Shying Away From Questioning: Discourse and Participation in the Mathematics Classroom

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Research Question

- What types of questioning help improve classroom discourse?

- What role does student comfort and classroom environment play when initiating discourse?

Methodology

- *Participants :* Approximately 150 high school Algebra 1 and Geometry students

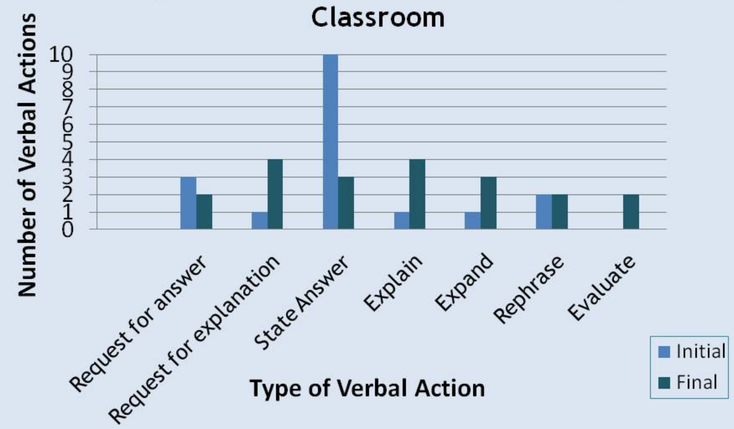
- *Data Sources:* Likert -scales (pre and post questionnaires), Homework, Exit slips, Video taped lessons, Group and individual activities, Quizzes and tests, and Teacher journals

- *Data Analysis*: Grounded-theory (Glaser & Strauss, 1967)

Framework

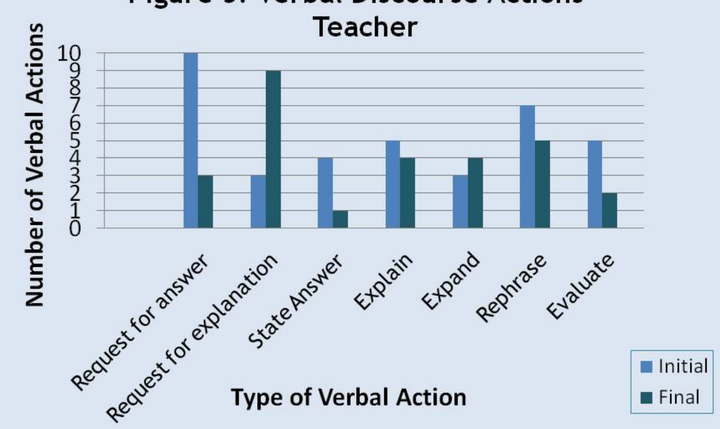
Discourse refers to "any stretch of spoken or written language longer than a single sentence" (Cazden & Beck, 2003, p.166). I used their elements of peer communication, discourse structure, and questioning strategies.

Figure 1: Verbal Discourse- Geometry Classroom



The number of responses that strictly stated the answer generally decreased, while the number of explanations and expansions generally increased throughout the semester.

Figure 3: Verbal Discourse Actions - Teacher



Over time, I incorporated more questions that required explanations and rephrased more questions rather than stating the answer.

Figure 2: Written Discourse- Algebra 1

Test Grade	Type of Error		Type of Approach		
	Procedure	Computation	Logical Reasoning	Procedural	Procedural + Visual
100-90	4/40	3/40	8/40	4/40	10/40
89-80	3/40	3/40	1/40	5/40	5/40
79-70	4/40	0/40	0/40	2/40	3/40
69-60	1/40	0/40	2/40**		

Written responses or explanations based on procedure, with no added explanation or expansions, typically resulted in more error and lower test grades compared to responses based on logical reasoning

Findings

- **Figure** 1 shows that by incorporating verbal discourse activities into lessons encourages more meaningful and substantial responses to mathematical questions over time. This result emphasizes the idea that classroom discourse is observed as a classroom norm.

- **Figure 2** shows that by asking students to write their responses to questions, the students use a variety of approaches. For this particular subset of responses, students who used more reasoning and less procedure as justification, performed higher on the chapter test.

- **Figure 3** details my personal growth with questioning practices throughout the semester. I found that questions that ask *how?* And *why?* were more valuable for learning than emphasizing procedures.

Conclusions

- Questions should be formatted to look for explanations and reasoning, not procedures or quick evaluation. This is true for both discourse types.

- To facilitate participation, include both modes of discourse in order to engage multiple learning preferences. Furthermore, for higher order thinking questions allow for peer discussion and use proper wait times.

- Through discourse, students form a solid understanding of material, which generally results in higher test and quiz scores.

- The classroom environment is a major factor when establishing a discourse-based classroom. Thus, before implementing activities, create an open classroom forum where students have opportunities to conjecture, debate, and discuss .