



Mathematics Teacher Leadership: A Sustainable Approach to Improve Mathematics Education

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Goal

The goal of this study is to investigate *the impact* of an NSF-funded mathematics leadership institute whose goals were to increase teachers' math *content knowledge* and improve their *leadership skills* and *teaching practices*.

Methodology

Subjects:

- Seventy-nine mathematics teacher leaders (TL)
- Three years or more of teaching experience
- Two large urban school districts

Treatment:

- Two summer programs (SP) and at least two academic year (AY) follow-up meetings

	Year 1		Year 2		Year 3	Year 4	Year 5	Year 6
Cohort 1	SP	AY	SP	AY	AY	AY	AY	AY
Cohort 2			SP	AY	SP	AY	AY	AY
Cohort 3					SP	AY	SP	AY

Instruments:

- Content tests: geometry, algebra, statistics, and combinatorics
- Follow-up surveys administered to TLs, their campus colleagues, and administrators (dichotomous – agree/disagree)
- Classroom observations of TLs (21 items in a checklist format – propositional knowledge, procedural knowledge, lesson implementation, & classroom culture)

Data Analysis:

- Repeated-measures ANOVA (pre/post-test content scores)
- Effect sizes (Cohen's d) of gains in content knowledge
- Descriptive statistics of survey results (percentages)
- Descriptive statistics of classroom observation results

Results

Paired t-tests Results for TLs' Scores on Pre/Post-Content Tests

Measure	Test	Mean	N	S.D.	S.E.	Sig. (2-tailed)	Effect Size
Geometry	Pre-test	20.785	79	9.391	1.057	<0.001	1.35
	Post-test	34.190	79	10.424	1.173		
Algebra	Pre-test	14.867	79	7.635	0.859	<0.001	1.81
	Post-test	29.506	79	8.505	0.957		
Probability & Statistics	Pre-test	13.930	71	10.600	1.258	<0.001	1.57
	Post-test	30.113	71	10.089	1.197		
Combinatorics	Pre-test	10.563	71	7.365	0.874	<0.001	2.63
	Post-test	32.662	71	9.313	1.105		

Percentages of Respondents Agreeing with Statements about the Institutes Impact on TLs

	Administrators (N = 27)	TLs (N = 37)
Influenced TLs' leadership skills	68	97
Influenced TLs' interactions with campus colleagues	84	86
Influenced TLs' interactions with campus administrators	72	81

Percentages of Respondents Agreeing with Statements about the Institute's Impact on TLs' Colleagues and the Colleagues' Students

	Administrators (N = 27)	TLs (N = 37)	Colleagues (N = 54)
Influenced TLs' colleagues' mathematics instructional strategies	80	89	85
Influenced TLs' colleagues' mathematics content knowledge	72	76	78
Influenced TLs' colleagues' students' understanding of the importance of studying advanced mathematics	56	57	70
Influenced TLs' colleagues' students' interest in studying advanced mathematics	52	51	57
Influenced TLs' colleagues' students' mathematics content knowledge	-	-	85

Percentages of Respondents Agreeing with Statements about Leadership Characteristics of Institute TLs

	Administrators (N = 27)	TLs (N = 37)	Colleagues (N = 54)
Showed a genuine interest in other teachers' opinions	96	100	100
Provided other teachers with relevant information	89	100	94
Interacted with teachers in an open and honest way	100	95	100
Unequivocally supported other teachers in their work	93	97	98
Expressed concerns objectively and constructively	85	95	94
Expressed expectations clearly and transparently	89	92	96

"This program has empowered us as a group to collectively and cooperatively address both positive and negative issues"
- A Teacher Leader

"Without her support our students would have suffered a great loss of academic achievement and rigor in their mathematical endeavors"
- A TL's administrator

"They (teacher leaders) encouraged me to make my lessons more rigorous"
- A TL's campus colleague

Conclusions

- Rice University's Mathematics Leadership Institute
- developed strong and abiding mathematics TLs
 - improved TLs' content knowledge significantly
 - positively impacted TLs' students, colleagues, and colleagues' students
 - positively impacted TLs' classroom practices
 - helped create a professional community of practice that works towards improving mathematics education for all students in urban schools.