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Math-in-CTE Study

Research Summary

The Math-in-CTE Study tested the impact of a professional development/pedagogic model on the mathematical achievement of high school career and technical education (CTE) students in five occupational areas. The model required the development of teams made up of CTE and mathematics teachers within each occupational area. The CTE teachers were drawn from agriculture, auto technology, business/marketing, health, and information technology. Teams of teachers within each of these areas were brought together for extended professional development (PD), 10 full working days over the course of an academic year, to teach them a pedagogy that was developed by the National Research Center for Career and Technical Education (NRC). Each CTE-math teacher team began the process by examining the regular CTE curriculum in order to identify embedded mathematical concepts (Curriculum Mapping). They then developed CTE lessons following the *Math-in-CTE model* to enhance the teaching of the existing mathematics within the occupational context.

The study was conducted with random assignment of teachers to the experimental and control conditions within each occupational area. A total of 131 CTE teachers and their students took part in this study: 57 teachers in the experimental group and 74 in the control group. Recruitment and random assignment was conducted at the teachers' classroom level rather than at the individual student level. Assignment at the classroom level distributed any unmeasured factors that may have affected the outcome measures randomly across classrooms and allowed unbiased comparisons of the experimental and control group performance.

After one year of exposure to the math-enhanced lessons, the students in the experimental classrooms performed significantly better on TerraNova and Accuplacer, two of the three math posttests administered. The overall effect size for TerraNova was .34 and .17 for Accuplacer. Students' performance on WorkKeys did not differ significantly between groups. Effect size results varied from .11 to .87. Put another way, the effect size coefficient represents the average percentile standing of the

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average treated (or experimental) participant relative to the average untreated (or control) participant. This shift in percentile standing ranged from 54th to 82nd depending on the test and the occupational area.

Data from focus groups, surveys, observations, and teaching reports were also collected and analyzed to help us learn more about what worked and what did not in our treatment/intervention. From analyses of multiple sources of data, we have distilled the following five core principles that we see as essential to replication of this model:

1. Develop and sustain a *community of practice.*
2. Begin with the *CTE curriculum* and not the math curriculum.
3. Understand that math is an essential *workplace skill*.
4. *Maximize the math* in the CTE curriculum.
5. Recognize that CTE teachers are *teachers of math-in-CTE* and not math teachers.

The results presented in this report were achieved without the need for exemplary school-based leadership or cultural change within the school, as opposed to what is commonly concluded in the school reform literature. Instead, the improved math performance of the experimental students was produced by assembling teams of teachers in a single occupational area across multiple schools and by providing them with a process and a pedagogy through which they could successfully enhance the math in their own curricula.