

Examining How Curriculum-Based
Professional Development
Influences Elementary Mathematics
Beliefs, Practices and Student
Learning Outcomes

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- Project Collaborators include:
 - Dr. David Pugalee, UNC Charlotte
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 - Dr. Chuang Wang, UNC Charlotte
 - Charlotte-Mecklenburg Schools
 - Kannapolis City Schools

School Districts Needs

- Support for implementing standards-based mathematics curriculum (*Investigations*) in elementary school grades
 - Content knowledge related to the curriculum
 - Facilitating discussions of mathematics concepts
 - Assessment: formative and summative data that is curriculum-based
 - Teaching through an indirect approach (content follows task exploration)

Partnering School Districts

- Charlotte-Mecklenburg Schools
 - 102 elementary schools (K-5)
 - Prior use of *Investigations* in some schools
- Kannapolis City Schools
 - 5 elementary schools (K-4)
 - 1 intermediate school (5th grade)
 - Limited prior use of *Investigations*

Professional Development

- Summer Institute (Summer, 2009)
 - 10 days (60 hours)
 - Co-facilitated by mathematics faculty and mathematics education faculty
- Follow-up
 - 4 days (24 hours) every 9 weeks
 - Facilitated by school-based mathematics coaches and professor from Educational Leadership

Summer Institute

- Mathematical Tasks
 - Teachers solved them, developed understanding of mathematics concepts
- Tasks from *Investigations*
 - Unpacking the mathematics in lessons
- Examining Student Learning
 - Overview of Cognitively Guided Instruction
 - Analysis of concepts across grades in the curriculum
 - Number Sense
 - Algebraic reasoning
- Analyzing Pedagogies in the curriculum
 - Differentiating questions (Revised Bloom's Taxonomy)
 - Role of manipulatives

Follow-Up

- Teacher leadership (Leadership faculty)
- Focal points based on need (School-based leaders)
 - Facilitating discussions
 - Assessment
 - Managing and organizing classrooms

Project Evaluation

- External evaluators from UNC Charlotte Center for Educational Evaluation
- Test of content knowledge
- Survey of teachers' practices
- Survey of teachers' beliefs
- Observations
 - 3 observations from randomly selected teachers

Teacher Level Factors

- Teacher Beliefs – Teaching Math
 - 7 teachers changed from D/C to T at end of year.
 - 9 changed from T to D/C at end of year.
- Teacher Beliefs – Learning Math
 - 8 changed from D/C to T.
 - 4 changed from T to D/C.
- Teacher Beliefs – Mathematics Overall
 - 8 changed from D/C to T.
 - 5 changed from T to D/C.
- All others remained unchanged from beginning to the end of the year (n = 53).

Teacher Level Factors

- Teacher Practices at the Beginning of the Year:
 - 40 student centered
 - 12 teacher centered
- Teacher Practices at the End of the Year:
 - 29 remained student centered
 - 5 changed from teacher to student centered
 - 5 remained teacher centered

 - 13 teachers missing data

Teacher Level Factors

- Mathematics Content Knowledge:
 - Overall mean gain from pre to post = 2.34 (SD = 5.37)
 - School District A (n = 17, M = 3.82, SD = 4.20) was not statistically significantly different from School District B (n = 18, M = 0.94, SD = 6.07), $t(33) = 1.62$, $p = .11$. The effect size was medium ($d = 0.55$).
 - No statistically significant differences in the interaction between school system and time, $F(1, 33) = 2.63$, $p = .11$, or between school districts, $F(1, 33) = 0.26$, $p = .62$, but a significant increase of teacher content knowledge, $F(1, 33) = 7.21$, $p = .01$.

Student Learning Outcomes

- 3 unit pre/post tests from *Investigations*.
- **Overall gain from assessment 1 to assessment 3, although some negative gains.**
- No relationship between teacher content knowledge gain and student achievement.
- During third assessment, teachers who changed from student to teacher centered saw more student gains. Unexpected result!

Teacher Perceptions

- Major Themes:
 - Teachers as learners
 - Implementation of professional development content into practice
 - Teachers as self-evaluators
 - Shifting paradigms
 - Influence of the End of Grade (EOG)

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