APPENDIX 5

SAMPLES OF CODED TRANSCRIPTS: SAMPLE 1 AND SAMPLE 2

In the transcripts below, students' names are abbreviated as follows. Group 1: **D** (**D**arla), **P** (**P**orter), **L** (**L**acey), and **G** (**G**race). Group 2: **R** (**R**oxanne), **J** (**J**asper), **A** (**A**rthur), **S** (**S**abrina). **T** = **T**eacher.

The components of SMD are abbreviated as follows: **CL** (**Cl**arifying the facts of a phenomenon or result), **P1/P2** (**P**rediction level **1** or **2**), **UE** (Describing or providing an **u**nderlying **e**xplanation for a phenomenon or result), **DDC** (**d**efining, **d**escribing, clarifying, and **c**onnecting scientific concepts, procedures, processes, and representations), and **TC** (**t**esting knowledge **c**ompatibility).

Requests for a component of SMD are coded in lower-case letters (e.g., tc = a request for a test of knowledge compatibility). Excerpts in parentheses are summaries of what occurred. **OT** = **o**ff-**t**ask behavior or **o**ff-**t**opic conversation.

Sample Transcript 1: Group 1 Discussion in Activity 3 of Cycle 5, Day 2 (More Exploration of What Causes Gravity) and Activity 4 of Cycle 5 (Gravity and Motion)

Speaker	Transcript	SMD code
	(T rings bell. T: You were finishing up activity, now need to do Making Sense, p. 5. Also get out homework.)	
	(T: while working on MAKING SENSE, I'll come by and look at homework. T: do stuff in Making Sense and discuss it.)	
	MAKING SENSE	
	(L reads Making Sense from A2. G says she's in the wrong place, but L,D say that L is in the right place. L wonders why her Making Sense looks different.)	
	(T: you're on wrong activity? L: A2! T: keep turning to A3. G: *this* page 5. L: Oh! L now on right page.)	
D	I don't get this. Why don't they (pencils) go together? I don't understand that.	ue
G	What?	
D	The two objects.	
G	Like the water thing and the box?	
D	No. It says (reads): "Put two objects on your desk and watch them very carefully for 15 seconds. Do the objects move towards each other? Why or why not?"	
L	Uh huh, watch. (L rolls a pencil on the table)	
G	They're going to move against each other if you *push* them.	UE
	(L rolling pencils into each other. OT.)	
G	Well, it won't move (normally). They're not supposed to do that. (roll into each other)	TC
	(G,L OT. D writing?)	
D	Why did they not move closer together? I don't get this.	ue
L	Because there's not a force of gravity on the side. There's a force of gravity in pulling it to the ground and holding it in one position.	UE
D	Well, yeah. But if you have the two water bottles - meter stick thing, that's on the string...well then the	TC

	other one...	
L	Yeah, but they have a force drawing them to the sand.	UE
G	What's the force?	ue
D	The force is gravity.	UE
L	Yeah, right.	
D	But don't you think there's gravity between these two objects? (pen and binder)	ue
L	Yeah, but it's not strong enough to pull the two things together. It's not like...it's different from if there's two pens hanging right here. (holds out 2 pens side-by-side)	UE ("It's not…"); TC ("it's different…")
L	And then this is sand (imaginary box) and this is sand (another imaginary box). And then they (pen and box?) go towards each other because there's forces right here...	UE (5:03-5:08)
L	...pulling them to each other. And the two pens...the two water bottles...	
G	But they're not hanging. That's your only problem.	TC
D (to L)	So you're saying gravity only happens if there's hanging?	ddc
L	No, gravity doesn't always happen if there's hanging. Because we (people) aren't hanging right here.	DDC
D	But, yeah...but how...	
L	Gravity's in the ground...like, gravity's not in the ground...(puts two pencils on table vertically, then lets go)...look, they don't go together. They fall...they may fall...	UE ("Gravity's …"); CL ("look, …"; 5:22-5:28)
L	...towards each other, but that's because pens aren't made to stand up on their end. They're made just to lay here.	
L	What I'm saying is: if these pens were attached to the ruler - how they proved gravity or whatever, and there was a box of sand here (one side) and a box of sand...	TC (5:34-5:41)
L	...there (other side), and it pulls it like that (rotating stick?), they don't have a force that's pulling them (2 pens) to each other.	
G	A table with no force. (laughs)	

L	There's nothing in between them that would be pulling them together. Just air.	UE
D	There's nothing in between the other ones, either. (pen and notebook?)	TC
L	But there's nothing...there's nothing like sand or something pushing them together.	UE
G	I don't think there would be. I don't think sand...	
L	(puts pens on table) Look, it watch. (pushes pens together, jokingly) They moved together, see?	
D	(jokingly) Yeah.	
L	If there's something *in between* them (puts pen top between pens)...they go together.	TC
G	Well, they didn't move together! They just rolled because of the ground. (L pushes them together again) They're not moving! You're moving them.	UE
D	I still don't get it.	
	(D reading)	
D	Well, I still don't get it!	
	(group turning pages, D writing)	
D	(to T) Mister Bohn, on this one (2 objects), I don't understand why they didn't move together.	
T	(arrives) We're going to discuss that (??). (??) clear that up for you. (leaves)	
D	Good, because that doesn't make sense.	
	(L OT)	
D	That statement (??) because we're not making any sense.	
G	It (section) should say "NOT Making Sense". (D, G laugh)	
	(L OT)	
	(group waiting for class discussion of situation)	
	(T rings bell. Need to get presentation boards and put down best answer for #2 on homework: what is the cause of gravity? what evidence?)	
	(T: we should have done this yesterday, so let's go! L leaves to get board. D asks G what she put, G says she was asleep, and what she wrote isn't any good.)	

(L returns with board)

D Ok...did you... (L getting something; D,G waiting)

D Ok, I'm the only one that kinda did this. And I put (reads HW answer): "The mass of objects nearby causes gravity."
(L OT about pen)

L Ok, so what's the question -- so I can write it right here?
(D says don't need question)

D It says (reads HW): "Make a summary statement about what causes gravity."
(L,D arguing about what to put on board. L puts "Cause of gravity" as board title, then "answer:".)

D This is what I put (reads again): "The mass of objects that are nearby causes gravity."

L Like, bodies are nearby the ground and the ground pulls it down.

G (to D) You want to go and... (present?)

D Well, I guess...yeah. Since nobody else did it, I guess that makes sense. (to L) Go ahead, put that. (her answer)
(writing with help from D: "The mass of objects that are nearby causes gravity.")

D Evidence... (L writes it.)

D The boxes...er, the sand boxes... (L writing; D says too much like "sand box")
(L: let's put "boxes full of sand". D: OK.)

L (writing) "The boxes that are full of sand..." Make sense?

D Actually, it should be the *mass* of the boxes.

L What?

D The mass of the boxes.

(L erasing, changes to "mass of the boxes full of sand")

D ...attracted the mass of the bottle of water. (L writes it with D's help)
(L stops writing and puts board up for viewing. It says: The mass of objects that are nearby causes gravity.)

(Evidence: The mass of the boxes full of sand attrated the mass of the bottles of water.)
(G, D waiting)

(presentations begin. T: need to think in terms of argument tool. L goes first)
(other ideas: forces between objects -- mass of bigger object controls force. student: does it have to be sand and water? T repeats question)
(student: no, because earth has sand in it. [?] Student: most of earth is water. Can it be water and something else attracting? T: do we have to use sand and water?)
(L: I don't know. We don't know if experiment will work with any other objects. D: doesn't gravity work with everything, not just water and sand?)
(D: people using sand/water because of Cavendish experiment. Student: why did *he* use sand and water? could get a rock.)
(T: could he have used some other object? student: yeah. D: easier to use lots of sand and boulders instead. T: could have used a big chunk of lead? D: yes.)
(more presentations. other ideas: large mass causes gravity, mass -- one is bigger than another, mass, gravity on earth caused by mass of earth)
(T: make sure look at these critically)

(other ideas: planet gravity caused by their size. T: only planets have gravity? what affected by gravity? student: everything.)
(L: black holes can suck you in w/ gravity.)

(T asks group about "nearby" -- what do you mean? D: talking about the sand and bottles. They were nearby. T: pencils on table nearby. Why nothing there?)
(D: I don't know. students: not free to move, stuck to ground. T holds 2 pens. T: gravitational pull between these two? students: some yes, some no.)
(L: drop and see what happens. have to be or they would be floating. [not relevant...] student: everything has gravity.)
(T: everything that has mass has gravity, right? L: even a feather has pull. T: darla, you asked why didn't move. An idea now?)

(student: if on strings, would move together. T: larger object, stronger pull. mass of pens compared to larger object? very small.)
(T: cavendish's experiment so amazing because he figured out a way to measure gravity of something besides a planet. T: how much think bottles actually moved?)
(student: 8 inches? T: extremely small movement shown in wide deflection of laser. Bottles didn't move very far.)
(T: why don't pencils move on table? students: gravity pulling to the table. T: run into friction with table.)
(T collects HW)

(T rings bell. T: turn to A4)

ACTIVITY 4: GRAVITY AND MOTION

ALIEN DIALOGUE

(students read dialogue aloud)

(dialogue ends)

(T reads top of p.2)

(T: I walked you through an interaction diagram yesterday, so you should be able to do this as a team today.)
INTERACTION DIAGRAM AND EXPERIMENTS

(L dropping crumpled paper from chair.)

(T: go on with assignment)

(L sits back down)

(D writing)

D (reading?) Ok, the time interval is when you let go of the paper ball. CL
(G, L writing)

L Object 1: paper ball.

D Yeah.

L What's object 2? cl

D	The floor?	cl
L	Gravity?	cl
D	No...	
G	Floor.	CL
L	The person dropping it?	cl
D	No, I think it would be gravity -- yeah.	CL
	(group writing)	
L	(reads) "Describe what happens to each object during the event."	
G	You get up on the...	
L	(writing) "The paper ball...drops to the ground."	CL
L	Gravity pulls it!	CL
D	Gravity pulls on the paper ball.	CL
	(group writing)	
L	(reads) "Describe what happens to each object when the other object is removed/turned off."	
L	The ball would float without gravity.	P1
	(group writing)	
D	What happened to gravity? Gravity would...	p
L	Nothing would happen to gravity. You can't do anything to it.	P2
D	Gravity would no longer pull.	P1
L	It would have nothing to pull.	P2
D	Yeah.	
G	Because there'd be no gravity.	CL
	(group writing)	
L	(reads) "Did different things happen? Yes or no."	
G	The ball was on the floor. (laughs)	

L	(writing) "Yes." There is an interaction.	
	(D writing. T asks L for HW. L: do we go onto next page? T: yes.)	
D, L	(reading #2, p. 3) "Each person in your team should drop the paper ball a couple of times. Everyone should watch it fall. "	
D,L	"What kind of motion does the paper have when you drop it? Speeding up, slowing down, constant speed? Discuss this with your team…" (L gets ball back, gives one to each student. They drop their paper balls a few times.)	
L	Constant. (speed; G, L drop theirs again)	CL
G	It's constant. (G drops again)	CL
D	It's speeding up. (G drops hers again)	CL
G	Yeah, it's speeding up.	CL
D	Yeah, it's speeding up. (drops ball again) Because it's faster when you let go of it. (L off messing around)	CL
D	(L returns) It's speeding up, Lacey. (L not paying attention)	
G (to L)	It's speeding up.	
	(group writing)	
G	(reads) "Observing the simulation, what kind of motion does a dropped object have?" (group waiting for simulator)	
	(T goes back to diagram. T: what put for "define the interval"? student: time ball drops to time hit ground. T: Ok.) (T: two objects? student: earth and ball. T: earth and ball, ok. L: gravity [ignored] T: what happens to each object during event? student: ball falls.) (T: what happens to earth? student: nothing. T: what happens if take one away, G? G: nothing happens.) (T: so, is there an interaction? did different things happen? students: yeah.) (T reads top of p. 3 Many students call out "speeding up" for motion of dropped ball. Some say "constant".)	

	(T: how know that it's speeding up? student: starts at zero speed, falls -- speeding up. T: what about when moving? continue to speed up, or constant speed?) (L: it needs a parachute to slow down to constant speed. If jump out of plane, you speed up. T asks L to repeat it. She does.) (T: let's go back to original questions. I agree with what you just said. Once ball dropped and sped up - did it keep speeding up, constant speed, or slow down?) (T: that's what I want you to discuss and answer at the top of the next page -- p. 3?)	
G (to D)	What do you think -- speeding up? (L drops ball again)	cl
L	Yeah, it speeds up.	CL
G	When you throw it up, yeah. (L drops again)	CL
G	Speed up? (laughs) Doesn't matter. (to D) Still think it's speeding up? I think it's constant.	cl
D	Speeding up or constant -- I don't know.	CL
G	I think it's speeding up, but constant -- I don't know.	CL
	(T reads #3, p. 3)	
	(T runs simulation)	
	(Student: speeding up. L says she was right. G: speeding up.) (group writing. T reads column headings: speed arrows, etc..) (T runs sim with strobe dots)	
	(T shows speed graph)	
	(T reads #4, p. 3)	
L	We were correct, right?	tc
D	Yeah. (writing) "We observed the same motion..."	
	(group writing)	
D	(writing) "...as the simulation."	
	(G turns page. Group waiting. L makes ball into parachute.)	

	(T: some people drew arrows and strobe dots horizontally. Draw like you saw it on the simulator -- vertical motion!)	
L	He (T) says they (arrows) should always go like this (left to right), never like this. Always go from left to right -- straight.	DDC
D	Well, that depends on how it falls.	DDC
L	He says always from left to right -- not diagonal...the speed dots and stuff.	DDC
	(T: now we'll see force arrows. T runs the sim. Do page 4, first column on left -- actually should have done that before I showed it to you.)	
D	Before you let it fall (left column), you're just holding it. So that's not a push or a pull.	DDC
G	So what do you put on that one? Nothing?	
L	Ok, so there's...	
G (to D)	There's no arrow because you're holding it. (D raises her hand)	DDC
L	(reads) "Explain the lengths and directions of your arrow(s)." There is no arrows.	
	(L calls over T. He arrives.)	
D (to T)	Would there be push or pull arrows? Because if you're just holding it, you're not pushing or pulling it. You're just holding it.	
D	So is there anything pulling on it?	
T	Ok, so this (left column) is before Kinet lets it fall. So isn't there a force holding it up?	
D	Your hand?	
T	Ok...	
G (to T)	But what would be the force -- the arrow?	
T	Isn't there a force holding it up? This way (makes down-grabbing motion), he's pulling it up.	
D	Ok...	
T	What's gravity trying to do?	
D,L	Pull it down.	

T Are those arrows the same length? (gravity, pull)

D No.

T Why aren't they? Aren't the forces equal? (bell rings)

L No. (L leaves)

T It takes me just as much force to hold it up than gravity's pulling down. (D writing, T leaves)

Sample Transcript 2: Group 2 Discussion in Activity 3 of Cycle 4 (Slowing Down)

Speaker	Transcript1	SMD CODE
	ALIEN DIALOGUE	
	(students reading dialogue aloud)	
	(end of dialogue)	
	ACTIVITY INTRODUCTION	
T	(what's activity going to be about?)	
	(S: slowing down. T: good for you)	
T	(make sure use smooth blocks for this activty. Turn to p. 2: Push block, then no longer pushing it. Record motion.)	
T	(turn to p. 3. Table: Column on left is for block being pushed, right column when no longer being pushed)	
T	(turn to p.4. Will address all 3 ideas, but will show simulation first. Make drawings on p. 3 first, then we'll show simulation to check drawings.)	
	SLIDING BLOCKS	
	(R returns with block)	
R	Ok, quick shove! (pushes block)	
S	(reads) "In cycle 2, you experimented with pushing and pulling some special carts, and with launching superballs ..."	
S	(reads) "Number 1. Your team will need 1 plain wood block. Place the block on on the desk. Give the block a quick shove and observe it sliding."	
R	(pushes block 3-4 times) Ok, we *know* what the block does if you push it. (as in, we already knew)	
A	(pushes block) It speeds up, stays constant for about a second -- a millisecond -- and then it slows down.	UE
R	It doesn't even stay constant. It just goes: (pushes block, it slows down).	CL
A	It speeds up...has to stay (??)	CL
R	Slows down. It slows down. It starts -- then slows down. No constant.	CL

S	Just like: (pushes pencil through air quickly, then slowing down).	
R	Yeah.	
S	Like, skips it. (skips constant speed?)	CL
R	It skips the constant, because it...(pushes block).	CL
S	Maybe it stays constant for about a millisecond.	UE
A	That's what I mean.	
R	If we threw it, it would be constant then. (kidding?)	TC
S	No, I think it stays constant for like a...	
A	...it stays constant for a millisecond.	
S	A hundredth of a hundredth of a second.	UE
R	Nuh uh. If you threw it, it stays constant forever until it hits the ground.	TC
A	If something speeds up and slows down, it stays constant for about a second.	DDC
R	If it's in the air, it stays constant!	TC
S	No, it could be like a hundredth of a hundredth of a second.	
R	No, it goes constant until it hits the ground. But we're not talking about that. We're talking about pushing it.	TC
A	Exactly. So why did you bring it up?	
R	Because...I was trying to prove a point.	
T	(asks S about activity 5 cycle 3 power drive. Then leaves.)	
R	(reading, singing) "Is it speeding up, slowing down, or moving with constant speed?" (S looking through papers for A5)	
R	(reads in accent) "What causes the block to slow down as it slides along your desk? Explain your answer." What causes the block to slow down, Arthur?	
A	Friction.	UE
R	(goofy voice) Friction. Friction causes the block to slow down. Now why is it friction, Arthur?	

A	Do you expect me to give you the answer?	
R	Yeah. You're in my group.	
A	Figure it out.	
R	But I don't even know what friction is! Is friction...?	
A	Rub your hands together. Rub your hands together. (did this in earlier activity; R does it) That heat? That's friction. (T stops by; S gives something to him)	UE
R	(rubs hands again) I'm creating heat and hair. (Some old joke about hair) (S, R OT)	
S	(reads #2) "The block speeds up while you are pushing it. Describe the block's motion after the shove."	
A	The block quickly speeds up...	CL
R	Then just slows down.	CL
A	...(??), and then...	
S	No.	
A	Yeah it does.	
S	I think it...	
R	Speeds up. If it doesn't speed up, then how does it...?	CL ("Speeds up."); tc ("If it…?")
A	Slow down.	tc (finishing question)
R	Yeah, how does it start up in the first place? It has to speed up.	tc ("Yeah, how…?"); TC ("It has…")
R	Actually, no. Because it can't possibly speed up unless there's like a constant push. Because it doesn't have wheels, you know.	TC
R	You push it, and then it just slows down. Because...	CL
A	The part where it moves?	cl

S	What about being constant for a second?	ue
A	(grabs block) This is what I put. (reads) I have: "The block quickly speeds up, then for a microsecond it stays constant, then it slows down."	
R	Not even a second.	UE
A	I said a microsecond.	
R	Not even a microsecond.	UE
S (to R)	It's like a hundredth of a hundredth of a second. Does that make sense?	UE
A	Computers think about in...a little less than a microsecond. That's how fast computers think.	DDC
R	Well, but it doesn't speed up. Because you're just pushing it. You don't keep pushing it, or else it would speed up.	TC
A	That would be constant speed.	UE
R	It's just: (pushes block, lets it go). You know, it just automatically slows down. You know?	UE (12:29-12:34)
R	(pushes block) Because there's no wheels on it.	
S	So it goes from speeding up to slowing down?	cl
R	It doesn't speed up, because you're just pushing it!	UE
S	That's what I'm saying, and then you said "Yes it does, otherwise how would it start?"	TC
R	Yeah, I take that back. I take that back.	
S	*Now* you take that back.	
R	I take it back. Because look! (gives block a push, it stops)	
S	It's constant, and then it goes slow.	CL
R	No, it just slows down!	CL
S	No, wait -- you would have to go...	
A	(draws a graph) Here's a graph showing it, right? This is what it was. (drawing?) Here's one, here's two seconds and here's three seconds. (R,S look at graph)	CL (12:53-13:17)
A	(drawing) This is zero speed...one...and so we're going to do that -- two...three...and four. This is how it goes.	

A	Right here (points to graph)...right up right next to the line, and then (follows graph down).	
A	Nice little constant speed right there, and then (makes dropping noise, like block slows down.)	
R	No, cause it just gets started up.	CL
A	Actually, you're right.	
R	(points to graph) It just goes...it starts up here. (R arguing that block starts at some speed w/o speeding up.)	CL
S	How could it start up there?	tc
R	I don't know.	
S	(points to graph) It's like, from going...it's from the pen going down there, to not moving, and going over here.	CL
R	Fine, fine!	
A	Only a machine can make that happen.	TC
R	If it speeds up, then you're going like this. (draws line sloped up from origin) But it's just going like this. (draws a line starting above zero, then slopes down)	TC (13:35-13:39)
R	So it can't speed up.	
S	No, I think it's going like this. Wait. It goes up at a constant speed...no, wait.	CL (13:40-13:47)
S	It goes fast (draws steep slope up)...then constant (weak slope down)...then slows down (sharp slope down).	
R	See, but he (A) showed it himself. He said it starts up here (above zero) and goes like this.	CL
A	No, I didn't say it starts up there.	CL
R	It doesn't speed up. It doesn't speed up. It just slows down. (immediately starts at nonzero speed, in other words)	CL
A	Yeah it does. (points to graph) Look what I showed you!	CL
S	It starts down there (origin), and went up. (speeding up)	CL
A	Yes, it goes up -- but it's so fast it doesn't...look. Here's the line right here.	CL
S	It starts and goes up.	

A	Goes up. In case you notice, it's not right on it. (on what?) And then it goes...like that.	CL
R	So there's no constant speed.	CL
A	Constant speed is right there.	CL
R	But there's no constant speed.	CL
A	Where it peaks is the constant speed.	CL
S	Yeah. For like a milli of a millisecond.	UE
A	For a microsecond.	UE
R	Then you've got to *write* that. (draws on graph)	
S	That dot (at peak between speeding up and slowing down) is the constant speed.	CL
A	The dot is the constant speed.	
A	(reads #3) "What causes the block to slow down as it slides along your desk? Explain your answer."	
R, A	Friction.	UE
	(everyone writing; A mumbling while writing)	
S (to A)	What causes it to slow down?	
A	Friction.	
R	(writing) "...for a milli of a microsecond..."	
S (to A)	From the desk? (friction)	ue (15:16-15:24)
A	Friction...the answer is friction. Of course, the explanation -- I'm trying to figure it out.	
S	Friction from the desk? But also -- all things must come to a stop sooner or later. (this is a law, I guess? Independent of friction...)	DDC ("But also…")
R	(reads aloud her answer to #2)	
A	No...ok, if I tell you...if I threw a wrench in space -- and there was absolutely nothing in front of it -- does it stop?	tc
R	Nope...	CL (15:37-15:39)
S	Well, we're not talking about space.	TC

R	...it stays constant.	
A	Exactly.	
R	There's no friction in space.	CL
A	Exactly.	
S	But we're not talking about space. We're talking about earth.	TC
A	Correct.	
R	But...back to the throwing thing...(goes on, but nobody listening)	
A (to S)	See, what you said is not true.	
S	I put: "On Earth, all things must come to an end. "	
R	...unless you threw it so high that it went into space...	TC
S	Ok, like someone's going to throw it that high. That's like millions and billions of miles away.	TC
R (to A)	Is it possible for something to be thrown that high? Or pushed?	tc
S	Launched. But not thrown.	TC
A	Launched, yes.	
R	Launched, like "poom!" (makes noise) -- and then it goes. Not...not...(makes slow sideways motion with hand). We're talking "poom!" (makes quick motion straight up).	TC
A,S	Yeah.	
A	You have to have the force of a nuclear explosion, though. She's (Roxanne's) saying...here's the block sitting here, and there's something under it -- and it's causing it just to shoot up, and it stops right after.	UE
R	Not...not...a rocket on it going...(picks up block, acts as if block is taking off slowly w/ something underneath it). It's just "boom!" (throws block up -- a quick blast).	TC
A	You have to have a force of a nuclear explosion. Actually, it's a little less than that. (Something about the force of a tomahawk missile explosion.)	UE
R	But back to throwing. It would stay constant, huh? It would stay constant. It would speed up, then stay constant until it hits the ground.	CL

S	Well, let's throw it and find out. Let's ask if we can go outside and throw it. (S tells R to throw it in class. Not really! Then group OT about throwing block.) (A drops block)	
R	See, it stayed constant! And then slowed...it never slows down because the ground just stops it. (goes from nonzero to zero speed instantaneously)	CL ("See!…"); UE ("It never…")
R	It doesn't slow down. It stays constant because of gravity.	UE
A	And she's making a point that no one can prove.	
R	Uh huh. That Bacon guy proved it.	
A	Bacon guy?	
S	Kevin Bacon?	
R	No! The...that Bacon guy! (the scientist!) I saw him in a history book -- last year! (R talks about "four people who defined law of gravity" -- one of them was Bacon) (group OT)	
	(T rings bell, asks for class attention)	
	COMPUTER SIMULATIONS (not analyzed for SMD)	
T	(turn to charts page, will show simulations. Should be able to grade your own drawings. Note that this group never got to the drawings!)	
T	(left hand column of table for during push; T runs simulation. Increasing speed arrows.) (talks about energy changes. T: what kind of energy input?) (S: mechanical? T: good.)	
	(T: Energy output? S: Heat. T: Where? S: Air. T: Any thermal? S: Yes. T: Let's take a look) (T runs sim.)	
	(discussion of heat and where it comes from. T: comes from mechanical energy. Has students rub hands again.)	

(on to speed graph)

(S: block speeds up. R protests that object does *not* speed up -- just like in group discussion. A,R argue again.)
(T moves on to next sim -- after push)

(T: Why block slowing down? S: Friction.)

(T: Expect to see for energy bars after push? Input and output? S: Mechanical. T: Is it? Energy being applied to block?)
(T: So, no mechanical. What will we see? Students: thermal, motion. T: Where does motion energy come from? S: push, friction.)
(T: what will happen? S: will slow down.)

(T points out energy graphs. T: Motion energy goes down. Energy goes to heat and thermal energy.)
(T shows strobe dots)

(T shows graph)

(T: What if can reduce friction while in motion? S: Motion would stay same if no friction, wouldn't slow down as much if just less friction)
(energy discussion if less friction. A: motion enery would go down more slowly if remove friction)

T (Have 5 minutes to do idea sheets. Note: T didn't say to do Making Sense.)
MAKING SENSE/IDEA JOURNAL

(group OT, S answers Making Sense q's silently)

T (should be working on blue idea sheets)

(A, R OT)

(S says should do Making Sense first, but R wants to do Idea Journals first)
(group OT: A calling R ditzy, discussing dinosaurs, etc.)

T (stops by, tells S to write something down in idea journal for #1, then talks to A about motion and energy)

T (rings bell, tells students aren't making distinction between motion energy and motion; group not really listening)

(group OT)

R What does "resistive" mean?

(group OT)

(R keeps asking what "resistive" means. A still acting crazy.)
(group OT)

(R asks T what "resistive" means. T: Friction is what we're talking about here. Resists my pushing.)
(students cleaned up; class over)