

Section of interview coding for 'Radio Waves'.

			Just switched to static field
7:04	Sue	Hmmmm I just showed the static field. It's just showing few of em um but I'm not really sure why. And hide the vectors ok this goes with that	Clicks hide the vectors and then to radiating field
7:32	Sue	I guess I like the radiating field better just cus as it gets further away it starts going just up and down. It seems to make more sense I guess.	Looking at the radiating field on Full field mode
7:43	Wendy	Ok	
7:44	Sue	Ummm Oooh that's a good one. Ummm I'm kinda looking at how this affects the wave and.... I sort of like that. Makes the wave make a little more sense I guess.	Looking and the curve with Vectors mode
8:12	Wendy	Uh huh	
8:12	Sue	To see it like push it push the wave up and down as it goes down it goes across	
8:19	Sue	ummm autoscale.. and let's see....	
8:30	Wendy	Uhhhhh	
8:30	Sue	So that may have frozen it.	
8:32	Wendy	That wasn't your fault	Exits and restarts
8:33	Sue	(unrecognizable)	
8:34	Wendy	Why don't you exit it and go back in.	
8:35	Sue	Ok	
8:36	Wendy	I was noticing that it was complaining about being out of memory in the corner.	
8:39	Sue	Ok	
8:39	Wendy	It never quite recovered	
8:45	Sue		Checks display strip chart and stares for a few seconds
		Um... Ok what would be the difference between these two?... I don't really seee...	
9:00	Wendy	Move the window around a little bit because there are some lables that are missing. Sometimes they come up without it... Here will it just let you resize it?	
9:07	Sue	This one?	
9:08	Wendy	Yea this No, the little guy.	
9:10	Sue	Noooo it's just got an x... so	
9:20	Wendy	Well it's supposed to say transmitter above the top one and receiver above the bottom one.	
9:25	Sue		Sue resizes and two versions of the strip chart show up.
		Ok, maybe like this.	
9:27	Wendy	Oh neat! It's really not working!	
9:29	Sue	Laughs	
9:32	Sue		trys to click x to get rid of the strip chart
		Um, Well mostly I'm just kinda trying to think...	
9:35	Wendy	The x doesn't do anything	
9:39	Sue	Ummm Go back to this one?	
9:43	Wendy		She clicks the check box off.
		You'll have to to move the thing out of the way.	

9:44	Sue	This one?	
9:44	Wendy	And um, On the side, where the controls are supposed to be.. Display strip chart. Just take it off.	
9:52	Sue	Ummm,,,, Well I guess I'm just trying to think back to um.. these question that it had asked me about. I guess it was which way the waves flow?	Stops using mouse and looks at Wendy
10:07	Wendy	Mmmmmhmmmm	
10:08	Sue	Sorta Umm I 'm just trying to think	
10:09	Wendy	It just asked you how the what effect the electric field has on and electron and then the other one asked you about the orientation of the antenna to pick up a signal.	
10:17	Sue	Ok So what effect the field has on the electron? So I guess I would want to show the static field and here to figure that out. and ummmm So that's the radiating field. So the static field is just.... along the main pole. I dont' know. Um. Well this is k this is radiating and that's how it would go all the way over here. But if it's static I don't know you would just see... I guess I'm trying to figure out the difference between static and radiating Why static is just stationary like in one area.	Looks back at the computer moves the mouse some and then plays with hair while she thinks and describes. Then uses the mouse to point and try different things.
11:12	Wendy	Have you tried all the controls? All the possible things you can do?	
11:17	Sue	Ummm I haven't tried really like changing this width this static field. But I think I've tried pretty much everything else.... umm Yea, I've tried all these things.	Looking at the screen, clicking around
11:36	Wendy	Did you try manual control?	
11:38	Sue	No. I did not.	
11:41	Sue	Sooo then... Oh so then I would move this here.	
11:45	Wendy	Mm hmmm	
11:47	Wendy	Yea I'm wonder.. Nobody's tried that. and I was wondering what kept you from trying it.	
11:52	Sue	Ummmm. I guess when it says manual control I would I thought that it was kind of maybe talking more about controlling this stuff which I was already doing so I didn't really	
12:02	Wendy	Ahhh Ok.	
12:04	Sue	I guess I didn't really think of moving this myself.	
12:07	Wendy	Ok	
12:09	Sue	Soooo let's see... it matters if I go fast or slow. It matters if I get higher! Maybe.... Well I guess it's... it doesn't really (cleared throat and banged mouse to readjust position on screen). Well I'm seeing obviously that when I move it the um the radiation starts I guess. And when I stop moving it there's nothign going on. So that would mean this would have to be moving for those waves to go out. Um but as far as moving down and then up and then down again I don't really know if there's really a difference between moving up and down other than just to keep it moving basically.	
13:16	Wendy	Mmmmmhnhhn	
13:20	Sue	So... umm	
13:23	Wendy	What were you trying to figure out before you did this?	

13:27	Sue	Ummm I guess just how Going to back to the question of um what effect does the electric field have on the electron.
13:37	Wendy	Mmhmm
13:39	Sue	Soooo
13:41	Wendy	You were looking at the static field and the radiating field?
13:43	Sue	Mmhmm I geuss I was trying to decide what the difference was. So it looks like... the static field um... it seems like it has maybe less effect on this one over here. Maybe just because it's not radiating as far it's not reaching as far. Which is I guess kinda of.. obvious with these because there not floating all the way over here they're just staying in this main range.
14:23	Wendy	Uhhuh
14:24	Sue	And static usually means to stay still doesn't it?
14:27	Wendy	Yep
14:29	Sue	Sooooo... This just doesn't show the arrows. I'm more drawn to the radiating field because I can see it reaches the other side. It makes more sense that way. So um. I guess I'm trying to figure out how the electric field... um works with the electron. I don't know I guess I don't really seee like where the electron like an electron would be in this other than maybe the green dots.
15:13	Wendy	Ok
15:15	Sue	So if I said the green dots were the actual electron and the arrows represent the field um...

Sample Interview Summary

Questions asked:

1. How does the signal transfer from a radio station to your home?
2. How does an electric field affect electrons?
3. Show three orientations of an antenna and ask which will pick up a radio signal.

Radio Wave Sim: Before simulation said she thinks an electric field is a wall of electrons but it could be passed through. Said radio waves could travel anywhere including space but didn't understand why. Answered questions correctly. Did sim and figured out electric field and electrons without prompting. Worked just about everything out. Said she liked radiating view better than static view. Actually saw them as different representations of the same thing rather than different things. I asked if she'd played with everything and she said yea. So I asked if she'd played with manual control and she said no. Played with it and I had to prompt her that she'd been working on static versus radiated. I don't think she ever noticed radiated view only created a field when the electron was moving and static view all the time. She said both things but not in the same thought. Went to the questions and answered and explained them very well. Said it'd help if the antenna on the house were easier to see and the effects of the electric field on the electron in the antenna were more obvious because that is the point isn't it? She had even

noticed that one electron (transmitting antenna) produced the field and the other one was affected by it. Attitude: Have to make sense to use equations right. In calc never had time half the time. This is much better. At first with Electric force didn't understand the equation but now she does. Was bothered by that until she got it.

Previously I wondered how she could be a high performer because she couldn't connect her everyday experiences to the physics. She excelled at this abstract stuff because you don't need to use your everyday experiences!

Class seating arrangement negatively affected her because she's in the back now. She has to focus more to concentrate. There is more whispering and snickering which really annoys her. She can't see the demos well but the screen is fine.