good reasoning about how Jadyn's "rule" that he's constructed about equal and opposite forces making objects remain stationary is also kind of a mathematical idea that could be represented using symbols and numbers. They basically reconstruct and then derive Newton's 3 rd law ... so, this is the pay-off of having kids engage in sense-making for a day or two instead of just reading and answering chapter questions when using a science text.
3:37 → 7:40 Bradley's group is finishing up their poster for Newton's 1 st Law.	Questions I use to help kids say more: 4:15 – In conversation with Bradley – he's thinking that there aren't any math ideas for the first law because there isn't an equation that goes with it ... I press him to consider math ideas beyond equations: <ul style="list-style-type: none"> • "How do you think you could represent "at rest" mathematically?" • "What do you think is different about "at rest" and "in motion" ... like different mathematically?" Literacy support: 4:15 Mathematical literacy/Scientific literacy – I'm helping Bradley connect

his (so far) conceptual & verbal ideas about inertia to some ideas about how you could use math to represent concepts.

6:45 -- Bradley then teaches the rest of the group what he's figured out about how to represent some of their ideas mathematically.

7:41 → 10:23

Yael's group is finishing up their poster for Newton's 2nd Law.

Important ideas/language I heard:

10:00 – Destiny spontaneously summarizes: “The main thing that we thought this section was about ...” ... contrast this with her earlier way of talking to Jessica where she was totally reading out of the text. Again, this is the pay-off for having students engaging in sense-making with a text and their peers instead of just reading a text and answering questions on their own.

10:23 → end

Bradley's group gives their poster presentation.

Important ideas/language I heard:

15:55 – Bradley – “because of friction and gravity ...” he starts to explain why things that are rolling (like a ball in their example or the rollerblader) will eventually slow down and stop unless pushing forces are applied. It's clear that he's starting to put together a complete “forces” explanation for the kinds of motion we've been observing.

16:21 – Samson from the audience paraphrases their concept but he adds two ideas: “loses momentum” and “loses force” ... which are sort of intuitive ideas but I'm wondering if he thinks that there's some kind of “left over” force from the push that keeps pushing you when you are coasting on skates or that keeps pushing a rolling ball – this is a commonly held concept when people think about motion, but it is not the way we think about it in Newtonian physics.

18:05 – Bradley shares his newly mastered mathematical ideas with the whole group so we can see the pay-off again of his sense-making in response to my earlier questioning about how he might represent “at rest” mathematically and “in motion” mathematically.

Questions I use to help kids say more:

16:08 – “What if we could live in a universe that doesn't have friction?”

17:15 – I hear Hanad say (very quietly) that the skater is using an external force – I mark what he says & invite elaborate when I say “Say more about that being an external force ...”

Other important discourse moves:

15:52 – “Why wouldn't it keep going on forever?” – pressing group to explain why, in real life, we DON'T see the kind of “forever” motion that Newton describes in his 1st Law.

Literacy support:

10:23 – I give a “things you should be listening for” advance organizer to help prime students about how to listen to a group presentation and I point out how to take down notes when listening to a group:

- Main Idea – Headline or The Concept
 - A Good Example
 - New Vocabulary or Mathematical Ideas
 - How the Law Helps you Understand the Rollerblader
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Press for Explanation:

15:52 – “Why wouldn’t it keep going on forever?” – pressing group to explain why, in real life, we DON’T see the kind of “forever” motion that Newton describes in his 1st Law.

16:51 – “So, what does the skater have to do to change their direction and motion?” – I’m pressing Shawna to connect her initial statement about “changing their motion” with the Newton’s 1st Law Idea about a force being applied.

END OF CLASS
