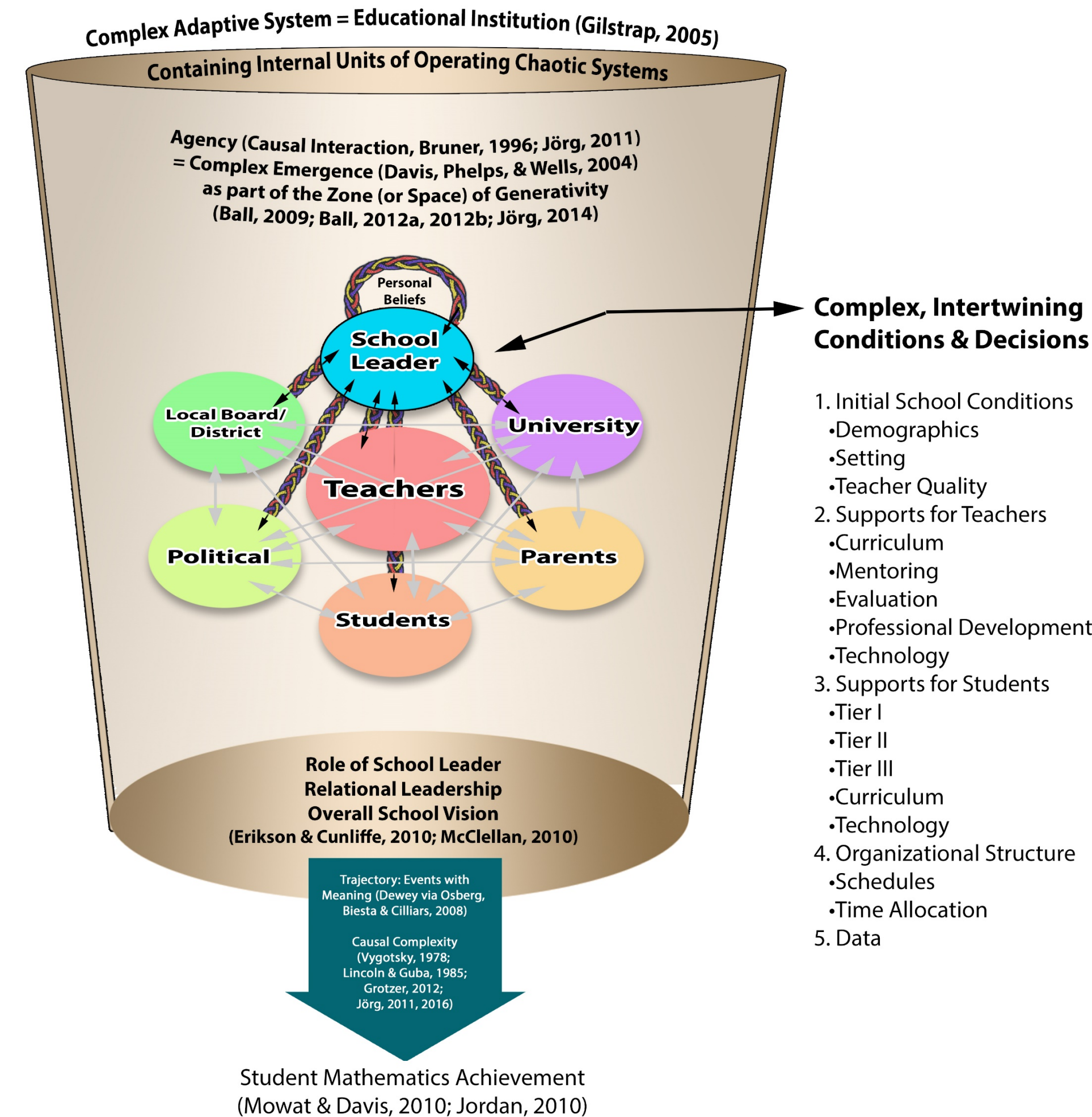


The School Leaders' Role in Students' Mathematics Achievement

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Conceptual Framework: Complexity Theory



Research Design

Explanatory sequential mixed method design to answer what the school leaders' role is in students' mathematics achievement in the context of complexity theory.

Quantitative

Quantitative data were collected via a survey (revised Principal's Questionnaire) to answer the research questions.

158 leaders From Utah K-12 public and charter schools

Qualitative

Qualitative data from focus group interviews were used to explain the quantitative results. Interviewees were school leaders selected based on their school's performance on SAGE tests, relative to their demographics.

5 leaders	HIGHER
6 leaders	AS EXPECTED
6 leaders	LOWER

Quantitative Phase

Data Analysis

- Preliminary Descriptive Analysis
- Randomized Forests and Variable Importance Plots
- Preliminary Model Assumptions & Correlation Analysis
- Network Analysis
- Post-Hoc Regression Analysis
- Multiple Regression Analysis

Final predictive model based on complexity theory:

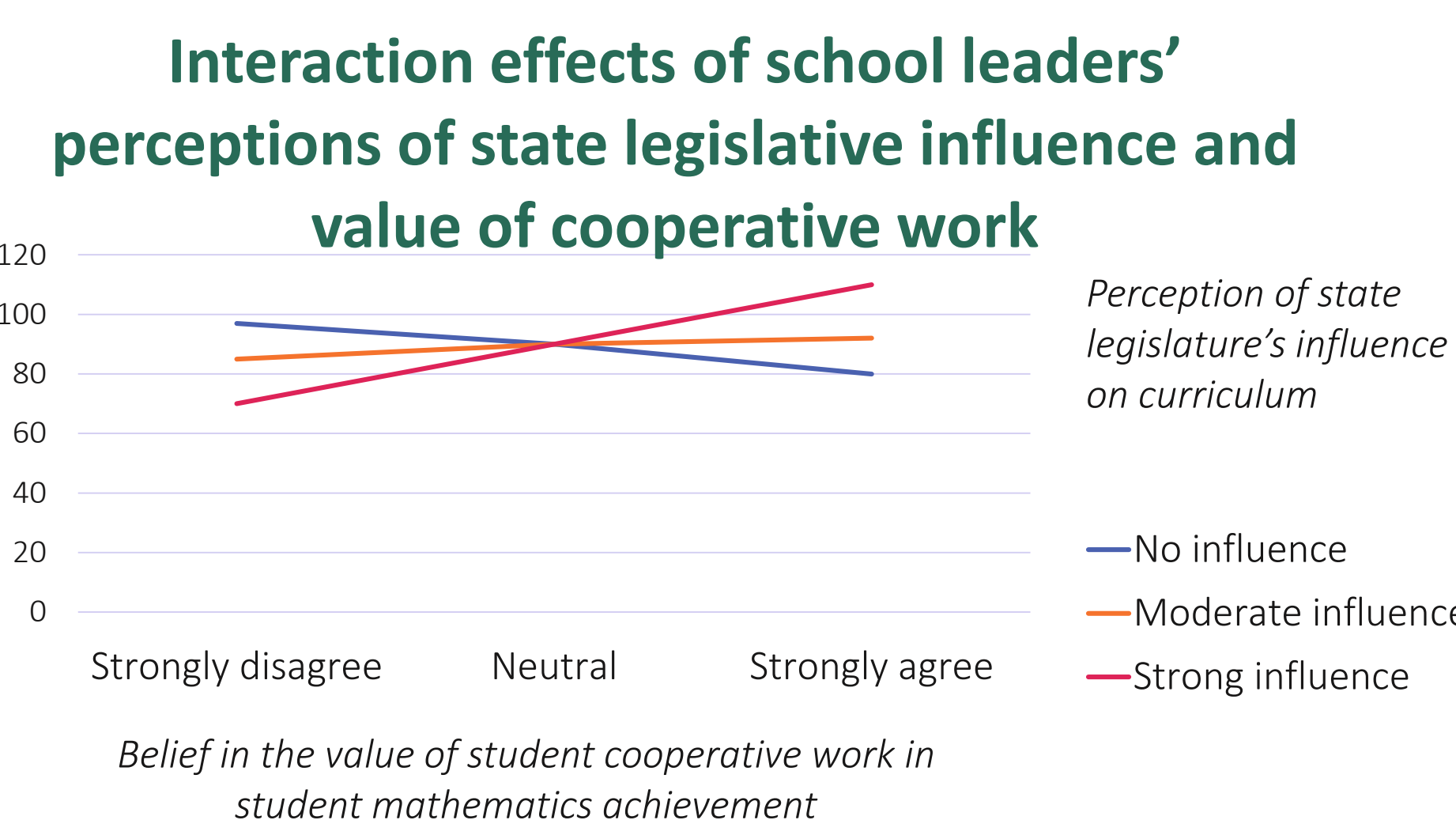
- A significant regression equation was found ($F(13,65) = 6.91, p < .001$), with R^2 of .580.
- Evidence of interaction effects and multiplicative looping effects, indicating emergent phenomena.

	b	SE	t	p
Intercept	109.69	38.78	NA	NA
Inf_State_1eg_2	2.77	.99	2.82	.006
*MTL39				
Inf_State_1eg_2	-8.26	3.63	-2.28	.026
MTL39	-6.93	3.71	-1.87	.066
Math_Ed*MTL	-13.79	8.06	-1.71	.092
62				
Math_Ed	53.15	28.55	1.86	.067
MTL62	10.76	8.90	1.21	.231
Inf_Teach3	-8.88	3.68	-2.42	.019
Inf_Nat_Org2	-3.22	1.20	-2.69	.009
Age	-.35	.18	-1.89	.064
Fam_PD_CL_D	-2.34	1.20	-1.95	.056
sc				
ISAM18	2.95	1.40	2.11	.039
*d_lowSES	-.25	.09	-2.92	.005
*dEthMin	-.03	.10	-.32	.75

Notes: $R^2 = .58$

Research Questions

- What characteristics of the school leader are most important in predicting students' mathematics achievement?
- What is the relationship between students' mathematics achievement and these characteristics of the school leader?



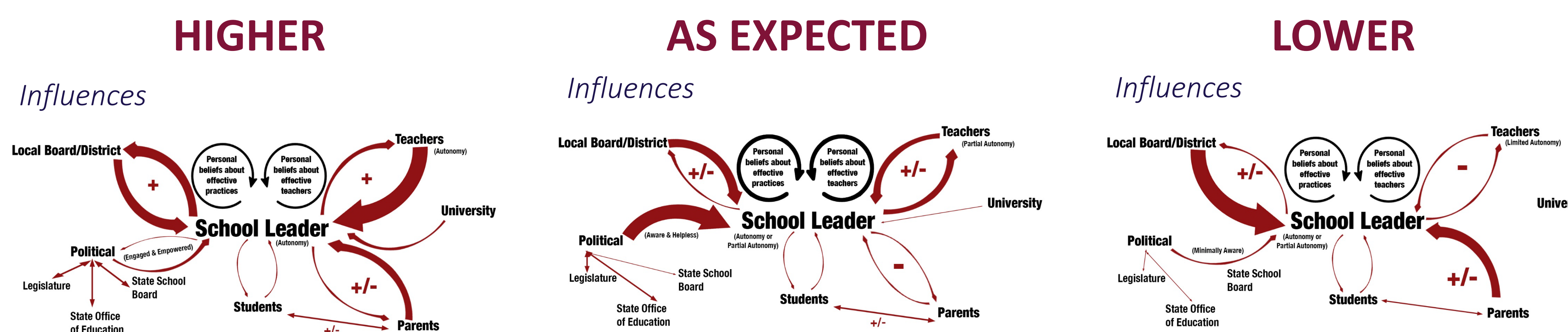
Qualitative Phase

Data Analysis

Constant comparative analysis procedures

Research Questions

- What relationships with stakeholders in the schools influence school leaders' decisions?
- What decisions and actions are being made by school leaders?



Shared vision of math education

Disparate vision of math education

Disparate vision of math education

School Leader Decisions and Actions

- Inquiry-based learning:** Tier I instruction strongly established
- Teachers:** Collaboration, distributed leadership, heterogeneous grouping
- Supports for Students:** Heavy on licensed teachers w/support from technology

School Leader Decisions and Actions

- Traditional methods vs. Inquiry-based learning:** Tier I generally established with exceptions
- Teachers:** Positive mindset; ability grouping; school leader
- Supports for Students:** Licensed teachers/aides w/support from technology

School Leader Decisions and Actions

- Focus on Basics:** Tier I not well established
- Teachers:** Aligning curriculum w/standards, hiring quality teachers, ability grouping, school leader
- Supports for Students:** Heavy on aides/volunteers & technology

Mixed Phase

Research Question

How are school leaders' decisions and actions associated with students' mathematics achievement?

Results

All groups of school leaders said it was their role to build the capacity of the faculty and students.

HIGHER	AS EXPECTED	LOWER
Facilitating a shared vision of the culture of mathematics education at their school.	Setting expectations driven by data and holding faculty accountable.	Coaching and mentoring, evaluating and giving feedback in a one-directional way.

Overall Result

The school leaders' role is to facilitate a shared vision of mathematics education between stakeholders in their school:

- Especially between administration, teachers, and local school board/district office
- Supporting inquiry-based learning and teacher collaborative practices
- Promoting heterogeneous grouping
- Focus on hiring and retaining high quality teachers
- Supporting sustained, coordinated, longitudinal teacher professional development
- Supporting distributed leadership practices
- Supporting distributed ownership of data
- Evaluation and feedback practices based on well-articulated plans developed with teachers and based on trust
- Supporting teacher created materials with textbook as resources.
- Utilizing university resources
- Partnering with parents
- Engaging in empowered political discourse

References available upon request