**Interaction 1:Session 4 (2:28-3:00)**

Uma: Yeah so that was ugh…….like right

Sean: We were talking about…………

Uma: Nods in agreement and then reads the question

**Building communal practice?**

In this interaction Uma starts by basically talking to herself and then looks over Sean’s paper to invite him for conversation. Sean agrees to her statement and then states what they did in the previous session ( couldn’t hear exactly what he said as there was too much noise just around the time he was speaking). Uma ends this session by restating the question.

**Building significance?**

In this interaction, Sean states their mathematical thinking in the previous session. He uses the word “we” were ………. This indicates that Sean position their ( his and hers) mathematical ideas as significant in the reaction. Uma did nod in agreement but never verbally said so.

**Interaction 2: Session 4 (5:17-6:07)**

Sean: We kind of discussed this a little bit last time.

Derek: Mhhm…

Sean: We kind of thought because we divided our timeline into segments that.. within each epics or era

Derek: Mhhm..

Sean: That we have a linear relationship even though overall it not

Derek: Interesting

Sean: the hypothetical one is a curve like that

Derek: So I guess what I am asking is to be careful and sketch, you said this one corresponds with your model?

Sean: Yeah

**Building Significance?**

This interaction did not involve Uma, Also Derek never asked any question, but Sean jumped in to describe their thinking and then compares it to that of the hypothetical students work. Derek did not directly position Sean mathematical ideas as significant. I must add to it that in Sean’s explanation he kept using the word “we” indicate that he acknowledges their ( his and hers) mathematical ideas as significant. Indirectly, it seemed as though Derek was only talking to Sean. Because when Derek’s asked a question he kept pointing to Sean paper.

**Building Communal practice?**

In this interaction, there is no invitation to both Sean and Uma. I think Derek indirectly only invited Sean for mathematical ideas.

**Interaction 3: Session 4(6:18-6:51)**

Sean: So I think for my horizontal scale go with units of 6 square just to try and fit all of this on one line

Uma: Yeah, all of this on one line

Sean: And then, the vertical scale.. not sure yet

Uma: it a little challenging

**Building Significance?**

Uma positions Sean’s mathematical thinking as significant in this interaction. She constantly agrees with his ideas. For instance, yeah all of this on one line. There are no instances where the reverse is true for this particular interaction

**Building Communal practices?**

In this interaction, I think Sean invites Uma to basically listen to is thinking and does not explicitly ask for her input. Also, he keeps using “I” for example, So I think for my horizontal scale I will go with units of 6 square fit just to ……..

**Side note**: It is interesting to know that Uma states it is challenging not knowing how to come up with vertical scale. While Sean says I am not sure yet how to do come up with the vertical scale. In their tone, Uma sounds not confident and admits struggle whereas it is opposite for Sean.

**Interaction 4: Session 4 (7:45-9:45)**

Uma: Silently raises her head up and looks at what Sean is doing.

Sean: (This is where he begins to talk: is this an indirect way to invite him to talk?)

Sean- So I think I am going to use the same kind of scale as 10^3, 10^4,…..

Uma- Yeah, all the way up to 10^10

Sean- Yeah, that’s going to be kind of a problem.

Uma: Ur concern…….

Sean-Um because I am still convinced that this is what it is (thinking it should be linear)

Uma: Its supposed to look like…..

Travis: well, I kind of want to get there and what I am getting here is just going to be a straight line. In fact, its going to be a straight line with-instead of this it might be something like that, which isn’t really what I want

Uma: Mhmm

Sean: If we do get the line……..

**Building Communal Practice?**

In this interaction, Uma silently raises her head up and looks at what Sean is doing and this some how prompts him to talk. Uma action certainly looks to me as inviting him for a conversation on the mathematics. In this interaction there are no instances where Sean invites Uma for a mathematical discussion.

**Building Significance?**

In this interaction it is very clear that Sean position his mathematical thinking as significant. Also, he keeps using the word “I”. He does eventually uses “we” when he noticed that Uma acknowledges his mathematical thinking as significant. Throughout this interaction, Uma keeps agreeing to Sean thinking. She also position Sean mathematical thinking as significant. Also, Uma silently looking Sean’s could be an indication of how he position his mathematical thinking as significant. There are no instances where Sean positions Uma’s mathematical thinking as significant.

**Interaction 5: Session 5 (10:35-12:00)**

Uma: Silently looks at what Sean is doing

Sean: What I was doing here (inaudible)…( Basically Sean is telling Uma about his mathematical approach to the problem)

Uma: (Affirming) Mhhm

Sean: What are your thoughts?

Uma: Also then we are gonna plot each points on the graph……..

Sean: Yeah

Uma: ….. 500, 000… right?

Sean: (Accepts the invitation) Yeah and using our original scale

Uma: Yeah and will include 10 to the power…

Ends with silence here

**Building Communal Practices?**

In this interaction, Uma does her indirect invitation again by silently looking at what Sean is doing. Sean accepts this indirect way of invitation and then tells her what he is up. Again, he uses “I” in his statement, For instance, What I was doing ( Basically Sean is telling Uma about his mathematical approach to the problem. As usual, Uma agrees by affirming his mathematical thinking. Then Sean extends an invitation to Uma for the first time in session by asking: What are your thoughts?. Uma begins her statement by using “we” (she often does). Sean affirms and Uma continues with her thinking and then ends by asking “right”. Here again she is inviting Sean for his mathematical input and also seeking his view on her mathematical thinking. He affirms and makes a few justifications and statement. In conclusion, Uma invites Sean and then Sean also invites Uma.

**Building Significance?**

In this interaction, it is clear that Uma positions Sean thinking as significant. For Instance, she affirms and agrees to his initial mathematical approach. Also, the reverse is true, After Sean invites Uma for her mathematical input she affirms and agrees by saying ”yeah”.

**Side Note:** Is it legit to say that it seems like in this interaction, Uma needed Sean to okay her mathematical thinking? When she devised the plan she kind of needed Sean “approval” by asking right?

**Interaction 6: Session 4 (15:09-16:10)**

Derek: I see what you are doing

Sean: The struggle I am having is that I know that this isn’t linear along………. I guess is where I am at.

Uma: Laughs

Derek: Why

Sean: Like I mentioned up here, is that I have exponential values linearly spaced………..I know that’s they …

Uma: they have

Derek: That who have? You mentioned they

Uma: Clearly explains but I can’t hear what she said.

**Building Community Practices?**

In this interaction, Derek invites both Sean and Uma for their mathematical thinking(Kudos). Also, for the first time in this session Sean admits a mathematical struggle. In the past interactions, he usually says he is not sure yet.

**Building Significance?**

Its hard to tell precisely in this interaction. Derek what do you think?

**Interaction 7: Session 5 (16:30-17:15)**

Sean: So, I am going to try another approach

Uma: Try another approach

Sean- Yeah, I am going to try and….. I am make kind of a linear scale for the vertical scale instead of an exponential

Uma: Oh, so make this one,…

Sean: Linear and then I think we will get what I’m- I’m probably way too focused on this but its like where I want to be

Uma: That’s your focus.

**Building Significance ?**

Clearly in this interaction, Sean positions his mathematical thinking as significant. Also, for the second time that he uses the word we. And he uses it in the same way he used it in first time. He only uses “we” when he notices that Uma acknowledges his mathematical thinking as significant. Uma positions Sean thinking as significant as she shown keen interest in following his mathematical approach. In this interaction, there are no instances where Sean positions Uma thinking as significant.

**Building Community Practices?**

There isn’t enough data to talk more on this in this interaction. However, Sean’s initial statement of his mathematical approach served as an invitation for talking about the mathematics

**Side note:** For the second time, Sean uses we when he noticed that Uma positions his mathematical thinking as significant.

**Interaction 8: Session 4 (19:14-22:56)**

Uma: Is it making sense?

Sean: I just made my vertical scale max out at…… and then I have 9 inches from there to the top. So

Uma: Yeah

Sean: What I was trying to figure out is one-inch equals however many years and I can’t count…..

Uma: What are your numbers down here?

Sean: Those are just because….. going distance to time- so that one is just this first unit of distance. The 2 is the second unit of distance. The 3 is the thirds unit because those are all-we may not have counted the squares but those are equal.

Derek: Intended to be the same

Sean: Intended to be the same so that’s what those are.

Uma: Mhhm

Sean: they are just units. We didn’t put a ruler to them, so they aren’t inches or anything they are just units

Uma: Okay

Derek: So, these are like the endpoints of those …… Is that what it is?

Sean: Yeah

Derek: Then the space in between is still trying to capture the space in between here

Sean: Its Scaled down. So, whatever the distance here (marking on original timeline) If that is a then this 1a, 2a, 3a, 4a… That’s what that is..

Derek: Okay

Sean : and then, um where we were- doing an exponential scale along here, and then now I am doing a linear scale now. And then, I am going to feel better about whats going on.

Derek: Uma I am curios to know your thoughts on the shape?

Uma: I get his point and that makes sense I guess I am struggling to know the vertical………..

Derek: So then it sounds like you are plotting these specific points?

Uma: Uh that was my intention

Derek: So then were you ( Sean) plotting those specific points?

Sean: so initially, these are just dividing line. Because we used 10^1-these are just the endpoints. Then the part that’s bothering me……..

Derek: And then you were going to out those dates or be able to locate them on there?

Sean- Yeah and the part that’s bothering me is that I don’t think they’re going to be on the that line?

Uma: Yeah

Derek: Uma does that make sense

Uma: Yeah I get it

**Building Significance?**

In this interaction, Derek positions both Uma and Sean mathematical thinking as significant. In the case of Uma, He explicitly ask her to share mathematical thinking which she did. Also same for Sean. In this interaction Sean uses “we” for the third again in the context of Uma positioning his mathematical thinking as significant. There are no instances where Sean positions Uma mathematical thinking as significant. Derek positions both of their thinking as significant via asking and invitation. Also, Uma positions Sean mathematical thinking via asking and agreeing as indicated in the transcripts are above.

**Building Community Practices ?**

In this interaction, there are instances where Derek invites both Sean and Uma to share their mathematical thinking thus creating a community of practice. He did that mainly through asking. For instance, with the case of Uma she asked Uma I am curious to know your thoughts? And with the case of Sean there are at least three instances where Sean is invited. Uma initial question: Is it making sense was her way of inviting Sean to talk more about the mathematics. However, there are no instances, where Sean specifically invites Uma to share her mathematical thinking.

**Interaction 9: Session 4 (22:57 -23: 45)**

Sean: continues to talk to himself (inaudible)( This happens for a while ) He invites Uma by saying now he is ready to go.

Uma: You have done it in the right way?

Side Note: In this interaction, I do not think there is enough data to answer both of the questions (i.e. building communal practice and significance). Uma was certainly distracted as she was on the phone. Derek do you agree?

**Interaction 10: Session 4 (24:00-28:12)**

Sean: so I am going to have to pick some big dates

Uma: So you are just going to plot specific points then?

Sean: Yeah, so because I went linear here, if I pick 500 the first date is going to be

Uma: way down

Sean: .00000000003 of an inch

Uma: Oh so it's going to be right above the line

Sean: I cant even draw. That’s 500 years, so on here that was right here. So the next one is- I am just reaching out to one that is going to give me a little bit of value, so 2x10^6 and that is still 1/1000th of an inch.

Uma: So once again, these ones are all going to be bunched together down there. And then you are going to see- because this one is going to be at the top value. These ones are going to be near it.

Sean: Yeah like lets do 1.1x10^9,

Uma: mhhm

Sean: That gives me 2/3 of an inch. So, 1.1x10^9 is right about there and that’s going to be 2/3 of an inch. Which is wherever that is. …………………

Derek: Shares a suggestions (Okay Sean it sounds like you are having a similar concern that…… were discussing. So maybe you seem to be very, very careful here which is awesome if the picture still doesn’t reflect what you think you are visualizing feel free to grab a piece of blank paper and do a sketch that you are visualizing)

Uma: ok

Sean: ok

Uma: Cus you still gonna have all these points down yeah

Sean: yeah right Like we did 1x10^9

Uma: it’s all the way down there so you have got two other values that could be in between them

Sean: that’s 5.7 the next smallest one……….that’s not terrible.. 1/3 of a distance, 1/3 of an inch.. that’s gonna be right about there

Uma: So its almost impossible to put these other ones on there. They are so insignificant

Sean: Yeah

Uma: You aren’t going to be able to graph them

**Building Significance?**

In this long interaction, Uma positions her partner mathematical thinking as significant whereas Sean positions his partner mathematical thinking as significant too. This can easily be seen by both Uma and Sean constantly agreeing to each other’s mathematical thinking. In this interaction too, there is seem to be a couple of taken as shared instances. For instance, Sean makes a comment like “yeah and “we” did here (pointing to a specific event on the timeline)” The use of we as well as “did here” presupposes that it was a methodology they both seem to agree on and are using for a different instance.

**Building Communal practice?**

In this interaction, there is an explicit instance where Uma invites Sean. Like when she asked “so you are going to plots specific points then?” Although there is no specific instance where Sean does same, it could easily be implied that even both of them continuously built a communal practice. This is because there is a lot of Back and forth between them.

**Interaction 11: Session 4 (29:30-31:17)**

Sean: I am just gonna do that

Uma: Mhhm

Sean: So its…..

Uma : makes it easier for yourself…..

Sean; Rambles to himself for a while and works on his own, Uma does same

**Building communal practice and significance**

This interaction isn’t interesting to study, although we see that Sean invites Uma by making a statement of how he intends to move forward on the assignment. Uma confirms by agreeing. In this case we see that Uma positions Sean thinking as significant. Hence we see a single case of building communal practice by Sean and also a single case of building significance by Uma. Again, nothing is interesting about this interaction; maybe a better way to say this is that there is only a single instance of building significance and single instance of building communal practice

**Interaction 12: Session 5 (31:18-34:40)**

Uma: So is it looking like what you wanted it to?

Sean: So, I think if we were down on this

Uma: yeah it will look like…

Sean: 1,2, 3, …..maybe……..I can want to throw it in..

Uma; yeah this one yeah

Sean: that’s about 13th ish………..

Uma: So where does this end up?

Sean: I think it gonna be right here ends here……

Uma: ok, which makes sense

Sean: Sky rock here

Uma: All the way up here

**Building Communal Practice**

So from the beginning we realize that Sean Rumbles to himself for a while, then he speaks out loud by telling Uma what he plans on doing. I think although he didn’t verbally invite her for a mathematical conversation, he did. This is because, when he is truly talking to himself he tends to rumble rather than speak out loud. Hence, when he spoke out loud telling her of his plan he could have been inviting her for a mathematical conversation. Similarly, although there is no specific instance where Uma invites him for a mathematical conversation, there is enough back and forth to indicate they both built a communal practice.

**Building Significance**

In this interaction, both Uma positions Sean thinking as significant. For example, we see instances where she agrees and further explains Sean’s point. Additionally, When she asked of Sean’s mathematical opinion (i.e. where does this end up?) she is positioning his mathematical thinking as significant. There is no specific Sean positions Uma thinking as significant

**Interaction 13 Session 4 (36-40:40)**

Uma: looks up to Sean

Sean: … this will be out the thousand where …..

Uma: Straight up

Sean: right

Uma: Mhhm

Silence

Sean: There is a couple more points of the same………… so 3.5x10^9

Uma: Is getting up there a little bit

Sean: Yeah so where did we have that, 3.5 x10^9,,, now like that guy…..

Uma: then it kind of jumps

Sean: So if we were precise and we draw that line, then any of the dates in there would fall on that line

Uma: Yeah

Sean: That’s not quite- So the next one I put on was 4.5 (times 10^9), so I would have expected it to fall under half, right? Like 5 is going to be right there

Uma: Yeah

Sean: So, I would have expected it to be more over here, Again, this is um you know, but where I would have expected it would have been right about there

Uma: Yeah

**Building Communal Practice**

This interaction starts with Uma gesturing an invitation by looking up to Sean. Other than that, there is no specific or explicit instance where there is an invitation for mathematical conversation from either Sean or Uma.

**Building Significance**

There are a lot of instances where Uma positions Sean mathematical contribution as significant. These are seen in the above transcripts where Uma constantly agrees with Sean thinking. However there is no instance where the inverse is true.