



Unit on Force and Motion: January 10th

Generating an Initial Theory of Motion: Why does the block slide differently on different surfaces & when it is different weights?



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. Instructions for upcoming homework assignment – concept map linking key ideas about the sliding block which then serves as a pre-writing scaffold to help students write a letter to their literacy teacher explaining why the block slides differently on different surface & differently when it is different weights.
2. Small group work generating an initial theory of motion – creating “zoomed in” diagrams of the surface of the block touching the surface of the table and carpet when light-weight & when heavy-weight; writing initial explanations for the differences in motion; theorizing about a “what if” scenario where the block is weighed down by three bricks.

Teacher comment: I combine moves from different discourse tools for particular purposes. In this whole video segment I think I repeatedly do the following:

From Discourse Tool 1 –

Phase 3. Pressing for explanation

Phase 5. Using student ideas to adapt instruction

From Discourse Tool 2 -

Phase 1. Orienting students to the concepts

Phase 2. Back-pocket questions: Observations and patterns

Phase 3. Back-pocket questions: Connection to the big idea

Phase 5. Using student ideas to adapt instruction

From Discourse Tool 3 -

Phase 2: Coordinating tentative explanation w/ evidence.

Phase 3: Committing an explanation to paper.

General discourse moves

1. Probing question
2. Re-voicing to mark/amplify student voice
3. Re-voicing to repair a student idea
4. Re-voicing to connect everyday & academic language
5. Pressing
6. Connecting/ facilitating student-to-student talk
7. Scaffolding academic language

Time points	Commentary
<p>0:00 → 2:04 Instructions for upcoming homework assignment</p>	<p>Instructions about concept map & tentative explanation paragraph about the sliding block.</p> <p>Concept map (“bubble map”) directions are important because of the push to label the links between ideas on the map. Students would otherwise just draw lines and they tend to go crazy connecting everything, but if they have to put words on their lines their maps are more meaningful and they think about the connections before drawing them.</p> <p>Then they will use their concept maps to help them write a letter to their literature teachers explaining their ideas about the block moving.</p>
<p>2:05 → 9:34 Liliana, Shawna, and Sydney talking about their theory for the block sliding on the carpet vs. table.</p> <p>Liliana speaks Spanish at home.</p> <p>Shawna speaks Cantonese & a little Mandarin at home.</p> <p>Sydney speaks English at home.</p>	<p>For the small group discussions, I’m listening for students’ ideas that might connect to any of the three laws of motion (Newton’s Laws) ... so I’m listening for forces causing changes in motion, for interactions between forces, for relationship between forces/mass/acceleration, and for opposite forces (like action/reaction pairs). I’m also listening for students’ ideas about forces that they are often unlikely to mention – Normal force in particular.</p> <p>Important ideas/language I heard:</p> <p>Shawna: “On a smoother surface it goes faster but then with the weight there’s more pressure so it goes slower.” “Because of the texture.”</p> <p>Liliana: “It’s gonna <i>get used to</i> going that path ... to going on this surface.”</p> <p>Sydney: “I’m gonna add on to what Liliana is saying ... (discourse norm in our class) ... the puller is the one who has to pull harder ... the puller gets used to having to pull it harder and after a while it gets easier but just because you’re used to it.” “The table is easier to slide because it’s just one texture and these are more bumpier and it has to go up and down.”</p> <p>Questions I use to help kids say more (most of these were improvised not pre-planned but I think I improvised them because I knew SOLIDLY ahead of time what aspects of forces/Newton I was listening for): “What if I gave you a carpet square that was all the same for the whole length of the table? What would happen?” “And why do you think that matters?” “Ok, how come?”</p> <p>Important discourse moves: “So it sounds like you’re saying ... (paraphrase)” “So are you saying ... or ... (clarifying question)” “How does X compare to Y? (clarifying question)”</p>

Press for Explanation:

“So I like how you put ‘because of the pressure’ but I think you need to add more theories that are more like an explanation – you know, **why** does it go faster and easier on the table? What is it about the carpet that might be slowing it down?”

6:57 → 9:35

Destiny & Hilina talking about their theory for the block sliding on the carpet vs. table.

Questions I use to help kids say more:

“Do you think this table is perfectly flat or does it have tiny bumpies in it? ...”
“What if it was totally new? Would it be perfectly flat then?” [trying to find out if these kids have an image of a frictionless surface or if they are imagining a slightly bumpy surface]

Destiny speaks
English at home.

Hilina speaks
Amharic and English
at home.

9:36 → 14:31

Hanad and Amy quietly talking about their theory for the block sliding on the carpet vs. table.

Important ideas/language I heard:

Hanad:

“I think it’s ‘cause it’s more smooth than this one ... before this turns to that [pointing to two carpet squares] ... this kind is like somebody weaved them and this one looks like first it was like this and then they cut the top off.” [he’s thinking deeply about how the carpet surfaces compare to each other]
“This one has holes and the splinters get caught.”

Hanad speaks
Arabic and Tigrinia
at home.

Amy:

“We’re testing it out ‘cause there’s three different kinds of carpet now. ... Which carpet is smoother.”
“This one gets splinters.”

Amy speaks
Vietnamese at
home.

Questions I use to help kids say more:

“What parts of your theory are you testing out?”
“How did the sliding feel on these carpets?”
“How do you know it’s harder to pull? Did you have to use more muscles?”
“Ok, so what about on the table? The table doesn’t seem to have any loops.”

Other important discourse moves:

At the beginning of this segment I encourage these two quiet kids to speak confidently and plainly. They are a little shy about the camera and a little shy in general – but it is a norm of Rainier Scholars to become confident in your ideas and in your public speaking so this is one way of re-establishing that expectation.

Literacy Support:

Important literacy scaffolding move at the end of this segment – I notice that Amy’s pencil is “hovering” above her paper (which can be a signal that she is having a hard time figuring out how to get started) so I ask her to tell me about how she’s going to start. She then proceeds to tell me what she’ll write first, second, third, and so on. This is an example of a rehearsal.

Press for Explanation:

“Seems to me like it should be harder to pull on the fuzzier one, but you’re saying it’s not. Why in the world would that be?”

“So why do you think that the movement of sliding is different on this one that’s kind of like cut off compared to this one that’s still long?”

“And what about this one, that like you were saying it looks like somebody weaved it?”

“Well, then what about the table? It doesn’t seem to have any loops so what’s happening on the table?”

“I like your idea about the splinters getting caught between the loops ... remember, look it says here, that an explanation has a theory and uses things you cannot see to help you explain the things that you can see.”

14:32 → 23:57

Clayton, Samson, Juan talking about their theory for the block sliding on carpet vs. table.

Clayton speaks
English at home.

Samson speaks
Farsi, Samoan,
Spanish, and
English at home.

Juan speaks
Spanish at home.

Important ideas/language I heard: (you fill in below, then check your observations against teacher commentary at end of this document)

Questions I use to help kids say more:

Other important discourse moves:

Literacy support:

23:58 → end

Yael, Jady, Bradley talking about their theory for the block sliding on carpet vs. table.

Important ideas/language I heard:

Yael:

“I think now that it’s more heavy, the splinters will sink down toward the carpet and grab on more.”

“Like maybe, it’s that there is a tiny air space that lets it slide ... some bit of wood is touching some bit of table ... maybe it’s that the ones that are like sloped will touch the table and cause some friction.”

Yael speaks
Spanish at home.

Jadyn speaks
English at home.

Bradley speaks
Japanese and
Korean at home.

Jadyn:

“The heavier the block is the more it will press into the carpet and the carpet parts in front of it will stand up and then it catches on the brick ...”

“Well, in the carpet, it’s touching more, like all of it is touching because it’s pushing down. And the carpet wants to go up.”

Bradley:

“I think it will go way more slower ... plus he’ll have to pull more harder ... plus I think there will be a lot of friction and traction” [this starts an elaborated partial explanation from Bradley ... who otherwise probably wouldn’t have talked at all because he is quiet.]

Questions I use to help kids say more:

“Can you tell me more about what you mean by friction and traction?”

“What about on the table?”

“Is it hard on your muscles when it’s heavy or is there more friction/traction?”

“When you drew your pictures, what did you imagine what the table and block’s surfaces would look like with zoomed in eyes?”

“How is that different from the carpet?”

Other important discourse moves:

“What do you think?” [Inviting Bradley to contribute. He will stay quiet unless invited to talk, but he always has good ideas.]

“Do you guys agree with what Yael is saying?”

END OF LESSON

Teacher's
commentary from
14:32 → 23:57

Important ideas/language I heard:

Clayton:

"I think it will go slower [with the three bricks] but still faster on the table than the carpet because with the carpet it will sink down and you'll have to use more muscles on the carpet."

"It's different ... [bricks pressing on table vs. bricks pressing on carpet]"

"If you could zoom in even more ... it would be uneven, a little bumpy ... you can feel it ... it would be flat, but kinda off the desk sometimes ... 'cause right now it's kinda balancing in the middle."

Samson:

"I also think it's different. Since the wood on the table isn't soft it can't really go in it, but this carpet is soft so it can go in it."

Juan:

"It would have to pull harder ... three times harder ... like because of one brick and then you add two more."

"Maybe it wouldn't be all straight. Maybe a little bit bumpy. I think like the block would be balancing on the bumpy parts (of the table) ... I think the block would be like the table and bumpy on some parts."

Questions I use to help kids say more:

"And what did you think ..."

"How did you get 'three times harder' ..."

"If we let the sled with the bricks sit on the carpet for a while, what do you expect would happen?"

"What if we left it sitting just on the table?" [trying to find out if these guys think that there's something different about the way the bricks press down on the carpet vs. pressing down on the table]

"Do you think if we put a scale on the table and a scale on the carpet, would it weigh the same or different?"

"What if you had Superman powerful eyes and you could zoom in and see these surfaces right here?"

"Do you think every bit of the block is touching every bit of the table? Well, what's it doing then?"

Other important discourse moves:

"Can you summarize what you talked about ..."

"So you're saying ..."

"What do you think, Juan?" [He will sit and listen without speaking unless he is invited, but he always has good ideas so I try to make sure to invite him to talk.]

Literacy support:

"Could you guys please add maybe one more zoomed in picture to your papers? The ideas that you just told me about aren't in your pictures."
