Mathematical ACTS: Achievement and Collaboration for Teachers and Students

Project Overview

We hypothesized that participating in Mathematical-ACTS teachers would increase their content knowledge and pedagogical repertoire and that this would lead to increased mathematical achievement as measured by student standardized tests.

Predictions: Indicators of Success

A Project Success Story

Evidence Based Research Paradigm

We empirically assessed alternate hypotheses for how PD given to teachers translates into student achievement by modeling treatment with different parameterizations to reflect the different assumptions. We modeled treatment in six different ways (Table 3) and used model selection criteria to test among these hypotheses.

Discussion

We anticipated using the SAT-9 Mathematics exam as a measure of student’s achievement. In 2003, the State adopted a criterion-referenced exam of state math standards that is not norm-referenced. To address the issue of growth in the context of our longitudinal design, we needed to include grade level as covariates in our models. The negative slopes seen in table and figure 1 are an artifact of the manner in which the CST exam is scaled among grades. For example, students generally score lower on the grade six test than they do on the grade five test.

Increased focus on high stakes testing in the State also began in 2003. Many districts (ours included) initiated a range of workshops to increase test scores, in addition to the workshops sponsored by the MSP grant. While this blurs the distinction between control and treatment, a more important uncontrollable consequence is the marked “PD fatigue” among the teachers.

The final challenge was how to model “treatment”. Not all teachers participated in all workshops. The “idealized” treatment roll out (see bottom left) was overly optimistic. An initial solution was to use a continuous variable indexed to number of hours of PD in place of a binary “Control/Treatment” parameterization. That solution ignored the fact that our treatment had three distinct attributes of longitudinal impact on students’ achievement, as shown in Table 2.

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Table 2: Parameters of the Mathematical-ACTS PD provided to teachers in relationship to the three hypothesized mechanisms for influencing student achievement

Table 3: Sample values based on the six different parameterizations of the Mathematical-ACTS PD

Evidence Based Research Paradigm

Teachers were randomly placed in to either Treatment or Control groups (stratified random procedure). The 16 elementary schools were paired by demographics and mathematical achievement. Within pairs which were randomly assigned to “Treatment” (i.e. teacher were eligible to participate) or “Control” (i.e. teachers needed to wait until the following year before they would be eligible for “Treatment”). In this first year, pairs were held as controls for the first two years before being assigned to control or treatment status. This guaranteed control treatment populations over the first three years but ultimately provided professional development opportunities for all interested teachers during the study.

Idealized Control and Treatment Populations within Elementary Schools (assumes 2 teacher per grade level; numbers reflect classrooms not students)

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