

APPENDIX 3:

Transcript of Marge, Donna, and Anne during Activity II-D1 , Day 6

This transcript is provided to support interpretation of the categories. Most, but not all, of the students' conversation is transcribed below. Activity II-D1 provided the "critical experiment" of breaking a magnetized nail, which was intended to challenge the separation model. However, Marge, Donna and Anne clearly saw nail movements which the instructor had not intended, and which allowed them to modify their separation model successfully (based on their experimental results). Their Activity document is reproduced in Appendix 2.

Transcribing Conventions:

Italics in [*brackets*] are notes on what students were doing.

Ellipses (. . .) represent non-transcribed portions of students' speech. Students read the instructions out loud, and these were not included.

Question marks in parentheses (???) represent unintelligible speech. Best guesses are included in parentheses.

Pauses or gaps are represented by dashes - -

Norms:

Evidence for the norms mentioned in Chapter 5 is marked on the right hand side. Shorthand names for the norms are:

Common Ground - When publicly describing general features of magnetic and electric phenomena, students were obliged to write or speak in terms of observables only, without reference to charges.

Evidence - students in the class were obligated only to admit evidence that was obtained from experiments conducted in the class.

Models - Students and groups were obligated to have models that they could support with specific evidence that was acceptable to the class.

Event type codes:

Episodes of the group's activity during which time they were constructing a group representation are marked with boxes. Within the boxes the types of events are marked with codes which are listed below.

The event type "Moving on" was not found in this transcript, and is not included in the table. Events are marked with just the single word, repeated as needed to show the extent of the event. In most cases, no single line corresponds to a single event, rather the event stretches over a number of lines.

Activity types codes key

Logistics	Checking	Comparing	Extending
Results recording experimental results	Monitor quiet monitoring	Similar discovering similarities in thinking	Negotiate negotiating a common idea from different starting points
Tech dealing with technical issues	Check spoken checking	Diff discovering differences in thinking	Explicit making an explicit statement from talk
On track getting a member on track	Errors detecting and correcting errors	Fail apparently failing to discover differences	Extend extending an idea or issue
Specs satisfying specifications			Explore exploring ideas that might be plausible

Time	Speaker	Transcript & [Notes]	Event type	Norm evidence
00:00		<i>Video begins while Anne is opening the document</i>	.	
00:11	Donna	So are we keeping our model? [<i>to Marge</i>]		Common ground norm: Group members check whether they all think the same.
00:13	Marge	I think, as far as working here, I didn't see anything to change my mind.		
00:17	Donna	Nothing out there that, yeah		
00:19	Marge	huh uh.		
00:30	Anne	[<i>time spent setting up the document</i>]		
01:09	Anne	We don't do this right now, do we?		
01:15	Donna	Do we have to do this? I think we do. Do we?		
01:18	Marge	Yeah, this is what he said we had to do that.		
01:21	Donna	"Imagine you have two nails, one.." [<i>Reading the instructions, not all of them are transcribed here</i>]		

01:46	Instructor	Do you need help in drawing pictures?		
01:47	Donna	I think we might		
01:51	Marge	We can put letters in here, right?		
02:00	-	<i>[Instructor shows how to make pictures of Ns and Ss. Anne begins placing N and S letters mixed together in the unrubbed nail diagram]</i>	Tech	
03:39				
03:40	Donna	Thank you <i>[Instructor leaves]</i>	Tech	
04:09	Anne	Okay now, Ss?	Check	
04:10	Donna	That's good		
04:11	Marge	Yeah	Check	
04:47	Donna	one down there, yeah <i>[Anne places the last S in the unrubbed nail]</i>		
04:53	Marge	(???) you can't delete?	Check	
04:54	Anne	Oh no, that's okay		
04:59	Anne	okay. down here -	Check	
05:00	Marge	Now go to the bottom. There we go.		
05:06	Anne	And do we want all the - okay, south ends	Error	
05:10	Marge	Want it to be a what?		
05:12	Anne	south over there.	Error	
05:12	Marge	North pointing nail.		
05:14	Anne	So that north's going to be - oh so we want the S-	Error	
05:17	Marge	want the norths down there,		
05:18	Anne	Down there. Gotcha	Error	
05:21	Marge	There (???) exact		
05:31	Anne	<i>[Placing Ns and Ss at opposite ends of the rubbed nail?]</i>	Monitor	
05:47	Donna	think there's a space in the middle of the nail? <i>[Donna notices the gap that is appearing as Anne draws the picture.]</i>	Extend	
05:51	Anne	I dunno		
05:52	Donna	Do you think like the south - they just butt up.	Extend	This question influences the group's thinking for the next hour
05:56	Anne	Just meet at each other.	Extend	
05:59	Donna	You know what I'm saying?		
06:00	Anne	Yeah	Extend	

06:00	Marge	We didn't test anything for the middle of it, I don't know what happens		Models: no evidence means
06:02	Donna	I mean just based on our model, do you think, because we're drawing a picture of what we think's happening, do you think that Ss come right up to the Ns?	Extend	no model details
06:14	Donna	or do you think there's a space in the middle of it?	Extend	
06:16	Marge	I don't know. It'd be interesting to take a magnet and		Linking model back to an experiment - consistent with "models" norm
06:21	Donna	Put it in the middle	Extend	
06:22	Marge	yeah, and go up and see when it changes. See if you can keep attraction, attraction, attraction all the way up through the center		
06:26	Anne	you mean	Extend	
06:28	Marge	then all the sudden dramatically it shifts		
06:29	Anne	Uh huh	Extend	
06:31	Donna	What do we think. Should we	Specs	Common ground
06:33	Anne	I don't know		
06:34	Marge	I don't know	Specs	
06:35	Donna	Leave it like that for now? Is that all, cause is that like all we know.		
06:36	Anne	Yeah, cause we don't really know.	Specs	
06:39	Donna	Okay		
07:00	Marge	Okay	Specs	
07:18		<i>[Group members getting apparatus ready]</i>		
07:34	Anne	"For your first prediction, imagine that you break a point north nail into two pieces. Predict. . . ." <i>[Anne reads the instructions on the screen]</i>		
07:40	Marge	Aaah! Here we go. Now we'll figure out what's happening in the middle.		Models: Marge sees opportunity
07:43	Anne	Yeah		to check model
07:48	Donna	What would happen to each piece if you floated it by itself..		with evidence.

07:51	Anne	I think you're right like just the south would all be like to the middle, like they would meet in the middle and they would be all north and south here. [<i>Anne may mean that N and S charges meet in the middle of the nail</i>]	Extend	
08:01	Anne	So predict what you would expect would happen to each piece if it was floated by itself. Well I think that it would probably	Extend	
08:08	Donna	I think the point piece would go north		Consistent with the Common Ground norm
08:10	Anne	Or south piece would just be	Extend	
08:12	Donna	And the head piece would face south.		
08:16	Anne	Just stay the same - cause	Extend	
08:17	Donna	I don't know if you like - I don't know if there would be any north ends in that bottom part.		Models:
08:25	Anne	yeah	Extend	Notice also the group is connecting their model with their predictions.
08:26	Marge	I don't think so. Uh uh.		
08:28	Marge	I would see no reason why the north ends would suddenly show up in somewhere else.	Extend	
08:33	Anne	yeah, I would think see them jumping		
08:34	Marge	I wouldn't see them jumping.	Extend	
08:36	Donna	Okay. So, Do we write it right there?	Specs	
08:43	Donna	I don't know		
08:44	Anne	Right	Specs	
08:45	Donna	Or do we write it down there?		
08:46	Anne	"How did you decide?" I think we just (??) it here then.	Specs	
08:49	Donna	Okay		
08:50	Anne	So we think it would stay the same. Right? No, no change would occur.	Diff	
08:54	Marge	What would happen to each piece if it were floated by itself?		
08:57	Donna	Do you think that the point piece would	Diff	
09:01	Marge	The north point piece would point to the North?		
09:01	Donna	the North?		
09:14		[<i>Anne types silently</i>]	Monitor	
09:20	Marge	The head piece. . . the head of the head piece would point to the South. I think.	Monitor	Common ground: Marge suggests her idea

09:26	Donna	Do you think the whole, well, yeah. Think it would matter? Do you think this might just as well point to the South? Is it all south? You know what I'm saying? Is that whole piece south?	Diff, Explore	Donna wonders whether a nail that is all south would have a preferred orientation.
09:39	Marge	You mean you think it would turn sideways?	Diff, Explore	Because of the different ideas,
09:42	Donna	No, I just don't know if it would matter.		the group considers both
09:45	Anne	you just think it'll	Diff	possibilities.
09:45	Donna	I don't know. I don't know.		
09:46	Marge	What would it do? I don't either.	Diff	
09:49	Anne	Where		
09:49	Donna	You know what I was thinking? okay,		
09:50	Marge	Would, you've got a concentration down here	Extend	
09:53	Donna	This is all norths. This is all north. What would it do? I'd think it would - do you think it would go that end or that end? Do you think it would matter? To that, to that piece?		
10:01	Marge	Well, if you dragged it this way the highest concentration of things I would think would be still down at the point of it.	Extend	Marge modifies her model to fit her prediction.
10:05	Donna	Ohhh. Maybe..		
10:09	Marge	And there would be less of them going to this end. And here the highest concentrations of the other ones would be at this end I would think.	Extend, Negotiate	Models: Marge is connecting a model to predicted phenomena
10:13	Donna	Yeah, okay. That's fair to think that.		
10:17	Donna	Okay. Let's just do that. We'll see I guess.	Negotiate	Donna accepts this move
10:19	Marge	And we'll see what happens.		
10:23	Anne	<i>[Types the group's predictions silently]</i>		
10:30	Donna	How did you decide? How did you decide?		
10:40	Anne	well, um, Because. because even though they're still cut in half, the magnet dragged the concentration as you were saying to, the, uh, to the point, the north point. So those north particles are still going to be there. they're not going to disappear. <i>[Anne's concern seems to be that the charges are still there after breaking the nail.]</i>	Explicit	

11:01	Donna	Well, basically we sort of saying what we said up at the board, right?	Explicit	
11:05	Marge	Mhmm.		
11:06	Donna	That's what we're saying. 'Cause that was our model. We just say, repeat what we said.	Explicit	
11:14	Marge	Basically all we said I think was that breaking the nail didn't change the fact that we think the north		
11:21	Donna	Start typing. [<i>Taps Anne on the shoulder</i>]	Explicit	
11:22	Marge	forces are concentrated at the pointy end and the south forces are concentrated at the head end.		
11:29	Donna	"Breaking the nail doesn't change the fact the" [<i>Reading what Anne typed</i>]	Monitor	
11:52	Marge	It still contains the concentration of the of the North attracting forces.		
12:08	Anne	you mean the concentration of the north forces? [<i>Anne may be thinking the North pole of the Earth has a north magnetic pole, which it doesn't. It has a south magnetic pole.</i>]	Monitor	
12:11	Marge	Of the North attracting forces, what ever they are. And the head end contains a concentration of the South attracting forces.	Monitor	
12:39	Donna	'kay then maybe we could put "we know that" oh well. Do we need to say stuff that we said on the board? Like - you know, that , what did we say?	Specs	Models: Donna asking whether formal evidence or class ideas are needed.
12:57	Anne	you mean just the - our, uh,	Specs	
13:02	Donna	That magnetism has direction pull, all those reasons, our		
13:08	Anne	maybe we could say that in breaking the nail that does not effect the direction of pull?	Specs	
13:15	Donna	(No, that's not) - [<i>Spoken very softly</i>] I guess we don't - we're talking about breaking the nail now, so,	Specs	
13:21	Marge	the only thing they're asking us is what's going to happen when you break the nail and how did you decide that?	Specs	
13:25	Donna	Okay. okay.	Specs	

13:31	Marge	see what they want next. Save your work.		
13:44	Anne	Hm.		
13:45	Donna	Now - "Imagine that you separately floated each half of the original," . . . okay, north pointing end, near each end of the two.		
13:58	Anne	Oh so you're taking another point north nail, bringing it towards each end. okay gotcha. (??) Head, a, b, and point.		
14:09	Donna	I think this one will attract. And this one will repel on both sides.	Similar	Common ground:
14:17	Anne	cause this has all the norths		
14:19	Donna	if you get this, or this, it's always going to, you know what I mean, it's going to attract, and this one will repel.. do you think? [<i>Marge was apparently not paying attention during this discussion, until now.</i>]	Similar	Group agreement sought. Marge needs to get on track with the group.
14:28	Anne	I agree with you cause I don't think it's gonna change.	Similar	
14:32	Marge	Let's see what the prediction table's asking. The only - is it you're talking about a and b which is these two points right here, and not the a's and b's aren't out at the points and the head, they're in the middle.	Specs	
14:46	Marge	At the breaking point. So this is where we're going to find out what you were asking, is what goes on in that middle.	Specs	
14:55	Anne	So		
14:56	Marge	Pull it up a little, let's see that.	On track,	
14:57	Anne	(???)	Specs	
15:03	Marge	head a b - okay, so they want to know what's going to happen at the head, and then at a and then at b and then at the point.	On track, specs	
15:07	Donna	yeah, both sides	On track	
15:10	Anne	I think that the head is going to attract, the point will repel and a and b I (??)		
15:14	Marge	Uhhuh yeah (??) at a and b.	On track,	
15:17	Donna	you think a will, you think a is going to attract also?	Similar	
15:20	Anne	probably		

15:21	Marge	Although a less effect, I would say a lesser effect.	Similar	Models: Marge connects with her model again.
15:23	Anne	You're right. okay. [<i>begins typing</i>]		
15:40	Donna	Or I guess it could do nothing. Maybe all the forces just pull to the end, and there's nothing in the middle. none of those	Explore	Donna considers the model also
15:50	Marge	Is that what you think?		
15:51	Donna	I don't know. No. I don't know. But it's you know, the third alternative. If you took all the forces and the forces just came to the end [<i>Sees 3 possibilities - attract same as before, attract weaker, or not attract at all.</i>]	Explore	
16:03	Marge	yeah there can be noth- [<i>Marge thinks of 3 possibilities: attract, no effect, repel.</i>]	Explore	
16:04	Donna	and there were none of those forces left, in the middle. and then it could just not react.	Explore	
16:10	Marge	It could not react, or it could react less, or it could, somebody could say well now you've made a polarized, two polarized things.	Explore	
16:19	Donna	yeah yeah I guess there's more		
16:20	Marge	And you'd have attract and repel [<i>Within a single piece</i>]	Explore	
16:22	Donna	yeah yeah		
16:23	Marge	and we'll see	Explore	
16:24	Donna	ohohoh. So which one do you think we should go with?		
16:29	Anne	Well I agree with what you first said I think that 'a' is going to have a lesser effect but it'll attract.	Similar	Common ground: Checking to see whether all agree
16:33	Donna	It'll still attract.		
16:35	Anne	you guys all agree with it?	Similar	
16:36	Donna	I don't know.		
16:36	Marge	mhmm	Similar	
16:37	Anne	this is just a prediction. We could just try it.		
16:38	Donna	[<i>Laughs</i>]	Similar	
16:40	Anne	But do we want to, maybe it'll attract?		
16:43	Donna	just put it, it will attract, but it will be a lesser	Similar	
16:45	Marge	that would be my first guess		

16:50	Donna	. . . effect or a lesser reaction or something like that.	Similar
17:04	Donna	'A lesser attraction.' Pretty nice grammar there.	Tech
17:06	Anne	We think that the effect will be a less attraction	
17:11	Donna	I don't know. No this doesn't sound good but. . .	Tech
17:14	Marge	No	
17:16	Anne	What do you want me to say?	Tech
17:17	Donna	No, it doesn't matter! <i>[laughs]</i>	
17:22	Marge	you can't get it up there. <i>[problems with the text box]</i>	Tech
17:23	Anne	Can't it click outside?	
17:37	Marge	Okay that's going up. There you go. Excellent.	Tech
17:48	Anne	will be less of an attraction. haha	
17:50	Donna	"b" will - we don't have to say we think	Tech
17:53	Marge	yeah	
17:54	Donna	but just say "will repel"	Tech
18:02	Donna	How do you say that? lesser attraction! <i>[laughs]</i>	(the problem is grammar)
18:05	Anne	B will repel	Tech
18:07	Donna	at a lesser repulsion? <i>[Giggling]</i>	
18:08	Anne	uh, but at a less. .	Tech
18:09	Marge	Well, actually, it, "be repelled" because it can move, this thing can't so it's going to be repelled, right?	
18:15	Marge	It's gonna - it's floating	Explicit
18:17	Anne	. . will be repelled . .at <i>[Typing]</i>	
18:20	Donna	a lesser rate	Explicit
18:21	Anne	at a lesser rate	
18:22	Donna	lesser, reaction?	Explicit
18:33	Donna	Point. point will repel.	
18:41	Anne	Point will repel. Enuf said. <i>[Types 'enuf said' then deletes it]</i>	Explicit
18:46	Marge	no - (??)	
18:48		<i>[Everyone laughs]</i>	
18:54	Anne	okay, how did you decide?	
18:54	Marge	(?ake 20??)	

18:58	Donna	Are we being recorded too? [<i>Anne turns to camera with a grin, and nods.</i>]		
19:02	Anne	How did you decide?		
19:03	Donna	How did we decide? [<i>in unison</i>]		Model: Document
19:04	Donna	umm		explicitly states
19:06	Anne	[<i>Reading</i>] "Your prediction should be based on the model you sketched on page 1." Well, you're right.		that groups should use their model.
19:14	Marge	a-a- we made the prediction predicated on our model and what we understand at this point.	Monitor	This may make it easier to connect with evidence
19:21	Anne	[<i>Types what Marge just said</i>]	Monitor	later.
19:22	Donna	Shoot, I (?) wonder if there's just (???) nothing in the middle.	Extend	
19:26	Marge	I don't know. I think that's what we're gonna test now, right? You think? We haven't . . . no . . .	Extend	
19:33	Donna	Maybe we could put that question. Say "although we think there more - even though we made a prediction, we wonder"	Extend	
19:43	Marge	We wonder what's going on in the middle.	Explicit	
19:45	Donna	We wonder what's going on in the middle. Is there nothing in the middle? just put that, just for the record.	Explicit	
19:51	Anne	Wait wait so hold on. Okay, so what do you want me to put here?	Explicit	
20:00	Marge	We wonder what is actually going on in the middle of the nail. Right?	Explicit	
20:05	Donna	uhuh.		
20:11	Anne	[<i>Typing</i>]	Monitor	
20:18	Donna	You're going to say even [<i>Response to what Anne typed</i>]	Monitor	
20:19	Marge	are there any charges there at all?		
20:21	Donna	Well, but we made the prediction that there is.	Explicit	
20:24	Marge	Okay I thought you wanted to		
20:26	Donna	Besides, maybe say besides our prediction, you know, 'cause that's our prediction that there still is something in the middle.	Explicit	
20:32	Marge	Okay	Explicit	
20:34	Donna	Besides our prediction we wonder		

20:40	Anne	we wonder if there is , there are any	Explicit
20:41	Marge	there are any forces at all left in the middle of the nail?	Monitor
20:48	Anne	[Typing, saves document, turns the page]	Monitor
21:07	Anne	uhhh, I think that says get. [Reads the document] "Get a nail prepared for breaking, it will have a cut through its middle."	
21:32		[More reading, then group collects things needed for the experiment]	
21:40	Anne	[Anne continues reading aloud while the other two are getting apparatus]	
22:45	Marge	What do we do, magnetize it and then - ? [To Anne]	
22:46	Anne	We're going to break it - Yeah we're going to magnetize it and break it and then float each piece	
22:51	Marge	Okay, she's getting the float stuff.	
22:57	Marge	Now we're making it a point north nail?	
23:02	Anne	yeah. yeah.	
23:04	Marge	[Goes off to magnetize and break the nail, even though she should not do that yet]	
24:12		[Anne, Donna, and the camera operator chat while waiting for Marge.]	
25:30		[Marge returns]	
25:31	Marge	Okay, here we are. "Float each half piece of the original point north nail separately." [Reads the instructions]	
25:48	Marge	okay, there's a half piece.	
25:50	Donna	[Gasps] We were supposed to test it first!	
25:52	Marge	I know, we didn't!	
25:55	Class helper	Need to make sure it works [Helper was listening in]	
25:57	Donna	Can you get (??) can we use another one?	
26:00	Marge	Yeah, I can start over again.	
26:02	Donna	Well, we need to, see, make sure	
26:06	Class helper	make sure that the instructor says there's enough.	
26:14	Donna	(??) It said don't break the nail yet.	

26:29	Donna	[<i>Marge returns with unrubbed nail and a magnet</i>] Were there enough? you want me to do it? What do I have to do.	
26:35	Marge	We're going to magnetize it and then test it?	
26:37	Anne	Is there enough or should we	
26:38	Instructor	We had a couple of extra	
26:39	Anne	okay	
26:40	Donna	sorry...	
26:42	Marge	We need to make it a pointy north	
26:44	Donna	So we use the south end	
26:45	Marge	uhuh	
26:49	Donna	okay, ready?	
27:00	Donna	But see Marge is the expert on this. Marge should be doing this. I'm nervous. [<i>rubs the nail anyway</i>]	
27:13	Donna	Think that's good enough?	
27:14	Anne	Yeah	
27:30	Marge	Probably move the magnet. [<i>Away from the nail float</i>]	
27:31	Donna	Oops, good idea	
27:56	Donna	Okay [<i>Floats the nail and it points North</i>]	
27:57	Marge	Okay?	
27:58	Anne	Okay Now we break it	
27:59	Donna	"Make sure your nail is working properly....	
28:11	Marge	Now we go break it.	
28:12	Anne	Now we go break it. [<i>Anne & Marge leave</i>]	
28:50	Donna	[<i>Waiting for Anne & Marge to return</i>]	
29:35	Marge	Float each half	
29:38	Donna	Float each half. So do I take the tape off? Which side do you guys want to do first.	
29:44	Anne	The pointy north	
29:45	Donna	Okay	
29:47	Marge	Probably untape it. Or I guess it doesn't make any difference.	The group also agreed on experimental procedures.
29:54	Donna	I can untape it. Want to untape it?	
29:57	Anne	Sure	

30:00	Camera	That was just for when you wouldn't lose it or fall on the floor or.. .		
30:03	Anne	Okay		
30:09	Donna	Do I need a - we're just using the magnet right?		
30:23	Donna	"Float each piece of the original point north nail separately"... . [<i>Reads the instructions</i>]		
30:47	Donna	I don't know. Still pointing north		The group also agreed on experimental results.
31:00	Anne	okay it's stopping		
31:01	Anne	think?		
31:04	Donna	I think it stopped		
31:04	Marge	Mhmm	Record	
31:09	Anne	[<i>Typing the group's observation</i>]	Record	
31:29	Donna	Dis (???) [<i>Heavily overlapped speech</i>]		
31:30	Anne	(???)		
31:30	Donna	I'll put the thick end, and I'll try and point it, and see if it turns around. [<i>Replaces the point piece with the head piece</i>]		
31:30	Marge	Now we have to do the other one		
31:51	Donna	It's turning		
31:52	Anne	Mhmm		
31:52	Marge	Yeah, it really is, dramatically, isn't it?		
31:55	Donna	Okay, now I take the thick, the head?		
31:59	Marge	take that one out (??) yeah. Don't want to contaminate it.	Record	
32:11	Anne	is in . [<i>Typing</i>]	Record	
32:43	Anne	Hmm.		
32:52	Donna	wooww	Record	
32:53	Anne	Same, huh? The head piece continued to point South?		
32:56	Donna	Uh huh.	Record	
33:00	Donna	Could also say that (???)tivity ??) [<i>laughs</i>]		
33:02	Marge	yeah, that's what we're going to find out when we do the magnet with it, or I guess we're gonna rub nail.		
33:07	Anne	Do you want me to say that?		
33:09	Marge	Or make another point north nail. No cause now we're gonna do it		
33:11	Anne	Okay		

33:12	Marge	Like what happens when a point north nail is brought near.	
33:13	Donna	"Make a point north nail .." [<i>Reads the instructions</i>]	
33:17	Donna	Okay, so do we need another nail,	
33:20	Donna	Just one, right? [<i>Gets up to get another nail</i>]	
33:20	Marge	Uhuh	
33:21	Marge	Yeah, and it doesn't have to be notched.	
33:31	Anne	"... instructions for step 3. Make another point north rubbed nail" [<i>Reading the instructions</i>]	
33:31	Marge	Okay	
33:36	Anne	Yeah.	
33:36	Marge	This will be good.	
33:37	Marge	See what happens with the middle	
33:42	Anne	[<i>More reading and interpreting instructions</i>]	
33:49	Marge	You can write right up here, write yippee?	Models:
33:55	Donna	[<i>Just returned</i>] what?	Marge is happy
33:56	Marge	Yippee, we get to test it!	to have a
33:57	Donna	Okay.	sanctioned
33:59	Marge	Rub it way down there.	test of the group's
34:01	Donna	I'm going to take my south end and rub it and I am going to rub it to	question.
34:06	Marge	the pointy end.	
34:07	Donna	the end of the pointy end	
34:08	Marge	Do it far away from this, don't get it over here.	
34:15	Anne	Drum roll, should be	
34:23	Donna	(???)	
34:27	Marge	Excelente	
34:28	Anne	To the head	
34:31	Anne	I thought it was nowhere	
34:32	Marge	Okay, put the pointy end towards the head	
34:34	Donna	Okay, guys	
34:36	Anne	Pointy end toward the head. Remember this is a face of this north end	
34:38	Donna	Pointy end toward the head?	
34:40	Marge	Head, that's your head	

34:43	Anne	Wow.		
34:44	Marge	Okay.	Record	
34:45	Anne	Attraction		
34:46	Marge	Strong attraction.	Record	Models:
34:48	Donna	So we know that the south forces are in the head of the nail.		Immediate connection to
34:55	Marge	Okay	Record	model
34:56	Donna	this is "a," right?		
34:57	Anne	Yeah		
34:57	Marge	yeah, now we go to "a,"		
34:58	Donna	Now I take my north point? 'kay, . .		
35:02	Marge	Close to "a," let's see what happens		
35:06	Donna	[Gasps as the other end attracts also]		
35:07	Anne	Attract		
35:07	Marge	Equally strong attraction.		
35:09	Donna	huh!		Models:
35:17	Donna	Then why is the head pointing south? Why does it - If I . . Won't the head . . Or why . . Why does it. Why does it - It makes a difference to that nail, which way it's going to settle. It doesn't make sense! [<i>Continues to test the two ends of the nail</i>]		The two ended behavior is a challenge to Donna's interpretation of the evidence that she interprets
35:46	Anne	mhmm.	Record	in terms of the
35:52	Donna	Okay.		group's model.
35:53	Anne	(Oh look at those?) that's right cause these are all still the south particles		
35:56	Donna	south particles,		
35:57	Anne	(The north particles?)		
35:58	Donna	but I'm thinking that this one always wants to go,		
36:00	Anne	this way		
36:01	Donna	flat head wants to go South.		
36:02	Anne	even though both of them are south.		
36:03	Donna	yeah		
36:04	Anne	probably cause maybe this has more of em? (???)		
36:06	Donna	It still has a real strong attraction.		
36:08	Anne	yeah it does.		
36:09	Marge	Uh huh.		
36:10	Donna	Okay, anyway.		
36:11	Anne	'kay		

36:12	Donna	Okay now I take the pointy end.	
36:24	Marge	Now this is going to be really interesting. If you have that strong an attraction	
36:28	Anne	repel	
36:30	Anne	'kay, that's the pointy. Oh.	Record
36:30	Marge	repel it? Yep	
36:35	Anne	all the- okay. The "a."	Record
36:36	Donna	okay. go ahead I'll remember	
36:38	Anne	yeah	
36:40	Marge	now we want the "a" [<i>Actually meaning "b", the broken end of the point piece</i>]	
36:42	Anne	Wow!	
36:43	Marge	Uh huh. See.	
36:45	Donna	Attraction.	
36:46	Marge	We didn't expect that.	Record
36:48	Anne	Incredibly. [<i>Strong effect</i>]	
36:55	Donna	Wow. So.	Record
37:01	Anne	Strong attraction.	
37:04	Anne	Would you do that again? I want to see it. I think that's like the strongest one, isn't it?	
37:10	Marge	that's really strong.	
37:12	Donna	Okay, so the point is repelling.. Oops.	
37:22	Anne	The point repels.	Record
37:34	Donna	So - [<i>Anne types response</i>]	
37:35	Marge	Mmhmm?	Record
37:48	Anne	"Carefully review all of your predictions and observations for the . . ." " [<i>Reading</i>]	Models: The documents again require groups to reconsider their models after getting new experimental evidence. The group takes it as normal.
38:02	Anne	". . . describe in the following space how and why your model needs to be modified." Well we could say something about	
38:08	Donna	Well there's still south forces in the middle. Well, yeah, it does	
38:19	Marge	Mhmm	
38:20	Donna	yeah	
38:21	Anne	Both middle ones attracted, right? The "a" and the "b"?	
38:24	Donna	This is all south. [<i>The head piece</i>]	
38:26	Anne	Yeah	

38:26 Donna This is all attraction. The end of this is south and only the point is north.

38:30 Marge mhmm

38:31 Anne yeah. So this is the only thing that repels

38:33 Donna You guys, can I just like point it in the middle and see what happens? [*Wants to test along the side of the point piece to see where the attraction ends and the repulsion begins.*]

38:36 Marge Mhmm. See if it, if there's a change, where does the change happen?

38:40 Anne Attraction

38:40 Donna Yeah, where does the change happen?

38:47 Donna I'm confused now, wait. That's repelling.

38:53 Anne No

38:54 Anne Repel

38:54 Donna No

38:55 Marge attract.

38:57 Donna I can't tell.

39:08 Anne I love watching this.

39:09 Donna I don't know.

39:12 Anne they're probably like, maybe like,

39:14 Marge It's hard to tell where it changes, isn't it.

39:15 Donna yeah

39:17 Anne But all of a sudden it's so strong that's what's so weird about it.

39:18 Donna Attraction. It's hard to tell, huh. Almost as if - only seems like it's at the very, very point. Attraction

39:30 Donna It seems like it's at the very, very point, huh? It's just well like from there, a quarter inch down.

39:37 Marge There that's repelling

39:41 Donna No, no, no, I guess that's halfway. No, okay

39:53 Anne Like just above halfway.

39:54 Donna Yeah, just above halfway. Its like three fourths of it's north and one fourth south, almost.

39:56 Anne Mhmm

40:02 Anne Mhmm

40:02	Donna	right?		
40:07	Anne	Wow, that's really weird		
40:08	Marge	Okay we can put them down in here now. [<i>Referring to the document</i>]	Specs	Common ground
40:11	Anne	Do we want to just put our exact things in there or no?		
40:13	Donna	Wait are we going to have to take another picture? Or I mean make another?	Specs	
40:13	Marge	we're going to revise our model. No.		
40:17	Marge	It says - if you - this is going to be the same as our prediction, as our first drawing. Then we take a picture of our first drawing and stick it here.	Specs	
40:25	Donna	Oh, okay. but it it's not.		
40:27	Marge	It's not. So we have to make a new one.	Specs	
40:28	Anne	we also need to describe why we think our model needs to be modified. Cause	Specs	Models
40:33	Donna	Well,	Explicit	
40:34	Anne	because there was an attraction - I mean attraction at "b." Is that "b?"		
40:38	Donna	yeah.	Explicit	
40:39	Donna	Yeah, that's "b"		
40:39	Marge	Mhmm	Explicit	
40:43	Anne	What should we say, there was an attraction. . .		
40:48	Marge	there was an attraction at "b" that we did not expect based on our . . . model	Explicit	
40:52	Donna	Model	Explicit	
41:05	Anne	Uuum . therefore, um		
41:07	Donna	Well, that's okay. So that's all you need to say I think.	Explicit	
41:13	Anne	Okay		
41:29	Anne	We want to take those n's and souths.	Tech	
41:33	Donna	Want to take a picture?	Tech	
41:42	Marge	(Alright, do ??) [<i>Group helps Anne take a picture of N and S letters</i>]	Tech	
41:51	Donna	kay, and then		
41:52	Marge	now, what did he say?	Tech	
41:54	Anne	Option, apple		
41:55	Donna	Apple	Tech	

41:57	Anne	shift	
41:59	Donna	oops	Tech
41:59	Marge	three- shift three. [<i>The group is learning how to take a picture of the screen</i>]	
42:00	Anne	It's fine, alright,	Tech
42:03			
42:06	Class helper	Start at like the upper left hand corner and	Tech
44:01	Anne	Those little dots are there but	Tech
44:03	Marge	So this is rubbed. So we're going to show what, Ss all the way down to about here? Is that where we thought they were?	Explicit
44:10	Donna	(Yeah, well?)	
44:13	Anne	Yeah, right?	Explicit
44:14	Donna	Even, right there. You can put an ess there.	
44:23	Anne	Okay, I don't think it's going to	Explicit
44:30	Donna	Not here, here!	
44:32	Anne	Oh, well don't we want to fill this up with Ss or do we	Explicit
44:34	Donna	I was just putting my finger so you	
44:34	Marge	She just wanted a starting point.	Explicit
44:35	Anne	oh, oh	
44:37	Donna	But you're - there. Think that's too much?	Explicit
44:41		[<i>Anne has a little problem with the software</i>]	Tech
44:47	Anne	How come those Ss look upside down? do they look up side down to you guys?	Tech
44:49	Instructor	Can I ask you a question, everybody? What did you find for your results right now?	
44:51	Marge	They look okay.	
44:53	Donna	We found with the flat head, both ends attract. And we found with the pointed end, the point north nail has a repulsion and point "b" which is that end, has an attraction.	
45:09	Instructor	Okay, so the half that was the pointy narrower half showed the attraction repulsion at two ends, and the thicker part showed what,	

45:18	Donna	Only at-		
45:19	Instructor	attraction at both parts. [<i>Leaves</i>]		
45:37	Anne	Okay, um, unrubbed	Monitor	
45:39	Marge	(??) going everywhere. (??) doing so well.		
45:51	Donna	now this one's all mixed up, right?	Monitor	
45:52	Marge	mhmm.		
46:22	Anne	that good enough?	Monitor	
46:22	Marge	Okay yeah that looks good.		
46:25	Anne	Okay. "Open up the explaining magnetism idea container. Take snapshots of your initial and final . ."		
46:41	Marge	You understand how to do that?		
46:42	Donna	yeah. Take a picture of that whole thing.		
46:43	Marge	okay		
46:46		[<i>The group has trouble taking a picture of their new model and pasting it into their Idea Container document. Eventually someone helps.</i>]		
52:29				
52:20	Donna	"Summarize your rationale in the second pocket . ."		
52:29	Anne	". . .along with the picture." Oh so at the end, okay. Add any other ideas to the second pocket of the idea container. Do we just want to say that we found that the south particles carried farther than we assumed?	Similar	
52:40	Marge	yeah!	Similar	
52:45	Donna	wait. should we save and print this document right here first?		
53:15		[<i>Group saving and printing</i>]		
53:21	Donna	there we go		
53:31	Anne	Oh, our, what do you want me to say?	Specs	
53:34	Donna	The north, the north forces, umm, concentrated		
53:39	Marge	What are we supposed to be saying? I don't remember the question	Specs	
53:41	Donna	Just our rationale		Models:
53:43	Anne	Just our rationale why we're changing it.	Specs	The group types their reason why.
53:44	Marge	Oh why we're changing it. Because we found		

53:48	Anne	That the south	Explicit	
53:49	Marge	that the south forces extended further through the nail than we expected to find them. [<i>Donna turns to look at the clock. The period is almost over.</i>]	Explicit	
54:09	Anne	Is that basically it? Do you want to say anything else?		
54:13	Donna	Um, put maybe we should explain the north point end had both attraction and repulsion.	Explicit	
54:26	Anne	Oh. We learned this because the north point broken half	Explicit	
54:36	Donna	the north point half had an attraction. Half, had both attraction and repulsion. Or showed. yeah.	Explicit	
54:56	Donna	repulsion to a north point nail.		
55:08	Anne	Do we need to save these?		
55:09	Donna	I would save it.		
55:10	Anne	I don't think I saved the other one.		
55:12	Donna	Should we print it too?		
55:19		[<i>Camera stopped, but then restarted to capture the rest of this conversation. Donna alerted Marge and Anne to the (alignment) models that many other groups had drawn on their computers.</i>]		
?:00	Donna	. . . So all the souths- like for example, the boxes are like the magnet. um, boxes north and south. There's one unit of north-south, another unit of north-south. In a box. North south, north south, so when you broke it, at least that's the rationale, you break it, there's still south ends at the- - you know. It's an interesting picture. Kind of looks like the ones up on the board		This discussion assumes that other groups have constructed models consistent with their experimental results
?:30	Anne	mmmmm [<i>Marge stands up to look.</i>]		
?:33	Anne	Mmmm! it is, it is,		
?:34	Marge	But then, if that were true, then when you broke it, you should have, and maybe they did, maybe they did,		
?:41	Donna	That's true		
?:42	Marge	repulsion at the end		
?:45	Donna	That's right.		
?:49	Marge	and we didn't have any.		
?:50		[<i>End of this discussion, tape ends.</i>]		

