

How Do K-8 Teachers Change Their Practices After Learning More Mathematics?

Yasemin Copur-Gencturk



















Content knowledge

Pedagogical Content Knowledge

The category most likely to distinguish the understanding of the content specialist from that of the pedagogue (Shulman, 1987, p.7)





Program Description

Data Collection







A Student B	Student A
35	3 5
×25	x2 5
175	12 5
+700	+75
875	87 5





Research Questions







Program Description

Data Collection





RICE Description of the Program

2.5-year master's program for K-8 teachers

Funded by the Illinois State Board of Education (ISBE)

Partnership between UIUC and a particular public school district

Designed to deepen the content knowledge and PCK of in-service teachers in math and science











Course Schedule

	Year 1			Year 2		Year 3
Fall	Spring	Summer	Fall	Spring	Summer	Fall
2008	2009	2009	2009	2010	2010	2010
Math Hybrid Course	Science Education Course	Science & Educational Psychology Courses	Educational Psychology	Math Content Course	Science Education Course & Seminar	Action Research Course











Math Courses

Hybrid Course

- Combination of typical "math methods" and "math for elementary teachers" courses
- Taught by a professor from Education Department
- Focused on number, geometry, measurement, algebra, and statistics/probability

Content Course

- Centered around the theme, "mathematics in the world around you"
- Taught by a professor from Math Department
- Focused on algebra, probability and statistics, number theory



Program Description Data Collection







Participants

21 inservice teachers

- 3 middle school, one special education, the rest elementary teachers (K-6)
- Teaching experience ranging from 1 to 12 years (mean=5.4; median=4)
- All certified teachers
- Majority had elementary education major (n=19)









Data



Data

Collection

Results

Discussion

Program

Description



Introduction





Multiple choice items

Captures teachers' common & specialized content knowledge

Two parallel forms (.75 and .76 reliabilities)

		Number & Operations Geometry		Patterns, Functions, & Algebra	
# of Items	Form A	26	19	17	
	Form B	25	23	18	













Classroom Observation Protocol

Results

Discussion

Adapted from Local Systemic Change Classroom (LSC) Observation Protocol & the Oregon Mathematics Leadership Institute (OMLI) Classroom Observation Protocol

39-items on 5-point scale, ranging from "Never" to "Consistently"

Program

Description

Scale	Reliability Estimates (Cronbach's Alpha)	# of Items
Inquiry-Oriented Lesson	.95	14
Student Engagement	.89	7
Worthwhile Mathematical Task	.87	5
Mathematical Sense-Making Agenda	.84	7
Classroom Climate	.71	3

Data

Collection



Introduction



Beliefs Survey



- Discovery methods of teaching have limited value because students often get answers without knowing where they came from.
- There are often many different ways to solve a mathematics problem.



Program Description Data Collection





RICE Timetable for Data Collection

- I	Year 0	Year 1			Year 2			Year 3
		Fall 2008	Spring 2009	Summer 2009	Fall 2009	Spring 2010	Summer 2010	Fall 2010
МКТ	August	December				January	June	December
Classroom Observations	May		March- May			March- May		October- November
Beliefs Survey							August	











Quantitative Analysis

Multi-level growth modeling w/time varying covariates

2-level MLM for the relationship between MKT & instruction Linear regression for beliefs











RICE MKT & Instructional Practices













How does teachers' MKT affect their instruction?

What is the relationship between teacher beliefs and mathematics instruction?











Results



Data

Collection

Results

Discussion



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Discussion

This 2.5-year program changed teachers' MKT and those changes corresponded with inquiry-oriented teaching, mathematical agenda, and classroom Limitations Convenience Teachers' beliefs teachers' lesson sample atical agenda. designs, task d Sample size Measures Teachers' beliefs and current level of MKT mediated the effect of the gain on changes in teachers' practices.



Program Description

Data Collection







Thanks! Questions?



