Description: Clip 1 of 5: Boats and fish - A conversation about building models **Parent Tape: Discovering equivalent fractions and introducing fraction notation** **Date: 1993-10-04** **Location: Colts Neck Elementary School** **Researcher: Professor Carolyn Maher**	**Transcriber(s): Yankelewitz, Dina** **Verifier(s): Yedman, Madeline** **Date Transcribed: Spring 2009** **Page: 1 of 6**

Line	Time	Speaker	Transcript
7.0.1		T/R 1:	Good morning! Are you all as awake as I am?
7.0.2		Meredith:	Yeah.
7.0.3		T/R 1:	I don't know if that is good or bad, Meredith. Let me shut this [the overhead projector fan] off. [Holding up Mark's diorama – Figure O-5-07] I was thinking when I was looking at Mark's model, and I noticed many of you made models, also for projects for another class. I was thinking about this model because we were talking about models the other day, weren't we. Remember that? But also we were talking about models in general. We asked ourselves some questions about models. Did you all build the same model?
7.0.10		Students:	No.
7.0.11		T/R 1:	To answer that question?
7.0.12		Students:	No, no.
7.0.13		T/R 1:	Some of you built different models. [Erik raises his hand] Erik?
7.0.14		Erik:	Some of us built the same models and some of us built different.
7.0.15		T/R 1:	Some of you built different models, and I asked you a question about that. Do you remember?
7.0.16		Erik:	[Raising his hand] Oh!
7.0.17		T/R 1:	Erik?
7.0.18		Erik:	Could you get different answers
7.0.19		Michael:	Using barred models?
7.0.20		Erik:	if you use different models.
7.0.21		T/R 1:	Yeah, can you get different answers, right Michael and Erik? - if you use different models. What did you think? How many of you thought you shouldn’t get different answers? [Some hands are raised] How many of you are not sure? [Few more hands are raised] It's okay not to be sure. Have you been thinking about that at all since then? Maybe not huh, Michael, have you been thinking about that a little bit?
7.0.22		Michael:	Um, well, I figured that it couldn't be because our answer that we got, me and Brian, was that it was bigger by one fourth because it will always take two, it will always take four quarters to equal up
7.0.23		Erik:	Yeah, because four is an even number and you can divide it by two.
7.0.24		Michael:	In half
7.0.25		Erik:	So there will always be one fourth and two fourths, three fourths, four fourths and two fourths is always going to be a half, half-way point.
7.0.26		T/R 1:	What do you think about that? There are a lot of good ideas in what you are saying. [Picking up Mark's diorama] I was thinking that maybe it would help you, it sort of helped me to look at Marks'

		model. Sometimes it helps to look at a model that's a little different. Maybe this is a model that doesn't use the Cuisenaire rods, but in a sense it's a model. Um, I found out a little bit from Mark about a book he read, he was telling me. This [pointing into diorama] was supposed to be a sea monster and this was supposed to be [again pointing into the diorama] two friends. And I looked at, I looked at what he built here[still pointing to diorama] to represent some of the story and I thought by looking at this model that I couldn't really tell of the boy and the girl who was taller by looking at them, I wasn't really sure, and I didn't know really if Mark cared about that. But I looked at the sea monster, okay, and I looked at the boat, okay, and I was thinking about their sizes a little bit, right? What are you, why are you smiling about Mark?
7.0.27	Mark:	Uh, well I wasn't thinking about the sizes. I made the sea monster bigger than the boat.
7.0.28	T/R 1:	Did you want the sea monster to be bigger than the boat?
7.0.29	Mark:	No.
7.0.30	T/R 1:	You really didn't. What about the boat and the children?
7.0.31	Mark:	Those too. The children are bigger.
7.0.32	T/R 1:	The children are bigger than the boat. Did you want that? [Mark, still smiling, shakes his head sideways, indicating negation.] No.
7.0.33	Michael:	Maybe he was trying to focus on the children and instead of just the boat.
7.0.34	Erik:	Yeah, he was probably trying maybe to make them look bigger, like you're looking at the children, not the boat
7.0.35	T/R 1:	I, I
7.0.36	Erik:	like he doesn't, he just put the boat in
7.0.37	T/R 1:	Yeah
7.0.38	Erik:	Cause they're at the dock. Yeah, but he wasn't just focusing on the boat.
7.0.39	T/R 1:	Maybe the boat wasn’t intended to be so close, but that he could make it, you know, the dock, not as far out as those things. Or maybe he didn't think about it, all those things. That wasn’t what he was focusing on, but I think suppose changed this, suppose we took this story and made it a math problem. Suppose we changed it for a different purpose. And I said to all of you, I want you to go and make me a model of two children, right, and they're sitting at a dock and they're fishing, and they just caught a fish, right? Let's not make it a sea monster and let's change it a little bit, they're fishing and then their boat is docked somewhere, do you understand? If I asked you to do that and it mattered now what sizes they were. What would you expect to be the largest object and the next and the next? What

		would you expect if you were really worrying about the size, you had two children at a dock and you have a boat and you have a fish, now we're not going to go with sea monsters. Mark?
7.0.40	Mark:	Uh, the boat's the biggest.
7.0.41	T/R 1:	The boat's the biggest. Do you agree?
7.0.42	Students:	Mm, hmm [nods of affirmation from various students].
7.0.43	T/R 1:	You think the boat's the biggest. okay.
7.0.44	Mark:	And then the children, um, and then the fish.
7.0.45	T/R 1:	Would be the smallest. You all agree with that?
7.0.46	Students:	Um, hmm. You agree with that, that there are certain things that all of you would have in your model. You have these four principal players right or things. The boat, two children and you have the fish. And how..what size will you make them will that necessarily be the same? Meredith?
7.0.56	Meredith:	Well, maybe not because everybody can't have the same because they don't have, they're not like copying each other
7.0.57	T/R 1:	Yeah. You make your children. some of you might use little dolls or something, right or bigger dolls, or
7.0.58	Meredith:	You're not measuring the same.
7.0.59	T/R 1:	You wouldn't measure them the same. But one thing that would be the same is the relative, one thing you have to be careful each of you in your own models would be the sizes in relation to the other sizes, right? And if somebody came in now with a fish bigger than the boy, [laughing] that would have missed the point, right?
7.0.60	Michael:	No, because a fish could be bigger than a boy.
7.0.61	T/R 1:	That's true, ok, that's true. But we really mean two children fishing at a little dock, not out in the ocean somewhere where we expect the fish to be smaller, but you're right, you're absolutely right Michael, it could be. But we'd have to agree on some things, on some constraints, here. Obviously if we changed it, that we were maybe deep sea fishing right, and we could be catching some whales or whatever. Or even some very, very big fish. Okay that would change. Now, what does that have to do with the models you made and some of the comments that Michael and Erik made about the models you made? What does that have to say about it? Would you expect one model to come up with something different than the other? Would it look different?
7.0.62	Students:	Yes
7.0.63	T/R 1:	Maybe. Would the relationships that you're suppose to show change?
7.0.64	Students:	No
7.0.65	T/R 1:	No. And that's the important thing to remember. That your model that you make should not be changing, right, your argument. But

		suppose Mark had his model and suppose Danielle made a model, ok? And Danielle decided to make a very little model okay a little tiny model? She doesn't like to carry big things to school. And let's suppose that Audra made a big model, right? She got some help. Could I take the fish in Danielle's model and swap it for the fish, the little fish in Danielle's model or let's take Audra's big fish, can I put it in Danielle's little box. No. Well, it depends on how big the fish is.
7.0.66	T/R 1:	Danielle's little box is really a little box, so, it's, um, you know, about this size [she holds horizontally a thermos bottle approximately 10 inches long]... and Audra's is like that [with her hands she shapes in air a box approximately two feet by two and one half feet] and so Audra's fish is maybe about this big [she holds two pens together in a straight line as these dashes are formed --] and Danielle's fish is about this big [she holds her thumb and forefinger approximately one inch apart]. Would it be okay to put Audra's fish in Danielle's box? No.
7.0.67	Michael:	It would look like a shrimp!
7.0.68	T/R 1:	It would look like a shrimp. Why wouldn't it be okay? What would probably happen if you did that? Graham?
7.0.69	Graham:	Well it wouldn't fit.
7.0.70	T/R 1:	It wouldn't fit in it. That's exactly right, it probably wouldn't even fit in. Maybe it would but it might not, right? And what would happen, Meredith?
7.0.71	Meredith:	Well you could put the Audra's fish and you could put Danielle's fish into Audra's box, because it's small and it could fit in.
7.0.72	T/R 1:	It could be a shrimp [laughing]
7.0.73	Meredith:	but you can't put Audra's fish into Danielle's box because it's [the box] too small
7.0.74	T/R 1:	Ok, it raises some interesting questions doesn't it? We're sort of, you know, making up some hypothetical things and imagining some things. But do you get the idea? That once you've built your model and you decide what you are going to call one, right? You've chosen to make your other principal players in relationship to that one, right? So in this case if, if your one is going to be the size of this little stage, if you like [gestures in the air a rectangle approximately one and one half feet by one foot], your players are made the boy the girl the fish the boat in relationship to this stage isn't it.
7.0.75	Erik:	Mm, hmm [agreeing]
7.0.76	T/R 1:	But if you've made your one a much bigger stage, if you like[gestures a rectangle approximately three feet by two feet] your players are going to be in relationship to that stage, isn't that right? And as long as you stay within your stage, right, you show your

		relationships and if they may or may not work when you switch stages right? And that's like switching candy bars right? Isn't that right?
7.0.77	Erik:	Yup.
7.0.78	T/R 1:	So I want you to think about that for models. Would you expect if you were building a brand new model that what you showed to be true with your first model, should it still work? Should it still work with the new model, the relationships you showed with your old model? Would you expect it to work if your-
7.0.79	Meredith:	Maybe, maybe.
7.0.80	T/R 1:	[As Michael is shaking his head side to side in negation] Michael changed his mind, he doesn't expect it to work Before he said it should work, and now he saying it may not work. So tell me what you're thinking.
7.0.81	Michael:	Well, your old model, say your old model, you decided it was too little and you couldn't see all the figures in it. So you make a bigger model and you try to take the little fish from that model because you decide that you don't want to make another one, you put it in and you wouldn't be able to see it there.
7.0.82	T/R 1:	Okay, but that's not my question now. Suppose in your little stage you showed the people and the boat and the fish, right? And you showed the fish were smaller than the people who were smaller than the boat. Right?
7.0.83	Michael :	Yeah, mmm, hmm [agreeing]
7.0.84	T/R 1:	Would you expect, let's say in Audra's model, which is a different model that her fish was smaller than the people and smaller than the boat?
7.0.85	Michael:	You'd have bigger people, bigger boat and a bigger fish.
7.0.86	T/R 1:	But should those relationships hold?
7.0.87	Michael:	Yeah.
7.0.88	Others:	Yes [simultaneous to Michael's reply]
7.0.89	T/R 1:	Yeah is that right?
7.0.90	Michael:	Yeah.
7.0.91	T/R 1:	Or if we had sort of a medium size model like Mark's and he were trying to make these fit, would you expect the fish to be smaller than the people than the boat?
7.0.92	Michael:	Yeah.
7.0.93	T/R 1:	So in each of your models would have those relationships holding, right?
7.0.94	Students:	Yeah.
7.0.95	T/R 1:	But they wouldn't all be built the same way and they wouldn't all be the same size

7.0.96	Erik:	So it'd be, it's standard that the fish would be smaller than the boat and the people, except the fish would be different sized and the people different sized and the boat different sized.
7.0.97	T/R 1:	Right. Is that like what you're doing when you make models to compare fractions?
7.0.98	Students:	Yeah.
7.0.99	T/R 1:	In what way is it the same or different? [some students raise their hands] Meredith?
7.0.100	Meredith:	Well if you have the same question asked and you do it right then you're going to wind up with the same answer and some of the models could be bigger and some of them could be smaller.
7.0.101	T/R 1:	What do the rest of you think? How many of you agree with what Meredith said? [some hands are raised]How many of you disagree? [no additional hands raised, at least in what was visible] How many of you are still not sure? [more hands are raised] You know we have to help the people who are not sure to understand. they don't disagree, but they're still not following. Can someone help? Let's talk about this a little bit more to help them? Who wants to give it a try? [Meredith's hand goes up] Or the people who aren't sure want to tell us what they are confused about. Do you want to talk a little bit? Audra? Jackie? What bothers you and then maybe the people here will try to help, ok? [students muttering]
7.0.111	T/R 1:	Michael do you want to add to that?
7.0.112	Michael:	Well, it's sort of like um, you can't, the fish has to be smaller than the people and the people have to be smaller than the boat, cause the people have to go in the boat and the people have to be able to pull the fish out of the water and if it was bigger than it they might have a little trouble getting it out. [laughter] So um, so then, um, its sort of like so, that just helps us understand what we're talking about with the Cuisenaire rods when we are using different sized boxes to make different sized, um, halves and quarters, um, but, they're basically you can call it the same thing as you would then just the small one with the small one if you call the box a whole, and the boat a half it would equal a quarter. You could still do that in Audra's model or any box.
7.0.113	T/R 1:	Does that help Laura, Audra, or would you like to ask Michael a question? Does anybody want to add to that? We've heard from Michael and we've heard from Erik. Meredith, you were going to say something earlier? [Meredith mutters]. Oh, it was said already?
7.0.114	Meredith:	Yes.
7.0.115	T/R 1:	Does anybody want to add to that? Sarah, Beth, okay, well it's something to think about isn't it, as we make, uh, different models.