JESSE RAGENT: So what we are going to ask you to do now is to do a game. Sort of a matching game. We're going to have you still stay in your groups. Still use these graphs. But we're going to pass out sets to you. Where, I've got a number of tables. These orange ones. And these blue ones with the equations. And what we are going to ask you to do is to make a triple. So, we are going to ask you to find three things that go together. Find a table and an equation and a graph that all three, kind of, make up a family or a set or a triple together. Um, And we'd like you think about these distinctions, these attributes, these characteristics, this language that we've been talking about so far. Linear, non-linear, slope, undefined, positive and negative slope, the Y-intercept.

You can be looking at those and thinking about all of those as you are making your triple. Now the way it's going to work is this. You're going to take turns. So, in a minute or so, or forty-five seconds, you're going to have all of this stuff laid out on your table. And you will take turns, and one person will go at a time. And the protocol that we are going to ask you to follow, I don't know if you can see this on the side there… Can you see that in the back? Is this. If Sidney goes first, and it's Sidney's turn she's going to be the only one talking and what we would like her to do… is to look it over and think out loud. So we want her to, think out loud giving mathematical reasons for selections she's using, using language generated, that you guys made up, that you guys got over here already.

So she might look at this and say, "Well, let me see." And she's thinking out loud, "Let me see, I notice that this X is staying the same, so I'm wondering if that would… So she is thinking out loud. Thinking about the slope, Y-intercept, positive/negative, linear/non-linear while she is doing that. While she's doing that thinking out loud, the other people in the class, in the group, excuse me, will listen closely

And, if you disagree or you don't understand the triple, the set, the family she came up with, You need to ask her a question, not say, "That's not right." But say, "Wait does that really work?" or "I don't get why you put those two together, can you explain that again."

So the protocol, one person speaks at a time. She's making her set. The rest of the people in the group will listen closely and ask questions if they disagree or don't understand. Questions about this? What you are being asked to do. And we are very interested to hear the conversation that will happen. Alright? O.K. Great.

STUDENTS: [Chatter] so you start.

TEACHER: One at a time, you guys, one at a time. Who is going first? So Erin, who is going first?

STUDENT: I have no idea.

STUDENT: Ashley.

STUDENT: Oh. O.K.

JAKE DISSTON: Excuse me for interrupting but you will notice that there are some blanks. So if you see graph and a table that match but you don't see the equation…you can fill in fill in an equation on one of the blanks, or vice-versa for the table that's left.

STUDENT: So, think it's this. It says negative two squared is four and one squared, no, negative one squared is one and then zero, zero.

STUDENT: That makes sense. Well that's a pair.

STUDENT: Maybe you guys can find one.

STUDENT: Maybe that one, X squared…

STUDENT: Because you can…

STUDENT: Right.

STUDENT: Can I see his for a sec? The Y is like the X, is like four is four, and it's y, 0,1,2,3,4

STUDENT: For this four… oh, yeah. You're right.

STUDENT: This is X. This is Y.

STUDENT: Oh!

STUDENT: X is.. This is X. This is Y.

STUDENT: Yes.

STUDENT: This changes. This stays the same. O.K. So G1 matches with T2.

STUDENT: O.K.

STUDENT: This is the X. X always stays four. Y changes.

STUDENT: Oh yeah. That makes sense.

STUDENT: Now we need to find the equation which is, I think, Y

STUDENT: Can I find it? I think I found it.

STUDENT: Where is it?

STUDENT: It's this one right here.

STUDENT: No, not that one.

STUDENT: X equals four. Yeah.

STUDENT: X equals 4.

STUDENT: Wait, no. On an undefined one, there is no equation.

STUDENT: Really? Oh.

STUDENT:Remember?

STUDENT:7 No I don't but O.K.

STUDENT: We should use this total as a last resort. That one actually matches. We don't need this.

STUDENT: No, X equals four.

STUDENT: But on an undefined…

STUDENT: How about we leave both of them and see what happens.

STUDENT: Yeah, but Y…the slope is M not X. You know that curly M thingy.

STUDENT: Oh ok.

STUDENT: Yeah. We're not using that. We're using X. Which means X would equal four, wouldn't it?

STUDENT:Let's just put that one there for now. Let's do that.

STUDENT: We just finished our first.

STUDENT: Now it's my turn. Yeah we were video-taped!

STUDENT: This T-chart matches this graph because Y stays at X all the time, no matter what happens.

STUDENT: Well, Y stays at four forever and shows on this graph and it doesn't matter what X changes it's still four. Now we need to find an equation.

STUDENT: We have to find an Y equals…

STUDENT: It has to be minus four. No, It has to be a plus four because…

STUDENT: Because X is a variable. Since X can vary you need to use one of those blank ones

STUDENT: You really like the blank ones don't you?

STUDENT: Y equals four.

STUDENT: But X is this one so that one won't work for that one.

STUDENT: So you have to use a blank one

STUDENT: Something X plus 4 because it intercepts at four.

STUDENT: There is no Y equals four. We don't have one. We don't have that one.

STUDENT: So, let's see the equations.

STUDENT: Negative 2, negative 4.

STUDENT: That one. No. This one

STUDENT: That's the…One of those.

STUDENT: So for the next graph I think I found a, for this zero slope, I think it's going to be T1 because…so for the Y it's always going to be four. Because we have a zero slope on four, so we just need to find an equation that goes with this. So, One half X. One half of negative two. Not four. X plus four. That may work. No, it would have to be X plus six to work so that's not it. Negative 2 X. So a negative times a negative is always a positive, right?: So, that wouldn't work. Yeah, stop. Wait, this could work. So negative. No. This is always four so this one wouldn't work either. So then X squared so… negative two times negative two is four. Negative one time negative one is not four so this wouldn't work. And X squared minus four…so that would be negative two times negative two, minus four that wouldn't work either. So it looks like we have to make a new equation.

STUDENT: Really?

STUDENT: So let's make a new equation then and we have a T-chart.

STUDENT: We have a T-chart. So.

STUDENT: So wouldn't have to be Y equals…

TEACHER: Whose turn is it? Sam's turn?

TEACHER: Good. So what are you thinking?

STUDENT: Zero equals zero and one equals one and negative one equals one and two equals four and negative two equals four so…They are the same no matter if they are positive or negative.

TEACHER: O.K.

STUDENT: That one is not.

TEACHER: O.K. So what are you looking for then? Are you looking for…

STUDENT: No that one doesn't work. We already tried it.

STUDENT: Maybe it does work.

STUDENT: This is going to be one of these guys.

TEACHER:: One or two minutes? O.K. guys about thirty more seconds. Try to finish the one you are on.

STUDENT: Finish the one we're on?

STUDENT: Okay, counting, So that works.

STUDENT: That one. That one and that one.

JESSE RAGENT: All right, finish the sentence you are on, please. All right. We are so impressed with how well you did with this and how hard you tried. It is very impressive hearing the language that you were using and the thinking that was going on… And trying to match these up. I hope you enjoyed it. We don't have enough time to talk about what's right or what's wrong or how you did it as a whole group. So we'd like for you now to think a little about the first part of the lesson. and the matching activity that you did in the second half of the lesson. these three questions.

JESSE RAGENT: And we would like you to write a reflection explaining your thoughts about this game or about this activity. Think about what strategies did you use as you were attempting to do the matching.

Did you start with this? Did you always start with this? Did you…think about the strategies that you used. And maybe all those other strategies that you heard other people in your group using. What did you learn while playing this game or doing this activity?

And finally, how did you feel while you were playing the game? Was it tense? Was it a good feeling? Was it a bad feeling? How did you feel about it? So these three, think about for a few seconds first before you just dive in. And if you could write your name at the top and then answer these three questions. What strategies did you use? What did you learn while playing the game? And how did you feel while you were playing this game? Paper? Everyone have paper?