MODELING TEACHERS' QUESTIONS IN HIGH SCHOOL MATHEMATICS CLASSES

Sara Dalton, Gary Davis & Stephen Hegedus

University of Massachusetts Dartmouth

We examine teachers' practice of asking questions in a mathematics classroom and how it relates to student response, engagement, and how questioning can set the norm for classroom flow. Our video data consists of wirelessly connected classrooms as well as non-connected classrooms. It is not uncommon for teachers to ask a lot of questions in a mathematics classroom. We have looked at classroom videos of several teachers and when we plot the number of questions asked versus time, the plot is uniformly linear (r^2= 0.98). Based on our data, the constant rate of questioning often extends over an entire class period. When a teacher is asking, on average, 1 question per 10 seconds, what sort of time are students given to answer?

Mary Budd Rowe (1972, 1987) introduced the idea of "wait-time": the time from a teacher's question until the teacher speaks again. Her research showed that increasing wait-times to 3 or more seconds has a strong positive effect on student answers; student responses were longer and more accurate, the number of "I don't know" answers, and no answers decreased, more students volunteered appropriate answers, and test scores increased. We look at the descriptive statistics of wait times, and their distribution, for one of the video clips we obtained: these statistics are typical.

Our data collected relates directly to this work done by Rowe; the teachers we've looked at have a mean wait time of 3.1 seconds. The interesting part is that the data is a highly skewed distribution with a high percentage of wait-times that are 3 or more seconds. We have also found that the nature of the questions affects the wait time given by the teacher. In the data we examined, longer wait times were given for questions that related to the teacher's aims for the class whereas shorter wait times were given for questions which did not directly pertain to the objective of the class according to the teacher.

Two of the classes we observed were connected classrooms in which student work was shared in a mathematically meaningful way among the class. This shared student work can lead to complex student peer to peer discussions, student question generation, and teacher questioning drops dramatically (Hegedus, et al., 2006).

References

Hegedus, S., Dalton, S., Cambridge, L., Davis, G., (2006). Patterns of Participation in Networked Classrooms. *Proc. of the 30th Conference of the Int. Group for the Psychology of Mathematics Education*. Prague, Czech Republic: Charles University.

Rowe, M. B. (1972). Wait-time and rewards as instructional variables, their influence in language, logic, and fate control. Paper presented at the National Association for Research in Science Teaching, Chicago. ED 061 103.