Video Supplement

Norms for Watching Video (if not using your own)
- Speak from the "I" perspective. For example: "If I could rewind the tape and ask students a question, I would ask…"
- Be inquisitive, not judgmental. For example: "I wonder what might happen if," instead of "the teachers should have…"
- Justify your ideas and conjectures based on the video clip, and not other parts of the lesson that you didn't see. For example: "I think that the student understands...because in the video she…"
- Focus on how what you learned from the video might help you implement this (or similar lessons) with your own students.

School Context
- School Type: Urban Public School
- School Demographic Information (approximate):
  - Students of color: 60%
  - Free and reduced lunch: 50%
  - English language learners: <5%
  - Students with special needs: 20%

Lesson Context
- Subject: 7th grade Mathematics
- Unit: Exponents and Identities
- Number of students in class: 30
- Lesson duration: 90 minutes
- Prior preparation: Students have been introduced to the rules for exponential identities, and also to factoring and expansion

Video Context
Students have already done the opening problem, and are now working through the card sort activity, where they are trying to match up expressions. The teacher is currently circulating around the room, and the video highlights the same group of three students working with different cards. For each of the statements, ideas of precision and cognitive demand are expressed on the whiteboard and aloud.

Discussion Questions
Cognitive Demand: *How long am I given to think, and to make sense of things? What happens when I get stuck? Am I invited to explain things, or just give answers?*

1. What do students' explanations tell us about what they struggle with or find challenging?
2. As a teacher, what questions might we ask or moves might we make that help students struggle more productively by inviting them to make sense of and explain important mathematical ideas?

Video Transcript

Legend		
T	Teacher	Per and within dialogue
S1 – S3	Students 1 - 3	Per and within dialogue
C	Class	Per and within dialogue
[ ]	Actions/Non-verbal	Dialogue
{{x}}	Sounds like	Dialogue
{{}}	Inaudible	Dialogue

| 1	S1:	0:02	So, it's 2 to the first power, it is 2.
2	S2:		You are doing it wrong, 2 minus 3 is negative 1. The bases are the same.
3	S1:		It doesn't matter, oh my God. So, what do you think?
4	S2:		It's 2, isn't it?
5	S1:		2 to the first power is 2.
6	S2:		Imagine it was 2, isn't it? It's 2.
7	S3:	0:35	Yeah, 2 to the first power equals 2.
8	S2:		So the answer is 2.
9	S1:		Yeah, but you were saying how…
10	S2:		You subtract it so it's -1.
11	S3:		Yeah, it would be negative, but, at the same time… but I think this is wrong [pointing to figure 1], I think you {{can't}} divide that.
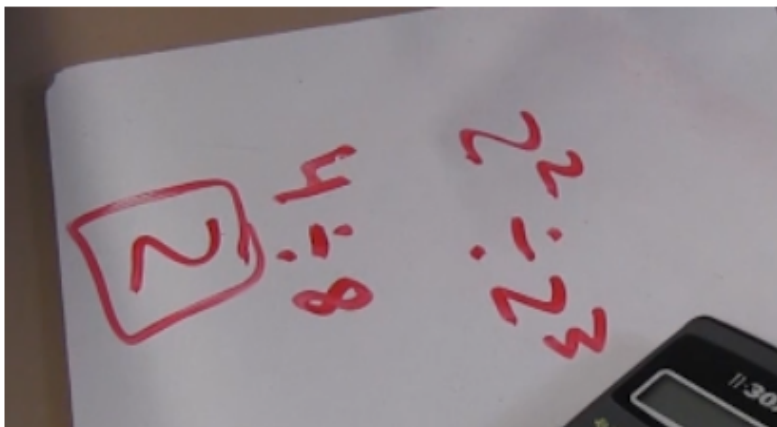
Figure 1

12	S1:	0:57	[using a calculator] 4 divided by 8 is 0.5
13	S3:		So it's negative, it's 2 to the -1.
14	S2:		Exactly
15	S1:		So, I did 4 divided by 8, I get 0.5, and 2 to the -1, oh it is 0.5. It will be this one. This is equal to 0.5 and if you do…
16	S2:		I thought it was this since it is -2.
17	S1:		No no no, this 4 divided by 8 is
18	S2:		-2
19	S1:	1:59	No, look [showing the calculator], 4 divided by 8, 0.5. Then if you do 2 to the negative first, then it equals 0.5. So it's this one.
20	S2:		Next, [showing card E5] 6 to the eighth power divided by 6 to the fourth power.
21	S1:		Hold on, 6 to the eighth power divided by what?
22	S2:		6 to the fourth.
23	S1:		6 to the fourth?
24	S2:		That's 8
25	S1:	2:37	Hold on… [Puts it on the calculator] 6 to the 8th power… 1,679,616
26	S3:		That's 8 take away four, three, wait…
27	S1:		Wait wait wait, what?
28	S3:		That's 6 to the third.
29	S1:		[erases work] But this is my {{}}
30	S2:		The bases are the same…
31	S1:		No, look the calculator…
32	S2:		8 divided by, no, 8 minus 4
33	S1:	3:00	Stop. Stop. Bases are the same, hold on,
34	S2:		6 to the fourth
35	S1:		1,679,616 and divide that by 6 to the fourth, what's 6 to the fourth? It is 1,296. So after you do that you do hold on…
36	S2:		It's 6 to the fourth.

37	T:		Keep in mind, everyone is responsible for being able to explain why something matches, ok? Make sure everyone in the group understands why something matches.
38	S1:	3:32	1,296.
39	S2:		6 to the fourth. The bases are the same, you subtract the exponents.
40	S3:		Wait, what's 6 to the fourth?
41	S1:		[checks with the calculator] Yep, 6 to the fourth. She is right.
42	S3:		Why do you do everything the hard way?
43	S2:		Exactly!
44	S1:	4:13	No, this is {{to}} check yourself. If this is not right, then you will have the wrong answer. That's why. It's like checking, what is it called? Checking your answer, or something like that. You do the work first, you guess and answer and then you do the work.
45	S3:		What's next?
46	S2:		That's 2 to the zeroth
47	S1:		Stop right now stop, 2 to the…
48	S3:		Don't you add the exponents?
49	S2:		Oh wait, no. It is 2 to the zeroth, we already got that.
50	S3:	4:34	Wait, do you add the exponents? Right? No?
51	S2:		She said one answer could have the same, equal {{answers}}.
52	S1:		2 to the fourth [working on card E6]. Do we have a 2 to the fourth?
53	S3:		Yes, no, no no.
54	S1:		It make sense though, you have to subtract {{}}.
55	S2:	4:57	Yeah, so it will be 2 to the zeroth. She said that one could have the same answer.
56	S1:		So, if I ask you {{}}… Tape this one right here.
57	S2:		That's the answer?
58	S3:	5:26	No.
59	S1:		Wait, zero to the second is zero, ok. Forget that, wait, what? Zero to the second is zero. This answer is zero.
60	S3:		Ok, then that's the {{answer}}
61	S1:		2 to the zero, that equals 0.5, this equals 0.5, this does not equal 0.5 [pointing to place on the poster]
62	S2:		I feel like {{this should be}} zero.

63	S1:		No, because 2 to the zeroth is equal to 0.5
64	S2:		But the bases are the same.
65	S1:		But does it matter?
66	S2:	5:57	It does.
67	S1:		If you check your stuff, wait, 2 to the second subtract 2 to the second, isn't 0.5. Therefore, it will be 0.5 and this will count twice, and this will count twice also.
68	S2:		What was the answer?
69	S3:		Zero to the second power.
70	S2:		I think that's 2 to the zeroth
71	S1:	7:01	No, oh my God, ok, let me explain this. I just dropped a piece. He just picked up our piece? He just picked up our this This…
72	S2:		To be honest, I will be honest. This equals this. You keep the base and you subtract the exponents. You can ask her. She is going to say that…
73	S1:		This equals 0.5, this equals 0.5, this equals 0, this equals 0. [pointing at poster]
74	S2:		That does not equal 0.5
75	S3:	7:24	That equals 0.5.
76	S1:		[using calculator] 2 to the zeroth power is one. Wait, what?
77	S2:		You should ask her.