Qualitative Methods for Research in Data Science Education

## The Block Model (Schulte 2008)

|  | Text Surface | Program Execution | Function |
| --- | --- | --- | --- |
| **Macrostructure** | Understanding the overall structure of the program | Understanding the “algorithm” of the program | Understanding the goal / purpose of the program (in its context) |
| **Relations** | References between blocks, e.g., method calls, object creation | Sequence of method calls, object sequence diagrams | Understanding how sub-goals are related to goals, how function is achieved by subfunctions |
| **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 |

## Student’s Coding Process

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

## References

Schulte, Carsten. 2008. “Block Model.” *Proceedings of the Fourth International Workshop on Computing Education Research*, September. <https://doi.org/10.1145/1404520.1404535>.