|  |  |
| --- | --- |
| **Student A** | **Student B** |
| plot(EarlyLengthAge$meanLE∼EarlyLengthAge$Age, las = 1, ylab = “Fork Length (mm)”, xlab = “Age”)  lines(EarlyLengthAge$meanLE∼EarlyLengthAge$Age)  points(MidLengthAge$meanLM∼MidLengthAge$Age, col = "red")  lines(MidLengthAge$meanLM∼MidLengthAge$Age, col = "red")  legend(15, 600, legend = c("1998-2003", "2006-2017"), col = c(“black”, “red”), lty = 1:1, cex = 0.8) | plot(x = predictionTimesD,   y = prediction,  type = “l,   col = “blue”,   xlab = “”,  ylab = “”,  ylim = c(0, 0.08),  main = “Mesocosm D”,  las = 1)  points(timed, obsD, pch = 19)  title(ylab = expression(paste("Tracer "^15, N[2], ":Ar")), line = 2.5, font.sub = 2)  title(xlab = "Time (days)",  line = 2, font.sub = 2)  legend("bottomright",  legend = c("Modeled", "Measured"),  lty = c("solid", NA),  col = c("blue", "black"),  pch = c(NA, 19)) |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Text Surface** | **Program Execution** | **Function** |
| **Macro Structure** | Understanding the overall structure of the program text | Understanding the “algorithm” of the program | Understanding of the goal / purpose of the program (in its context) |
| **Relations** | References between blocks, e.g., method calls, object creation, accessing data… | Sequence of method calls, object sequence diagrams | Understanding how sub-goals are related to goals, how function is achieved by sub-functions |
| **Blocks** | Regions of interest (ROI) that syntactically or semantically build a unit | Operation of a block, a method, or a ROI (as a sequence of statements) | Function of a block, may be seen as a sub-goal |
| **Atoms** | Language elements | Operation of a statement | Function of a statement, only understandable in context |

**The Block Model (Schulte, 2008)  
  
Student Code**

**Student Interaction**

Sean: So I kinda ran out of room here, but I just went 1010, 109, 108 (*points to the different eras on his paper, turning towards Uma*) and then will fit those within there.

Uma: Oh, ok! And then we’ll fit them. Yeah.

Sean: Yeah.

*The two work independently on their own papers. Both students can be heard narrating their work (5 seconds).*

Uma: (*turning to look at Sean’s paper*) 106

Sean: Yep, 105, and then I’m going to start my line over here, I’m actually going to extend it on– (*continuing to work on his own paper*)

Uma: (*After working independently for 9 seconds, learning towards Sean to see his paper*) and then you’re adding a little bit more? (*returning to her own paper*)

Sean: Yeah (*continuing on his own paper*)

Uma: (*5 sec.*) Keeping the similar—

Sean: Mhm (*affirming, 7 sec.*) Well, and that’s turning into a scale that I recognize (*bobbing, smiling slightly, looking over his glasses to Uma*).

Uma: Yeah, so then that’s… it goes to 104

Sean: Mhm

Uma: and then that’s going to be 103, and then 102 (*turning to look at Sean*)?

Sean: Yep, and then I just went on out to—

Uma: 100, yeah to make it easier (*4 sec.*). So then “Now” falls in at the zero mark, right? Right? Would that be where we have now?

Sean: That’s “Now”, yep (*working on his own paper*)

Uma: (*5 sec.*) And then 102 is 100, right?

Sean: Yeah, so you want to kinda like— (*continuing to work on his own paper*)

Uma: so then you have— (*working on her own paper*)

Sean: (*4 sec*) so if you want to like— (*continuing to work on his one paper, 7 sec.*) so if we— the difference from here is actually 900 years, right.

Uma: Yeah, but then with each one the years are going to be more (*gesturing “expanding” with her hands*).

Sean: Yep, yep (*nodding*).

Uma: Yeah, that’s what I was thinking. I was like— because 500 is going to be, because this is 1000, so your 500 is kinda going to be like half-way, right?

Sean: Y-e-a-h (*with hesitation, watching Uma work on her paper briefly before returning to his paper*)

Uma: It should be like here, 500, and then this will be 1000 (*working on her own paper, 6 sec., thinking aloud*) 104 right here.

*The interaction ends with about 54 seconds of the two students working independently on their own papers. Uma occasionally narrates as she writes. Neither student acknowledges the other.*