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Unpacking the Logic Model: A Discussion of Mediators and Antecedents of Educational Outcomes from the Investing in Innovation (i3) program

September 9, 2020

Presenters:

Katie Lass, The Policy & Research Group

Hannah D'Apice, Empirical Education & Stanford University

Audra Wingard, Empirical Education

Thanh Nguyen, Empirical Education

Discussant:

Anne Wolf, Abt Associates

Investing In Innovation (i3)

Tiered Evidence Grants

Development

Develop and test innovative education practices that show promise of effectiveness

- *Katie Lass, Peer Group Connection (RCT)*
- *Hannah D'Apice, Enhanced Units (RCT)*
- *Audra Wingard, CREATE (QED)*

Validation

Further develop innovative education practices and regionally or nationally scale those practices. Moderate prior evidence of effectiveness.

- *Thanh Nguyen, Making Sense of SCIENCE (RCT)*

Scale-Up

Programs supported by strong prior evidence of effectiveness. Improve outcomes for an increased number of high-need students and generate information about the students and contexts for which a practice is most effective.

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CENTER FOR SUPPORTIVE SCHOOLS

Impact on Antecedents of Student Dropout in a Cross-Age Peer Mentoring Program

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Sherry Barr, Center for Supportive Schools

Federal Funding Acknowledgement and Disclaimer

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Peer Connection Study Overview

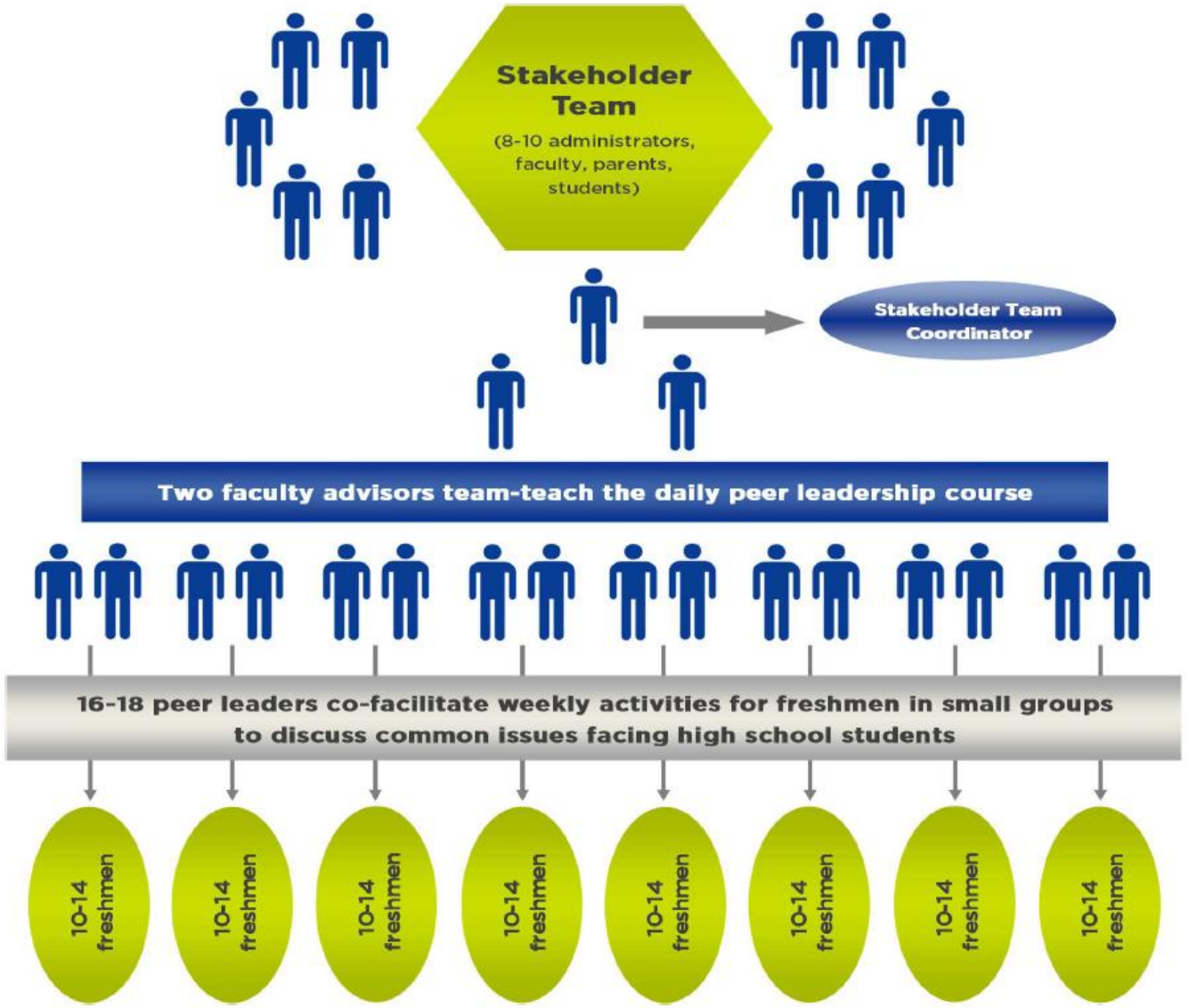
- **Implementation Years: 2016-17, 2017-18, 2018-19**
- **Study partners:**
  - Intervention developer - Center for Supportive Schools
  - Independent evaluator - The Policy & Research Group
  - Implementation sites - 6 high schools in rural North Carolina
- **Study design:**
  - Randomized Controlled Trial (RCT) targeting 9th grade students
  - Primary outcomes of interest – daily attendance and credit accrual
  - Exploratory outcomes of interest – disciplinary events, engagement, educational outlook, social and emotional skills
  - Data collection - school records and pre- and post-program questionnaire

Peer Group Connection-High School

Equipping older students to help 9th graders transition to high school

What	**Peer-to-peer group mentoring model** that trains and mobilizes older/more experienced students to help **ease the transition into high school** for incoming students
When	• **Daily** leadership course for credit for student leaders (11th/12th graders) • **Weekly** group mentoring sessions for 9th graders led by trained student leaders
Why	• Enhance student engagement • Build leadership, academic, social, and emotional skills • Support academic outcomes (remaining in school, student achievement, increased attendance, lower suspension rates, and, ultimately, graduation from high school)

Intervention Structure



Logic Model

PEER GROUP CONNECTION (PGC): High School Transition & Cross-Age Peer Mentoring Program

GOAL: *Improve adolescent education outcomes by promoting mediating factors that (1) improve students' non-cognitive abilities and (2) enhance student engagement through a school-based youth development program that utilizes the power of older students to effect positive changes for younger students.*

Inputs

- i3 funding
- Matching funding
- CSS staff
- North Carolina LEA staff and resources
- Partner and consultant resources
- Ongoing technical support
- Fully developed PGC curriculum
- Support from stakeholder team
- Support from veteran school intervention sites

Key Components Offered and Received

Stakeholder Team
- Holds planning meetings
- Supports Faculty Advisors

Faculty Advisors
- Offered training (11 days)
- Select Peer Leaders

Junior/Senior Peer Leaders
- Offered 3-day leadership retreat
- Offered 12-hour mid-program retreat
- Enrolled in daily Leadership Development Course during regular school hours
  - 4 days per week receive training
  - 1 day per week conduct Outreach Sessions

Freshman PGC Participants
- Offered five-hour 9th Grade Activity Day with PGC participants, peer leaders, and faculty advisors
- Offered Family Night to 9th graders, peer leaders, and their families
- Offered weekly Outreach Sessions in groups of 10-14 with 2 Peer Leaders
  - Minimum of 18 45-minute sessions
  - Using most up-to-date version of PGC curriculum
  - Service learning project completed during two of the 18 outreach sessions

Mediators

Improvements in Non-Cognitive Abilities and Enhanced Student Engagement
- Increased perceived connectedness among peers
- Increased school engagement/attachment
- Increased perception of peer support for academic engagement/attachments
- Increased educational aspirations
- Increased competence in peer relationships
- Increased self-efficacy in goal-setting skills
- Increased decision-making skills
- Increased grit
- Increased growth mindset

Student Outcomes

Short-term

- Increased days of attendance (i.e., staying in school)
- Increased credits earned towards high school graduation (i.e., progressing in school)

Long-term

- Increased on-time high school graduation rates
- Increased college enrollment and job attainment following high school

Exploratory Impact Analysis Methods

Going beyond ITT effects

Research Questions	Predictors	Analysis
Are there variations in PGC-HS's impact for different subgroups of students?	▪ Demographic characteristics ▪ Baseline attitudes and SEL skills	Interaction term (TX*predictor)
Are there variations in PGC-HS's impact under different school-level implementation conditions?	▪ Number and type of sessions offered ▪ Length of programming ▪ Previous experience implementing	Interaction term (TX*predictor)
What are the Complier Average Causal Effects (CACE) of participating fully in PGC?	▪ Compliance ▪ Baseline predictors of compliance	▪ Two-stage least squares regression ▪ Principal score weighting

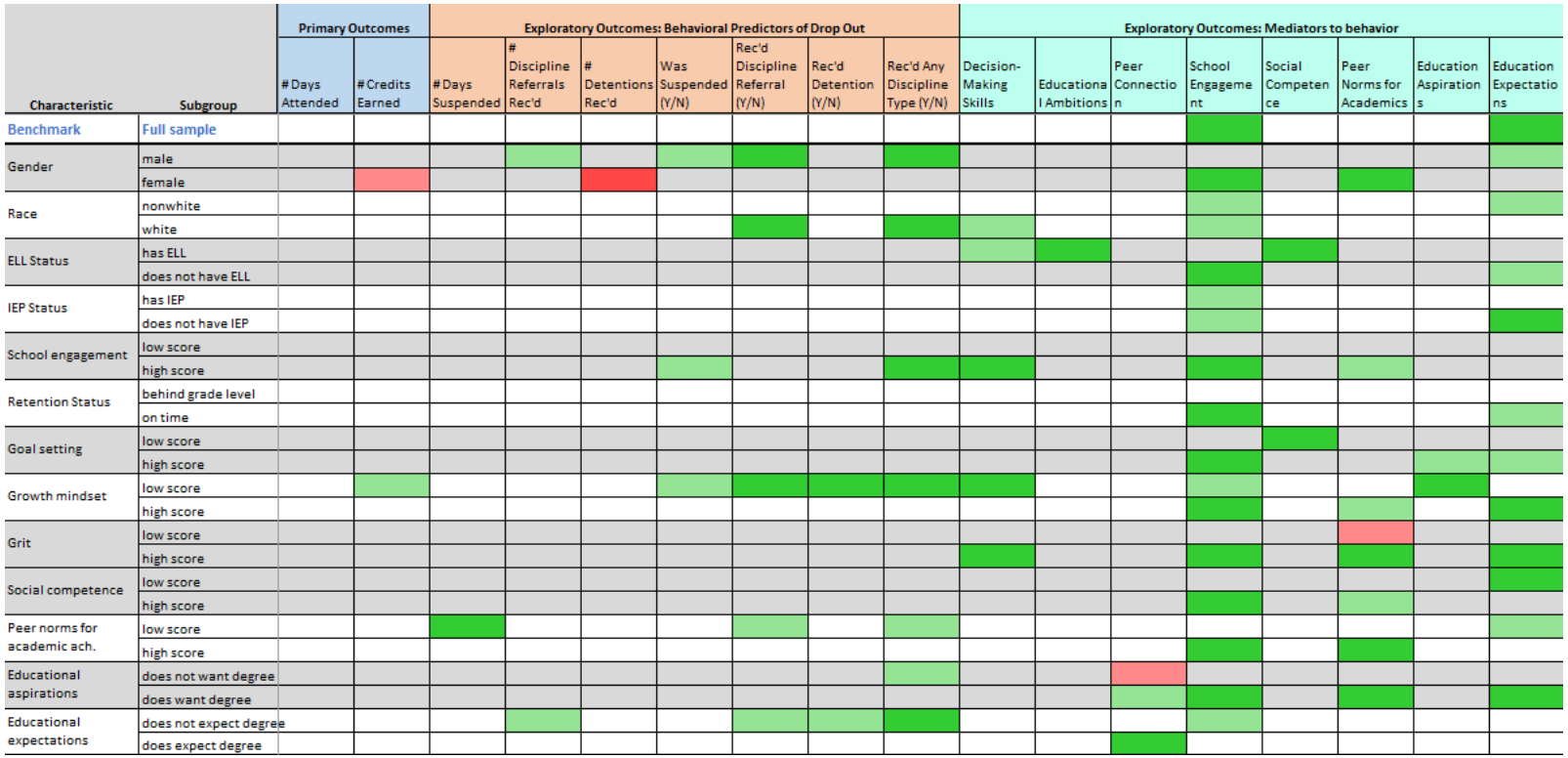
Subgroup Analyses

For which outcomes are there variations in effect?

For which subgroups are there variations in outcomes?

Outcomes

Subgroups



Characteristic	Subgroup	Primary Outcomes		Exploratory Outcomes: Behavioral Predictors of Drop Out							Exploratory Outcomes: Mediators to behavior							
		# Days Attended	# Credits Earned	# Days Suspended	# Discipline Referrals Rec'd	# Detentions Rec'd	Was Suspended (Y/N)	Rec'd Discipline Referral (Y/N)	Rec'd Detention (Y/N)	Rec'd Any Discipline Type (Y/N)	Decision-Making Skills	Educational Ambitions	Peer Connection	School Engagement	Social Competence	Peer Norms for Academics	Education Aspirations	Education Expectations
Benchmark	Full sample																	
Gender	male																	
	female																	
Race	nonwhite																	
	white																	
ELL Status	has ELL																	
	does not have ELL																	
IEP Status	has IEP																	
	does not have IEP																	
School engagement	low score																	
	high score																	
Retention Status	behind grade level																	
	on time																	
Goal setting	low score																	
	high score																	
Growth mindset	low score																	
	high score																	
Grit	low score																	
	high score																	
Social competence	low score																	
	high score																	
Peer norms for academic ach.	low score																	
	high score																	
Educational aspirations	does not want degree																	
	does want degree																	
Educational expectations	does not expect degree																	
	does expect degree																	

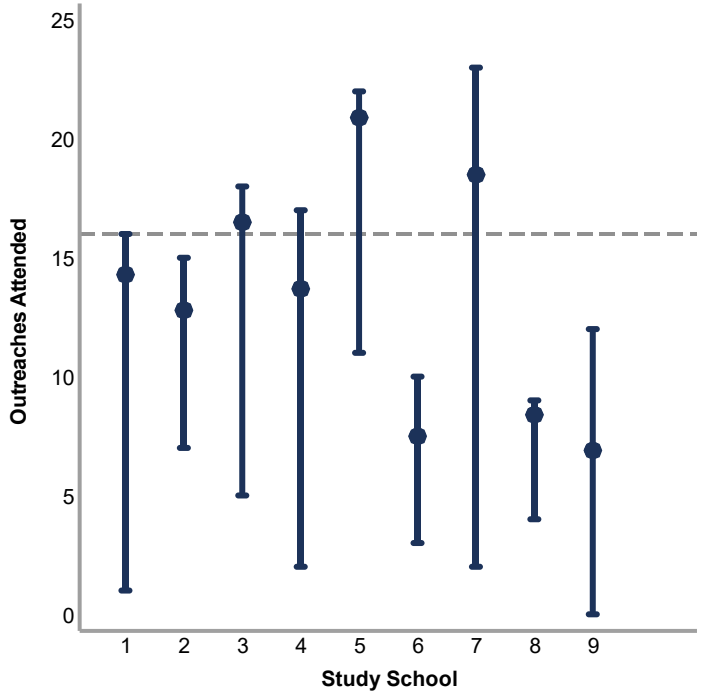
Under what implementation conditions do impacts vary?

School-level Measures	Definition of contrasts	
Number of sessions offered	Offered at least 18 sessions (minimum fidelity requirement) *6 schools*	Offered less than 18 sessions (did not meet fidelity requirements) *3 schools*
Type of sessions offered	Offered all of the required types of sessions (to meet fidelity requirements) *4 schools*	Failed to offer at least one of the required sessions (did not meet fidelity requirements) *5 schools*
Length of programming	Offered PGC-HS for the fall semester only *7 schools*	Offered PGC-HS for the entire academic year *2 schools*
Experience with program	First year implementing PGC-HS *5 schools*	Second year implementing PGC-HS *4 schools*

Complier Average Causal Effect

How much of the program do students need for it to have an effect?

- Dosage varied widely
- Full participation defined as attending 16 or more outreach sessions (39% compliance)
- Compared two common approaches:
  - *Instrumental variable two-stage least squares regression*
  - *Principal score weighting*



Stuart & Jo (2015) Assessing the sensitivity of methods for estimating principal causal effects. Statistical Methods in Medical Research, 24(6): 657-674.

Key Findings

Study	Results

Subgroup Analyses	• PGC appears to have a stronger (more significant) impact on reducing disciplinary events with:
	  • Male students
	  • Students who had a negative growth mindset attitude
	  • Students who didn't expect to receive a college degree

Implementation Conditions	• When schools offer a minimum of 18 sessions, offer the required type of sessions, and/or are offering the program for the first time, students in PGC group:
	  • Were less likely to receive a disciplinary infraction
	  • Scored higher on school engagement
	  • Scored higher on measures of SEL skills

CACE	• Attending 16 or more outreach sessions was associated with:
	  • Reduced likelihood of suspension
	  • Higher GPAs
	  • Higher scores on SEL skills, engagement, and educational mindset

Next Steps: *Examine impact on long-term outcomes beyond 9th grade*

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Thank you!

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September 2020

Supporting Content-area Learning in Biology and U.S. History

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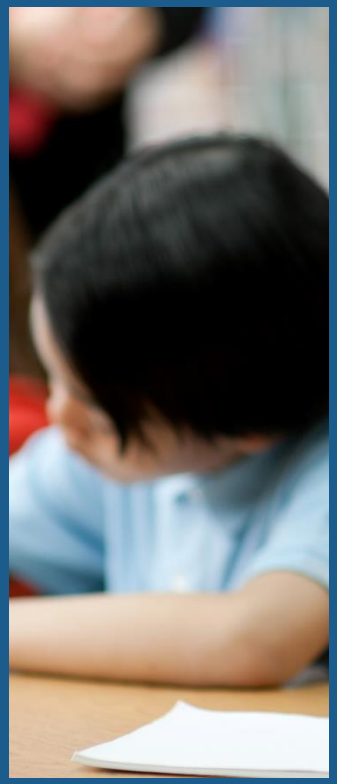

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Presenters

Hannah D'Apice, Research Manager & Stanford Doctoral Student

Andrew Jaciw, Chief Scientist

Jenna Zacamy, VP of Research Ops

Li Lin, Statistician

Agenda

- What are *Enhanced Units*?
- Study overview
- Results
- Conditions to support impact
- Areas for improvement & follow-on research

Enhanced Units

- Developed by SRI, CAST, and research and practitioner partners
- Goal to improve student content learning and higher order reasoning in secondary school, especially for students with learning challenges
- Funded by i3 Development grant (2014)

Enhanced Units

- Integrated research-based content enhancement routines (CER)s
- Routines used in the study are based on the Strategic Instruction Model (SIM)
  - unit organizers
  - question/exploration guides
  - cause and effect guides
  - comparison (compare and contrast) tables
- CORGI – online CER component

Unit Organizer

Red print indicates routines to be used in pilot study.

4 BIGGER PICTURE: Civil Liberties and National Security

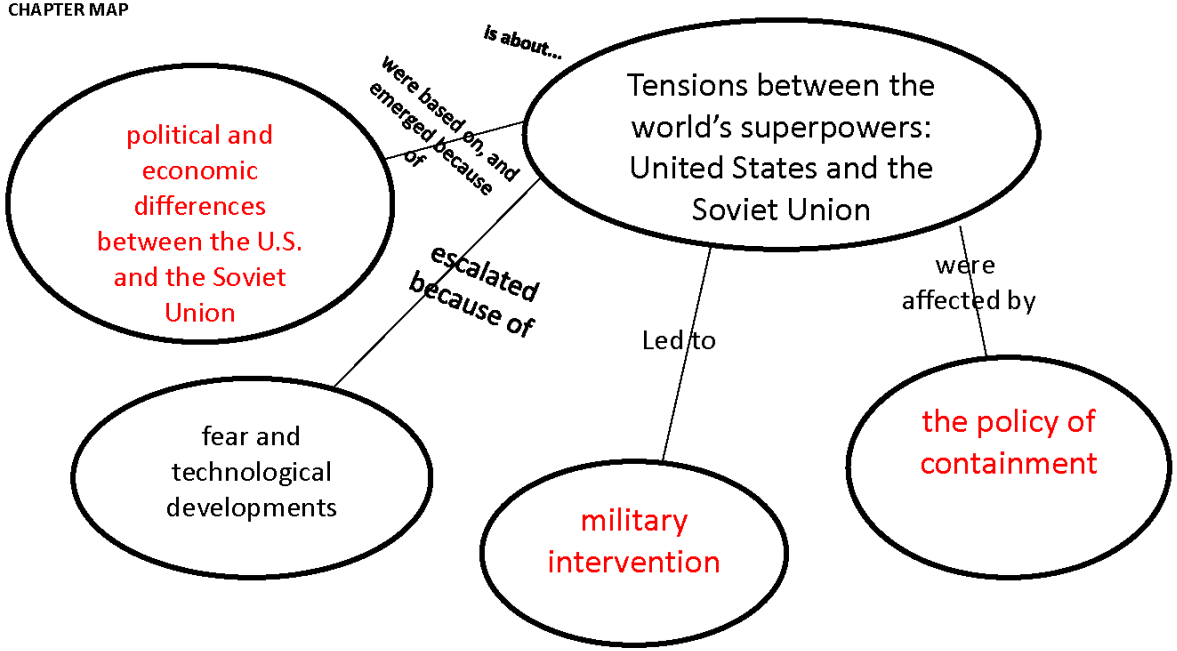
2 LAST CHAPTER: WWII

1 CURRENT UNIT: Cold War (1945-1989)

3 NEXT CHAPTER: Civil Rights Movement

8 CHAPTER SCHEDULE

5 CHAPTER MAP



7 SELF-TEST QUESTIONS

1. What were the causes and effects of the Cold War?
2. How did the rise of espionage and advancements in technology escalate Cold War tensions?
3. How were the military interventions of the Soviet Union and the United States during the Cold War (1945-1960) similar and different?
4. How did the policy of containment affect tensions between the United States and the Soviet Union in the early Cold War years (1945-1952)?

6 RELATIONSHIPS

- Cause-Effect
- Explanation
- Compare-Contrast
- Explanation

Originally developed, validated and copyrighted, 'The Unit Organizer Routine' by B. Keith Lenz, Janis A. Bulgren, Jean B. Schumaker, Donald D. Deshler, and Daniel A. Boudah. Edge Enterprises Inc. (1994). The authors have granted their permission to SRI International to adapt the Unit Organizer Routine and display and distribute the adaptation on corgi.sri.com via an application hosted by Google, funded by the U.S. Department of Education, Investing in Innovation (i3) Development Grant #U411C140003. The contents of this document were developed under the i3 grant from the Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.

EU Logic Model

INPUT	PROXIMAL OUTPUTS	LONGER TERM OUTPUTS	TEACHER OUTCOMES	STUDENT OUTCOMES
Classroom level Biology and U.S. History teachers receive curricular materials for i3 *EU* **Key Component 1:** Biology and U.S. History teachers receive sufficient support: In-Person PD: Biology and U.S. History teachers receive sufficient support to use i3 *EU* materials by attending 3 days of PD Ongoing coaching: Biology and U.S. History teachers receive sufficient support by receiving at least 8 hours of coaching from SIM professional developers	Teacher **Key Component 2:** Teacher use of *EU*: Biology and U.S. History teachers use *EU*. Biology and U.S. History teachers implement one practice *EU* and two study *EU*s as per study design. Teachers deliver quality instruction, adhere to dosage, and report on likely effectiveness of the intervention on student performance. Student Students understand the purpose and application of the *EU*s in their biology and U.S. History classes	Teacher Improved implementation of, adherence to, and quality of *EU* instructional practices; improved effectiveness of *EU*	Teacher Improved/ increased implementation of SIM strategies (particularly the content enhancement routines specified in *EU*)	Student Improved achievement on end-of-unit content assessment measures

2018 Field Study Primary & Secondary Research Questions

Primary questions compared participants to the scores of similar grade BAU students:

- Did students in grades 9-12 who attended HS *EU* **Biology** classes demonstrate higher order content knowledge in the **Biology** unit test scores?
- Did 11th grade students who attended HS *EU* **U.S. History** classes demonstrate higher order content knowledge in the **U.S. History** unit test scores?
- Did both groups of *EU* students, as a group, demonstrate higher order content knowledge in their respective unit test scores?

Secondary questions are the same, but specific to students that received special education services.

2018 Field Study
Exploratory Research Questions

- Is there a difference in impact on student achievement depending on:
  - teachers' self-reported levels of comfort with technology?
  - biology content area, specifically, evolution compared to ecology?
- Is there a positive impact of *EU* on achievement by Biology content area, or by U.S. History content area?
- What is the level of the treatment-control contrast in the use of SIM instructional practices deemed central to implementation of *EU*?
- Is there evidence that *EU* had impact on instructional practices posited to mediate impacts on student achievement?

2018 Field Study: Design
(Spring semester of 2017/18 school year)

2 states

5 high schools

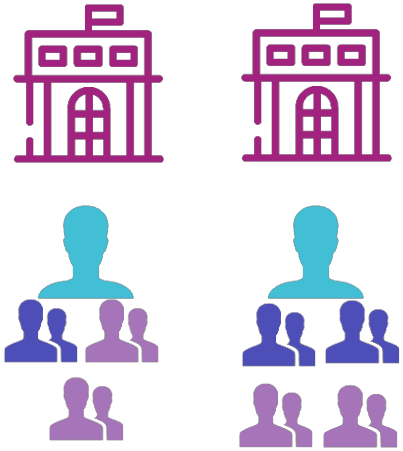
13 teachers

18 Biology classes

12 U.S. History classes

2018 Field Study: Design
(Spring semester of 2017/18 school year)

2 states



5 high schools

15 *EU* classes

15 control classes

2018 Field Study: Data (Spring semester of 2017/18 school year)

Baseline

- Teacher baseline survey
- Class rosters
- Student demographics

During implementation

- Daily implementation logs
- Instructional practice surveys
- End-of-unit student assessment – Cronbach alphas above .75 for all

End of study

- Student survey
- Teacher interviews

Findings: Main Impact from 3-Level HLM Analysis

	Effect size	*p* value	Change in percentile ranking
Biology			
Unadjusted effect size	0.01	.958	0%
Adjusted effect size	0.01	.892	0%
U.S. History			
Unadjusted effect size	0.33	.214	12%
Adjusted effect size	0.32	**.037**	12%
Biology & U.S. History combined			
Unadjusted effect size	0.14	.516	6%
Adjusted effect size	0.14	**.067**	6%

Low Differential Attrition: No classes were lost to attrition—we obtained outcomes for one or more students present at baseline in the classroom. Student attrition for the combined sample was 3.8% overall, and 2% differential. Low potential for bias.

Sensitivity Analyses: U.S. History and Combined results are robust in terms of their magnitudes; however, for U.S. History, the *p* values fluctuate around significance level .05.

Findings: Moderator Analyses (Combined Sample)

- Positive differential impact of *EU* on achievement, depending on disability status.

- No differential impact of *EU* on achievement, depending on level of teachers' baseline score on the Technological Pedagogical and Content Knowledge (TPAK).

Findings:
Impact *Within* Biology Units

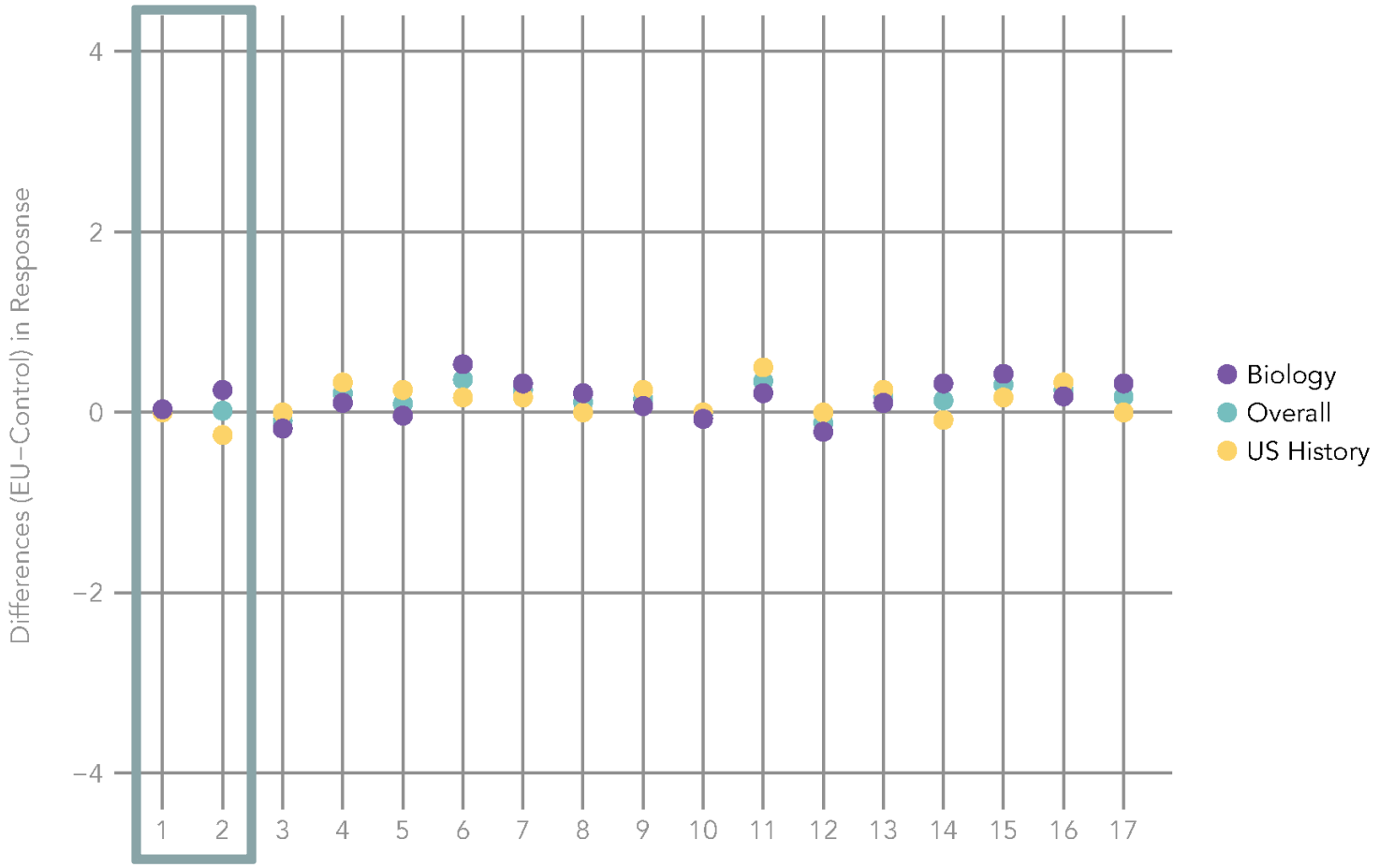
> *…the content of Enhanced Units best support student learning when they focus on a single topic, allow adequate time, and use instructional supports that all relate to the critical topic of the unit and build sequential understanding.*

- Students on average experienced greater impact of *EU* on assessment of Evolution than Ecology.
- These results are considered exploratory.

Findings: Conditions for Impact

- Fidelity of implementation not met system-wide. Indicators included:
  - teacher adherence
  - teacher quality of delivery
  - teacher-perceived usefulness of tools/strategies
  - student self-reported understanding
  - student self-reported collaboration
- Treatment-control contrast was strong based on use of SIM routines. No evidence of contamination.

No Differences in Mediator Impacts



Ex: (1) Explicit instruction, (2) Reteach to a few students

Areas for Improvement

- Provide additional support for less-structured, less-sequential content
- Explore how content enhancement routines can be applied to a greater range of topics
- Adjust for operational challenges of technology tool: visual interface, usability, Google Drive interface
- Improve tools and strategies for students that may struggle with typing or prefer using paper

Follow-on research

- What mediates impact? Flesh out Logic Model, identify better measures of mediators
- Tease out impact for students with disabilities: look at different types of disabilities
- What is/are the best way(s) for teachers to present SIM routines to their students, particularly for students with learning challenges through SIM intervention?
  - Investigate how the routines can be applied to a greater range of topics.
  - Consider how introducing devices to the routines potentially presents steeper learning curves and difficulty with buy-in for teachers and students alike

Contact

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Full EU report available at

https://www.empiricaleducation.com/past_research/

Reference this presentation:

D'Apice, H., Schellinger, A., Zacamy, J., Wei, X., & Jaciw, A. P. (2020). *Supporting Content-Area Learning in Biology and U.S. History: A Randomized Control Trial of Enhanced Units in California and Virginia.* Presentation delivered in a virtual symposium on September 9, 2020 for the annual spring conference of the Society for Research on Educational Effectiveness, Washington, DC. Retrieve from https://www.empiricaleducation.com/past_research/

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September 2020

Collaboration and Reflection to Enhance Atlanta Teacher Effectiveness (CREATE) Teacher Residency Program

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Presenters

Audra Wingard, Research Manager

Jenna Zacamy, VP of Research Operations

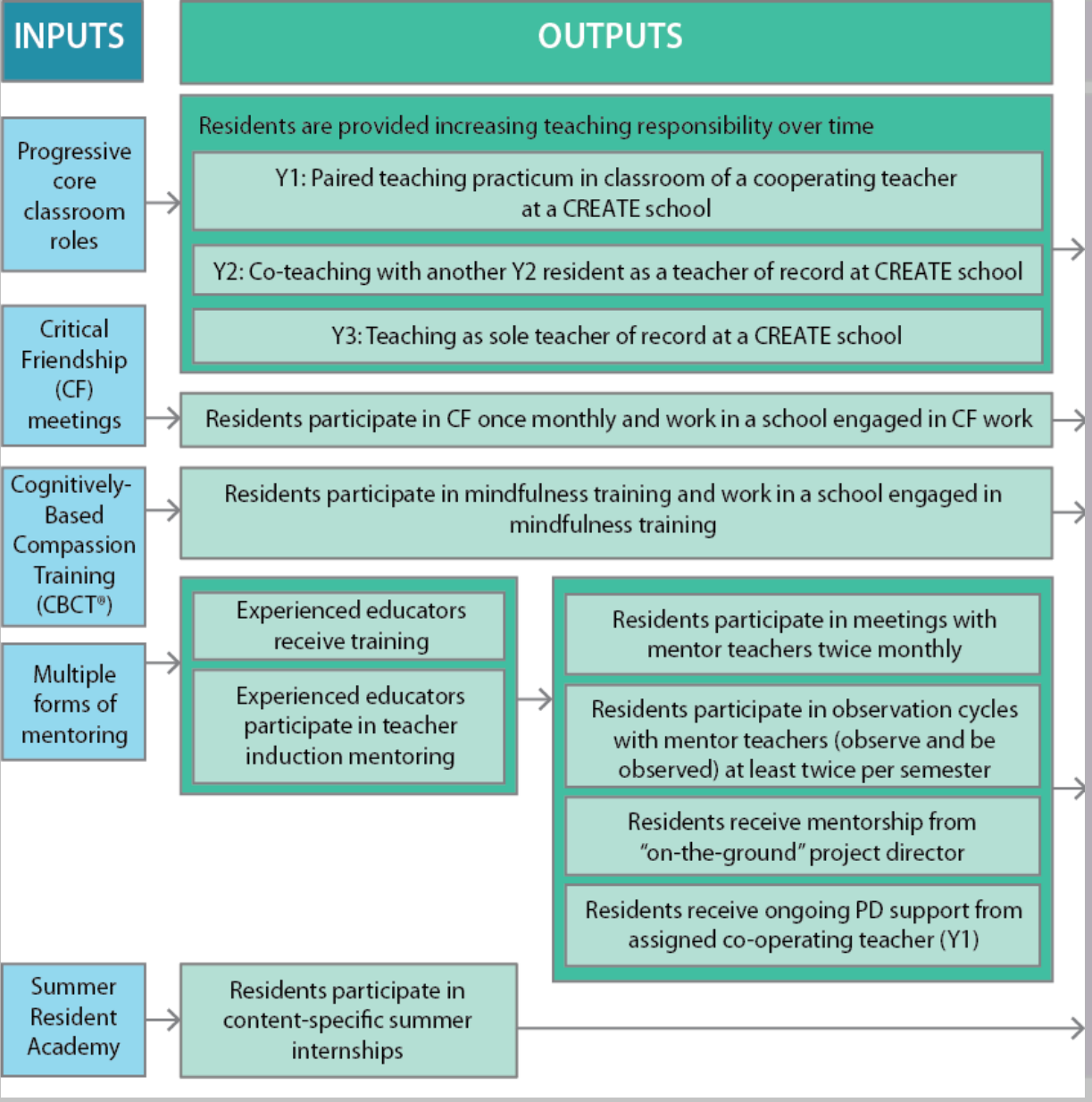
Andrew Jaciw, Principal Investigator

The Intervention: CREATE

- 3 year teacher residency program
  - *Year 1* = Student teaching year
  - *Year 2* = First year as a full-time teacher
  - *Year 3* = Second year as a full-time teacher
- aims to develop new teachers into **critically-conscious**, **compassionate**, and **skilled** with the goal of retaining effective teachers in high-needs schools and ultimately raising student achievement

Agenda

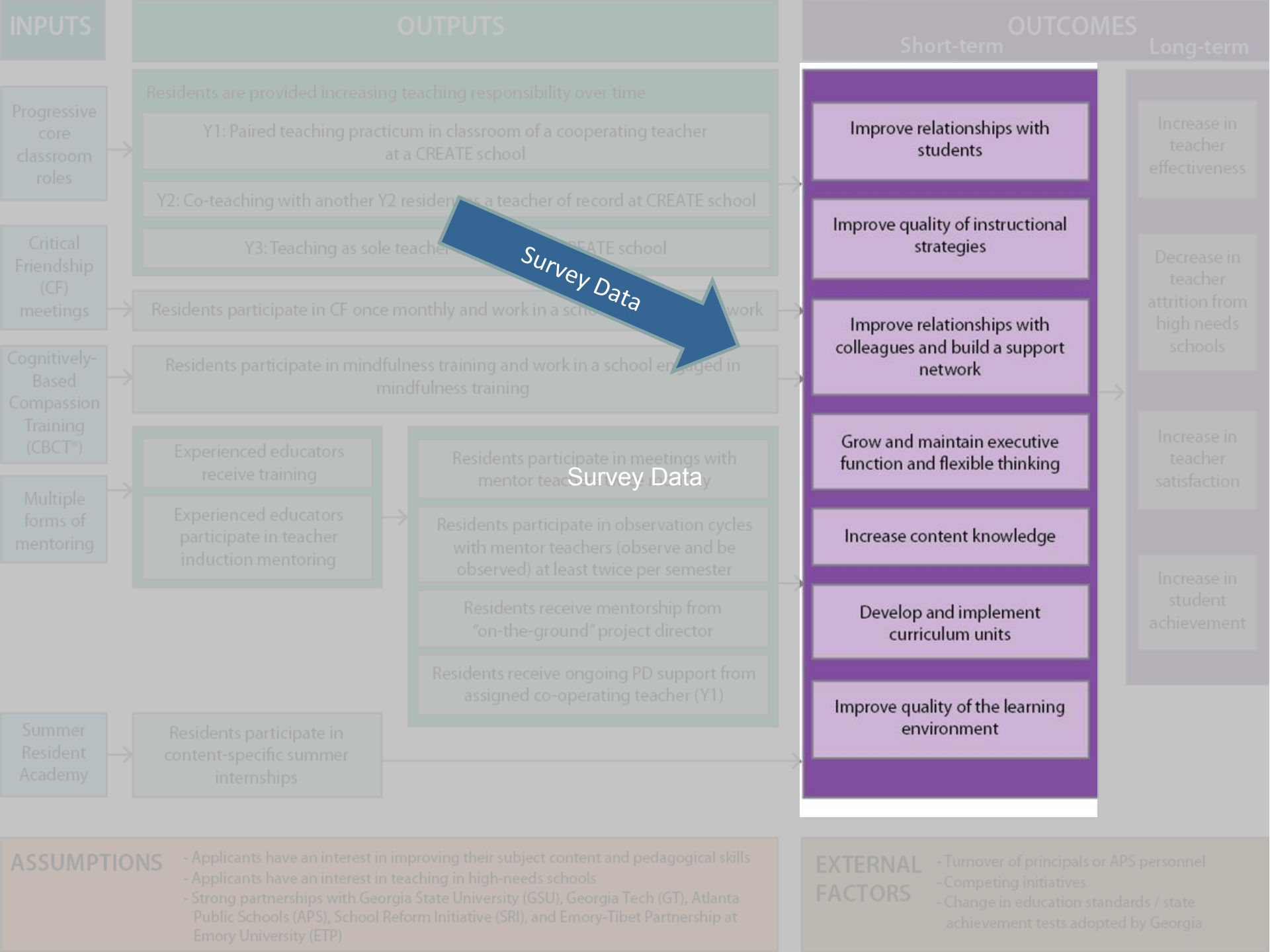
1. **Logic Model**
2. Study Design
3. Findings
4. Challenges
5. What's next?


INPUTS
OUTPUTS
Progressive core classroom roles
Residents are provided increasing teaching responsibility over time
Y1: Paired teaching practicum in classroom of a cooperating teacher at a CREATE school
Y2: Co-teaching with another Y2 resident as a teacher of record at CREATE school
Y3: Teaching as sole teacher of record at a CREATE school
Critical Friendship (CF) meetings
Residents participate in CF once monthly and work in a school engaged in CF work
Cognitively-Based Compassion Training (CBCT®)
Residents participate in mindfulness training and work in a school engaged in mindfulness training
Multiple forms of mentoring
Experienced educators receive training
Experienced educators participate in teacher induction mentoring
Residents participate in meetings with mentor teachers twice monthly
Residents participate in observation cycles with mentor teachers (observe and be observed) at least twice per semester
Residents receive mentorship from "on-the-ground" project director
Residents receive ongoing PD support from assigned co-operating teacher (Y1)
Summer Resident Academy
Residents participate in content-specific summer internships

OUTCOMES
Short-term
Improve relationships with students
Improve quality of instructional strategies
Improve relationships with colleagues and build a support network
Grow and maintain executive function and flexible thinking
Increase content knowledge
Develop and implement curriculum units
Improve quality of the learning environment
Long-term
Increase in teacher effectiveness
Decrease in teacher attrition from high needs schools
Increase in teacher satisfaction
Increase in student achievement

ASSUMPTIONS
- Applicants have an interest in improving their subject content and pedagogical skills
- Applicants have an interest in teaching in high-needs schools
- Strong partnerships with Georgia State University (GSU), Georgia Tech (GT), Atlanta Public Schools (APS), School Reform Initiative (SRI), and Emory-Tibet Partnership at Emory University (ETP)

EXTERNAL FACTORS
- Turnover of principals or APS personnel
- Competing initiatives
- Change in education standards / state achievement tests adopted by Georgia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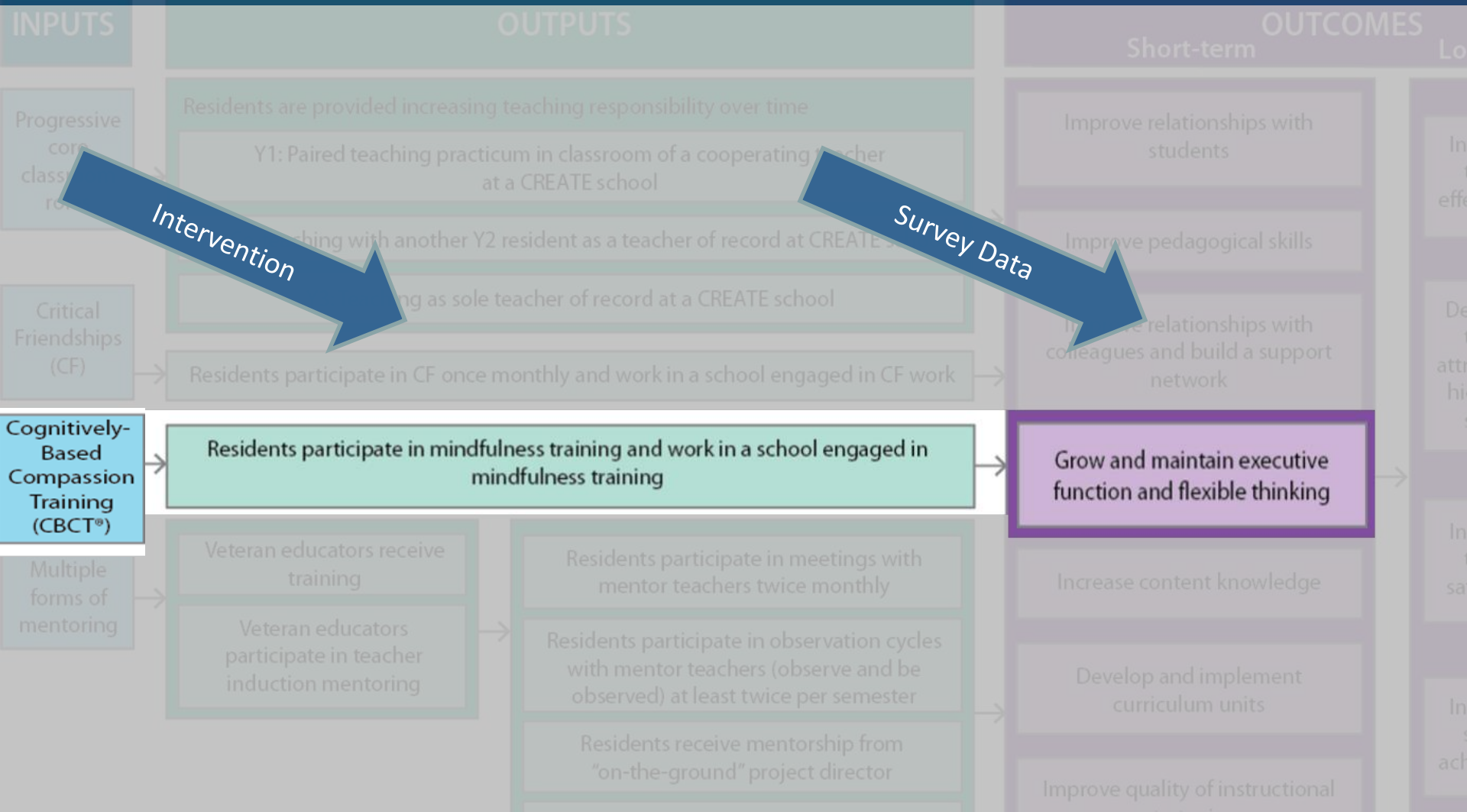
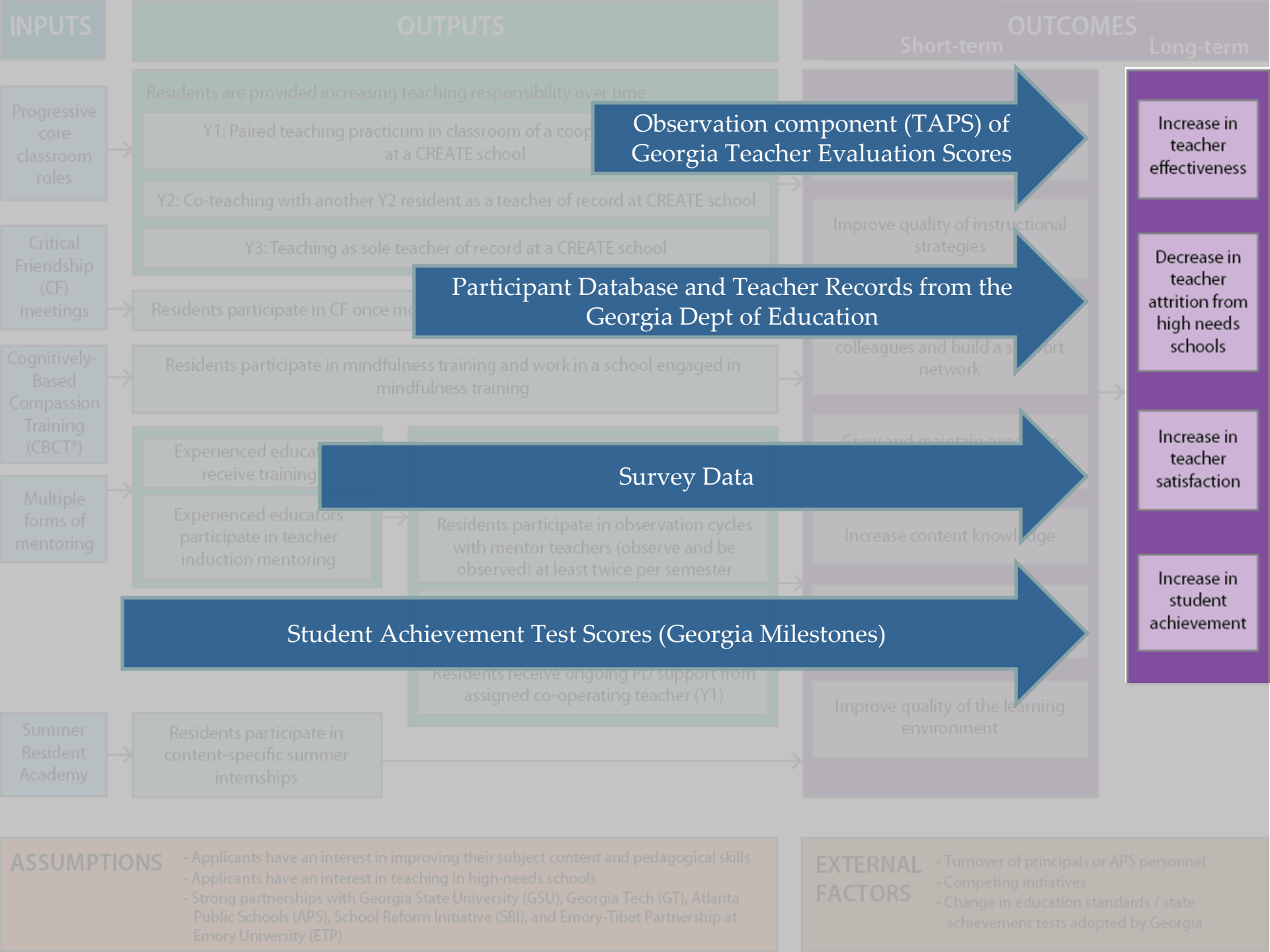
CREATE's Impact on Teachers' Executive Functioning and Flexible Thinking Skills

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Improve quality of instructional strategies
colleagues and build a s ort network
Grow and maintain exce
Increase content knowl dge
Improve quality of the learning environment
Observation component (TAPS) of Georgia Teacher Evaluation Scores
Participant Database and Teacher Records from the Georgia Dept of Education
Survey Data
Student Achievement Test Scores (Georgia Milestones)
Increase in teacher effectiveness
Decrease in teacher attrition from high needs schools
Increase in teacher satisfaction
Increase in student achievement
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- Competing initiatives
- Change in education standards / state achievement tests adopted by Georgia

What is the impact of CREATE on…

Executive function and flexible thinking skills?

- Mindfulness
- Resilience
- Self-Compassion*
- Burnout*

Teacher retention?

Teacher effectiveness?

Student achievement?

* Self-compassion and burnout are outcomes we began assessing under the SEED grant

Agenda

1. Logic Model
2. **Study Design**
3. Findings
4. Challenges
5. What's next?

Study Design

- Quasi-Experiment with a matched comparison group
- Two groups:
  - Treatment: Participants in CREATE residency program
  - Comparison: Similar pre-service teachers at GSU who will go through traditional credentialing program
- 6 Cohorts

Agenda

1. Logic Model
2. Study Design
3. **Findings**
4. **Challenges**
5. What's next?

Review of Findings

Executive Functioning and Flexible Thinking Skills

1. Mindfulness
2. Stress Management & Empathy Related to Teaching
3. Commitment to Teaching
4. Self-Efficacy in Teaching
5. Resilience

No statistically significant findings

Troubleshooting

- Do impacts vary depending on individual attributes?

- Are measures sensitive to the effects of the intervention?

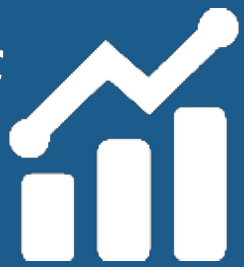
Do impacts vary depending on individual attributes?

- ✓ **Confidence in general teaching skills**
  1. Mindfulness

- ✓ **Confidence in subject matter**
  1. Mindfulness
  2. Stress Management & Empathy
  3. Commitment to Teaching

$p < .01$

Are measures sensitive to the effects of the intervention?



Understanding CREATE's Impact

Reduce Stress and Promote Resilience
(Five Facets, Stress Management & Empathy, CD-RISC)

+

Develop Self Compassion
(Self-Compassion Scale)

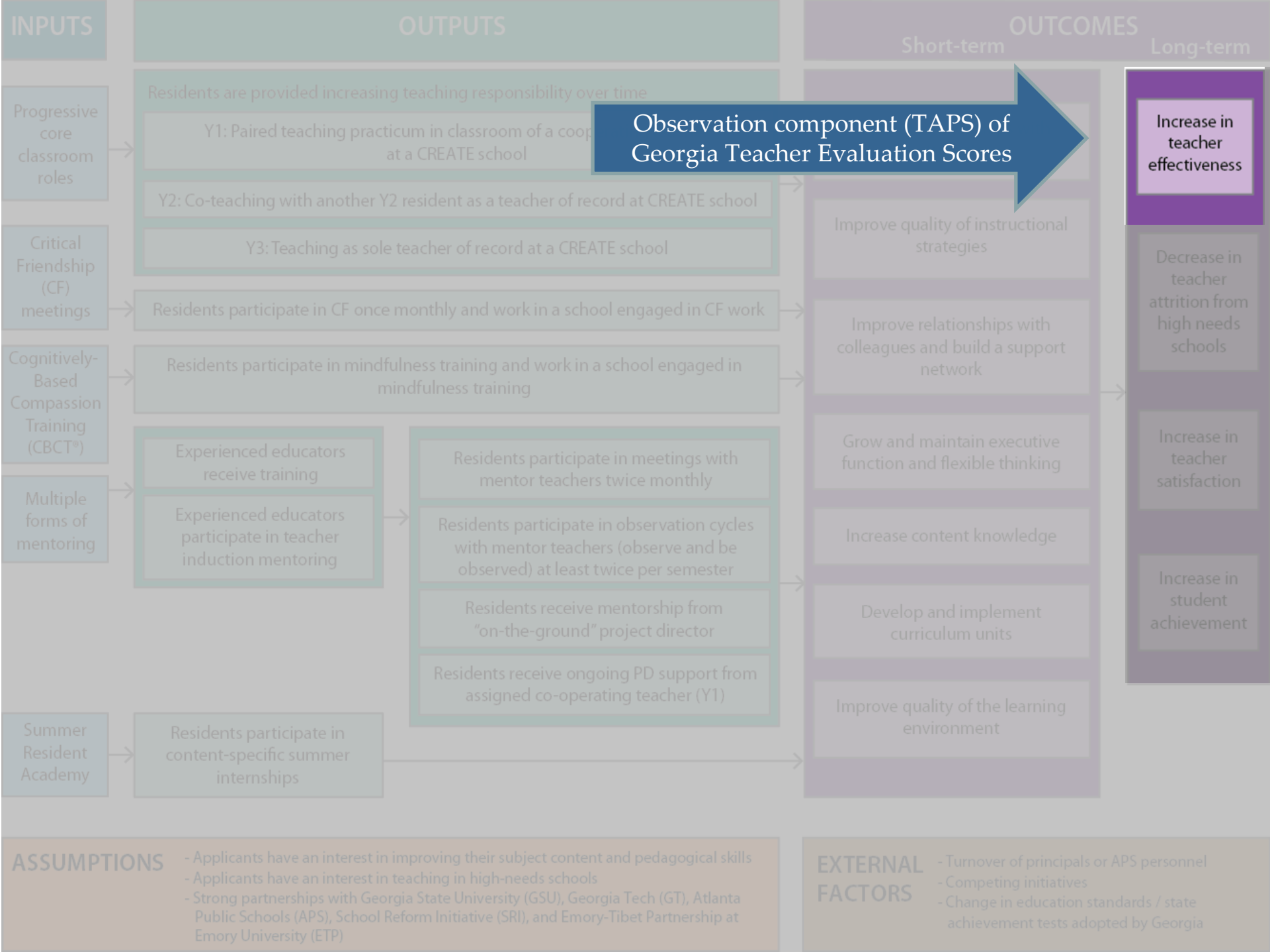
+

Prevent Burnout
(Maslach Teacher Burnout scale)

=

Long term outcomes

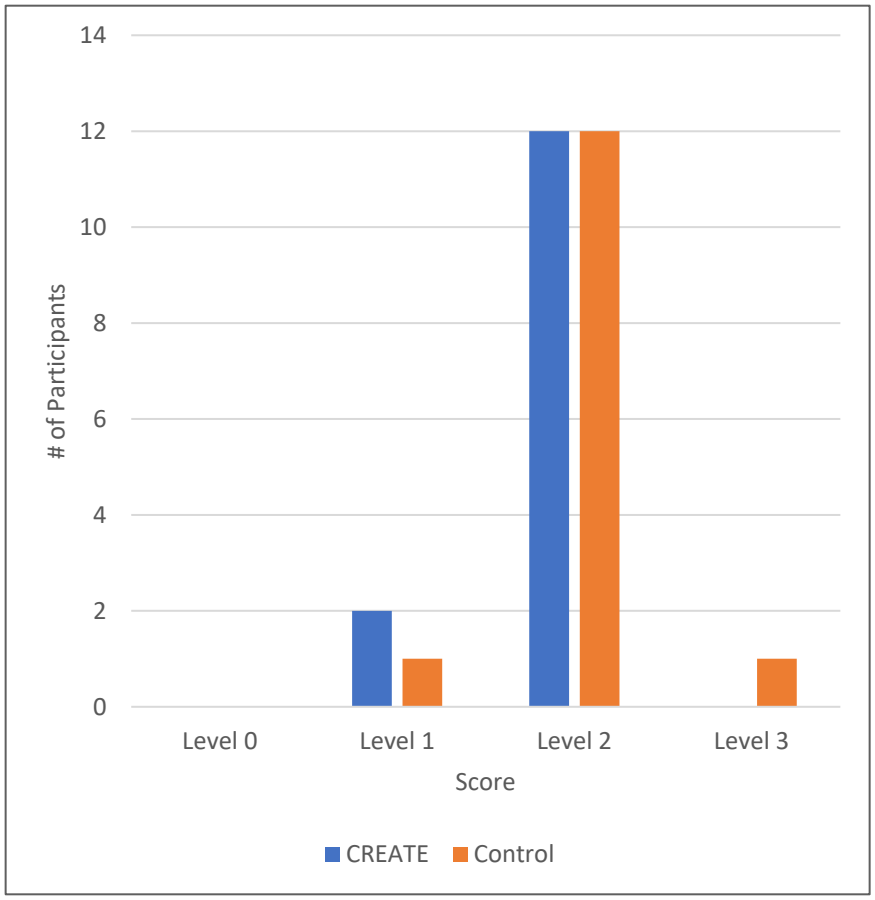
teacher effectiveness
+
teacher retention
+
student achievement


INPUTS
OUTPUTS
OUTCOMES
Short-term
Long-term
Observation component (TAPS) of Georgia Teacher Evaluation Scores
Increase in teacher effectiveness
Progressive core classroom roles
Residents are provided increasing teaching responsibility over time
Y1: Paired teaching practicum in classroom of a coop
at a CREATE school
Y2: Co-teaching with another Y2 resident as a teacher of record at CREATE school
Y3: Teaching as sole teacher of record at a CREATE school
Critical Friendship (CF) meetings
Residents participate in CF once monthly and work in a school engaged in CF work
Cognitively-Based Compassion Training (CBCT®)
Residents participate in mindfulness training and work in a school engaged in mindfulness training
Multiple forms of mentoring
Experienced educators receive training
Experienced educators participate in teacher induction mentoring
Residents participate in meetings with mentor teachers twice monthly
Residents participate in observation cycles with mentor teachers (observe and be observed) at least twice per semester
Residents receive mentorship from "on-the-ground" project director
Residents receive ongoing PD support from assigned co-operating teacher (Y1)
Summer Resident Academy
Residents participate in content-specific summer internships
Improve quality of instructional strategies
Improve relationships with colleagues and build a support network
Grow and maintain executive function and flexible thinking
Increase content knowledge
Develop and implement curriculum units
Improve quality of the learning environment
Decrease in teacher attrition from high needs schools
Increase in teacher satisfaction
Increase in student achievement
ASSUMPTIONS
- Applicants have an interest in improving their subject content and pedagogical skills
- Applicants have an interest in teaching in high-needs schools
- Strong partnerships with Georgia State University (GSU), Georgia Tech (GT), Atlanta Public Schools (APS), School Reform Initiative (SRI), and Emory-Tibet Partnership at Emory University (ETP)
EXTERNAL FACTORS
- Turnover of principals or APS personnel
- Competing initiatives
- Change in education standards / state achievement tests adopted by Georgia

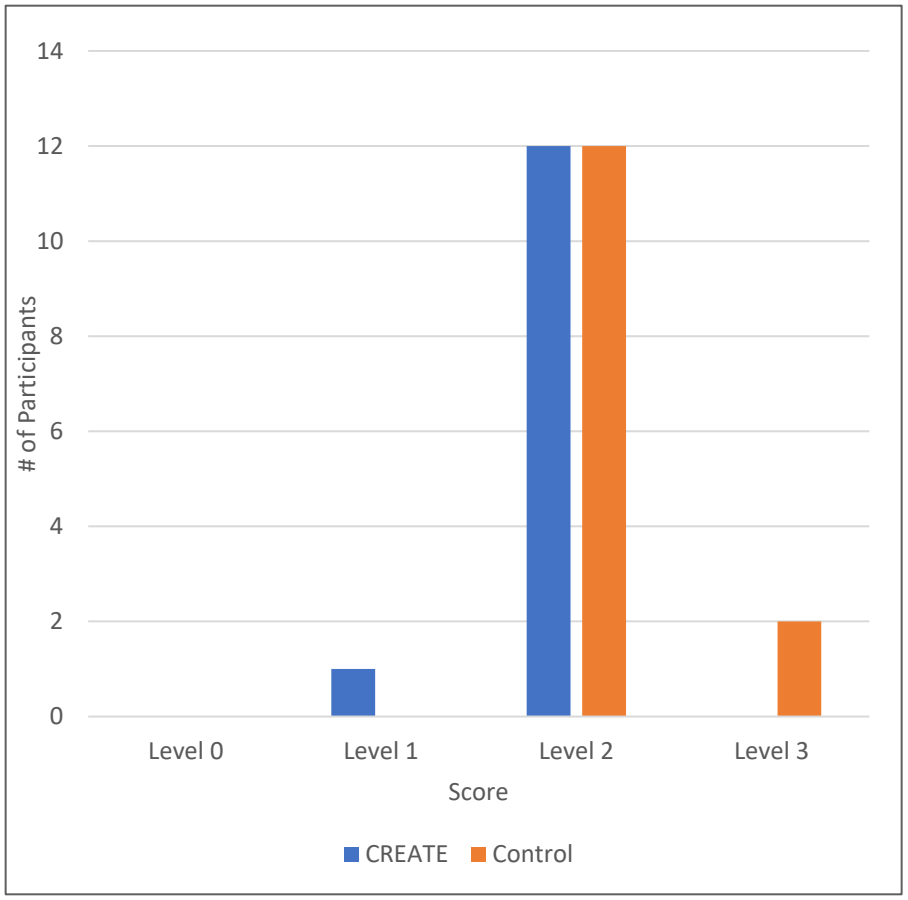
Findings

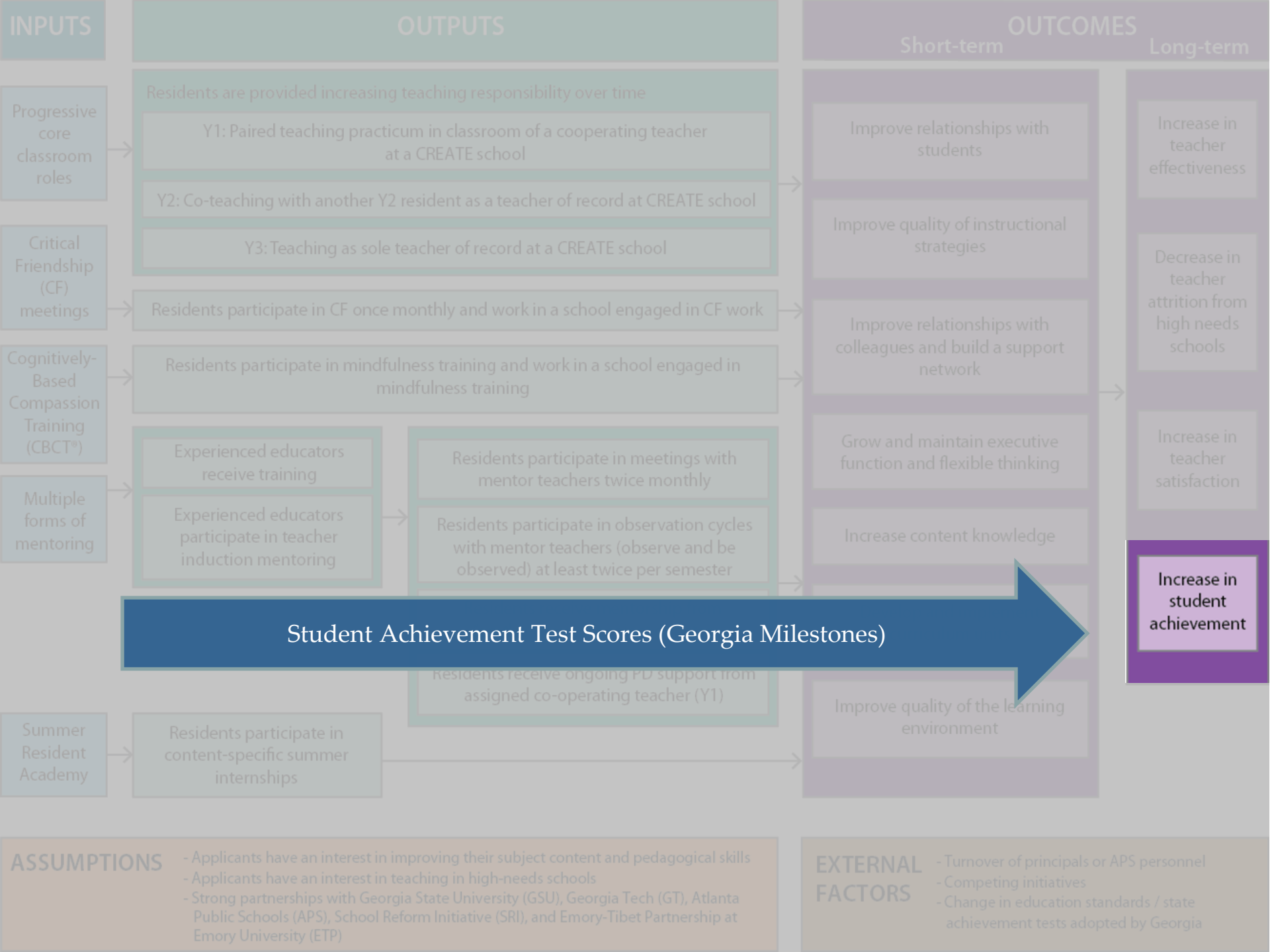
Teacher Effectiveness

Instructional Strategies



Positive Learning Environment

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Increase in teacher satisfaction
Increase in student achievement
Student Achievement Test Scores (Georgia Milestones)
ASSUMPTIONS
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- Applicants have an interest in teaching in high-needs schools
- Strong partnerships with Georgia State University (GSU), Georgia Tech (GT), Atlanta Public Schools (APS), School Reform Initiative (SRI), and Emory-Tibet Partnership at Emory University (ETP)
EXTERNAL FACTORS
- Turnover of principals or APS personnel
- Competing initiatives
- Change in education standards / state achievement tests adopted by Georgia

Findings

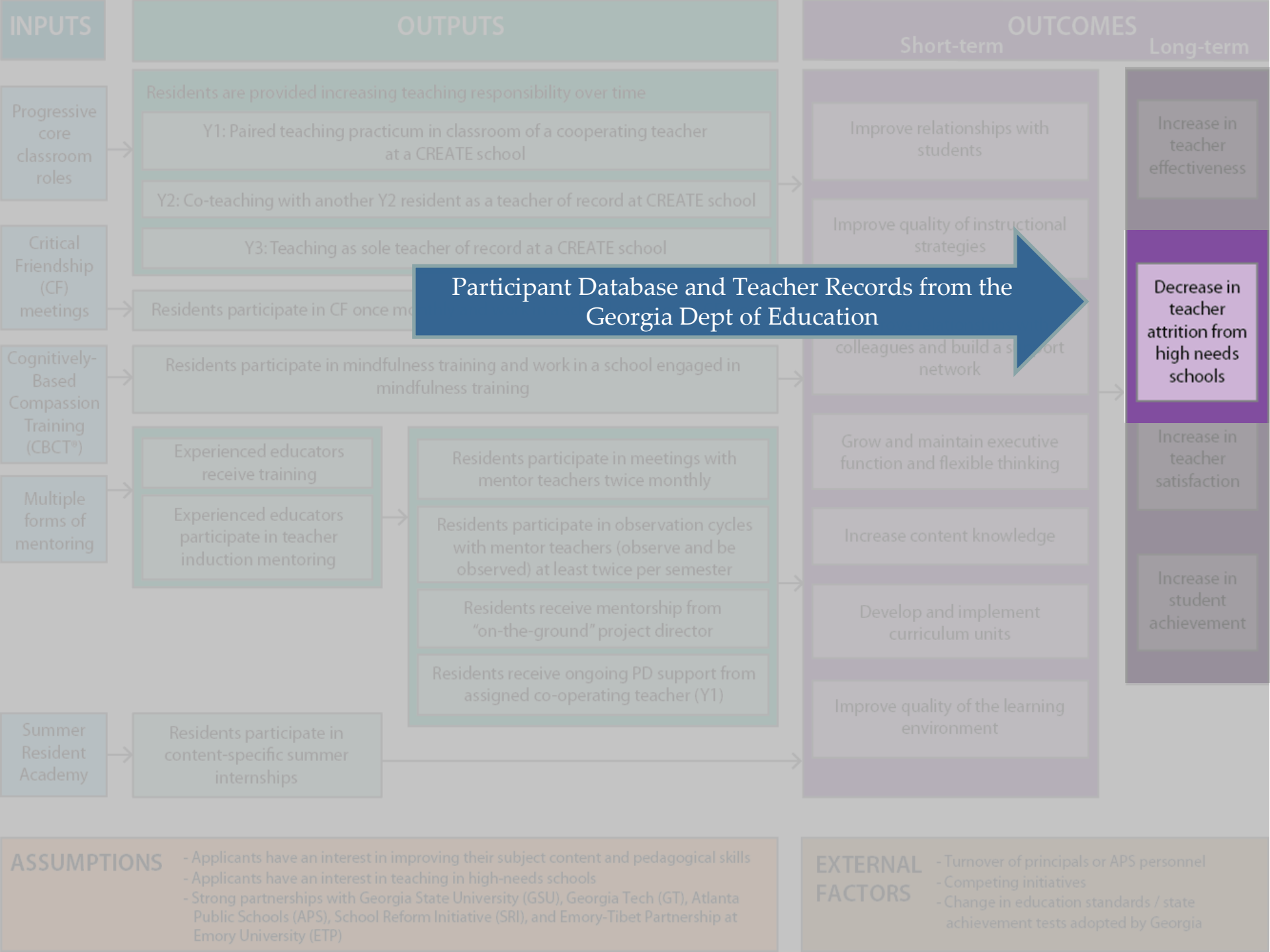
Student Achievement

What is the impact of CREATE on **mathematics** and **ELA** achievement of students in grades 4-8, as measured by the Georgia Milestones Assessment System?

No statistically significant findings

Limited sample:

- ✓ Full-time teacher
- ✓ Tested grade (Grades 3-8)
- ✓ Subject matter (Math and ELA)
- ✓ Consent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Grow and maintain executive function and flexible thinking
Increase content knowledge
Develop and implement curriculum units
Improve quality of the learning environment
Participant Database and Teacher Records from the Georgia Dept of Education
Increase in teacher effectiveness
Decrease in teacher attrition from high needs schools
Increase in teacher satisfaction
Increase in student achievement
ASSUMPTIONS
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EXTERNAL FACTORS
- Turnover of principals or APS personnel
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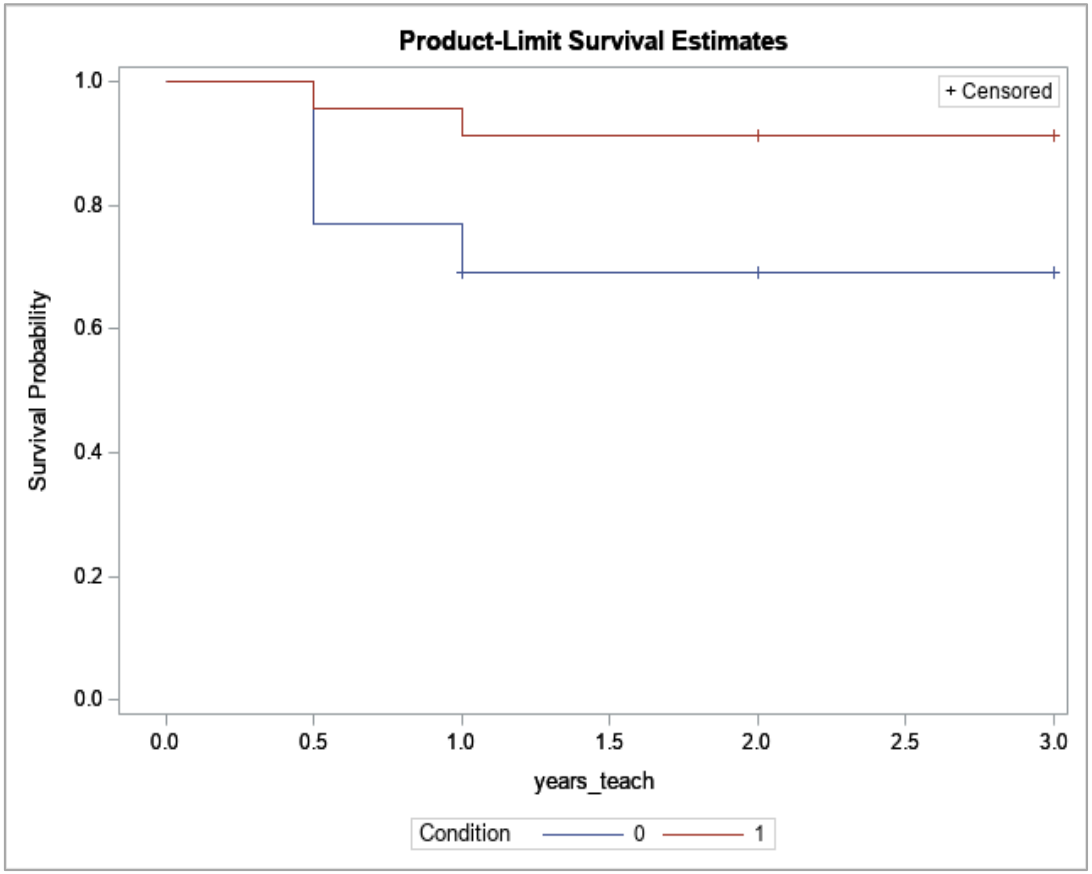
Findings

Teacher Retention



Treatment

91% probability of remaining in teaching after Year 3

Control

69% probability of remaining in teaching after Year 3

$p = .027$

Agenda

1. Logic Model
2. Study Design
3. Findings
4. Challenges
5. **What's next?**

What's Next?

- Increase sample size by adding more cohorts of teachers
- Continue survey analysis for Cohorts 3-5
- Investigate possible mediating mechanisms on teacher retention (as captured through surveys)
- Track teachers for additional years after they leave the CREATE program

Questions?

Reference this presentation:

Wingard, A., Jaciw, A. P., & Zacamy, J. (2020). *The Role of Socioemotional Learning in Teacher Induction: A Longitudinal Study of the CREATE Teacher Residency Program.* Presentation delivered in a virtual symposium on September 9, 2020 for the annual spring conference of the Society for Research on Educational Effectiveness, Washington, DC. Retrieved from https://www.empiricaleducation.com/create/

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September 9, 2020

Uncovering the Black Box: Impacts on Mediators of a Science Teacher Professional Development Model

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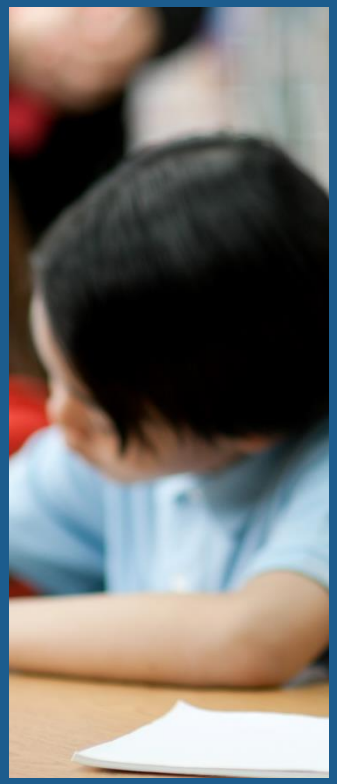

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Agenda

- Setting the stage
- Overview of Making Sense of SCIENCE (MSS)
- Overview of the study and this exploratory analysis
- Description of the analysis specific to unpacking the logic model
- Findings: Unpacking the logic model
- Making sense of the findings

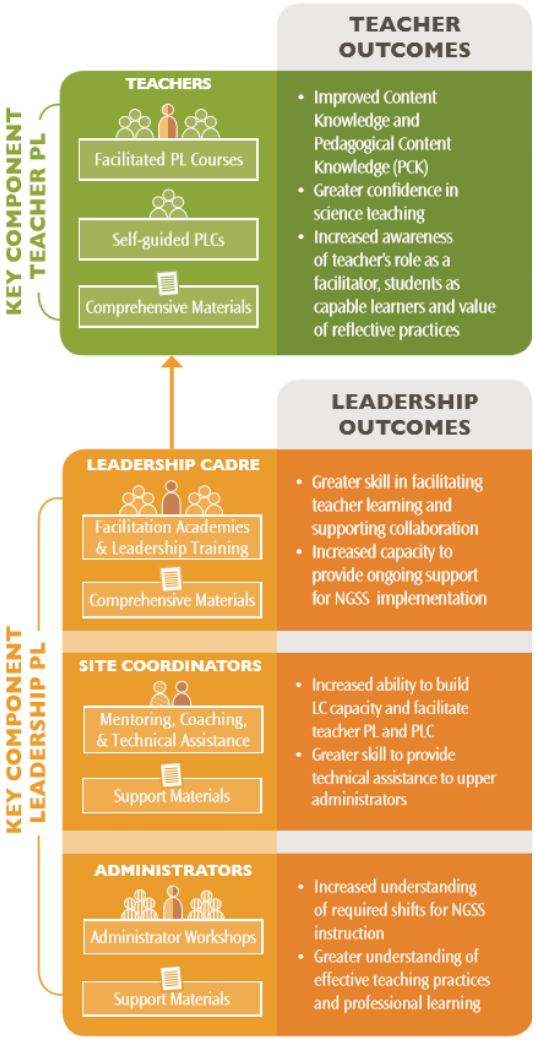
Fundamental Shifts in Science Education

- Release of Next Generation Science Standards (NGSS) in 2013
- Focus on three-dimensional learning
- Guidance calls for systematic changes
  - Curriculum and curriculum resources
  - Teacher professional development
  - Instructional practices
  - Assessment

Overview of the Intervention

- Science teacher professional learning model
- Developed by WestEd
- Focuses on the critical connections between **science understanding**, **literacy support**, **and classroom practices**, in ways that support the implementation of NGSS and the CCSS
- Capacity building for school administrators and a Leadership Cadre
- Professional learning activities for teachers each year for 2 years
  - 30 hours of professional learning in the summer
  - 12 hours of Professional Learning Communities (PLCs)

Making Sense of SCIENCE: Logic Model



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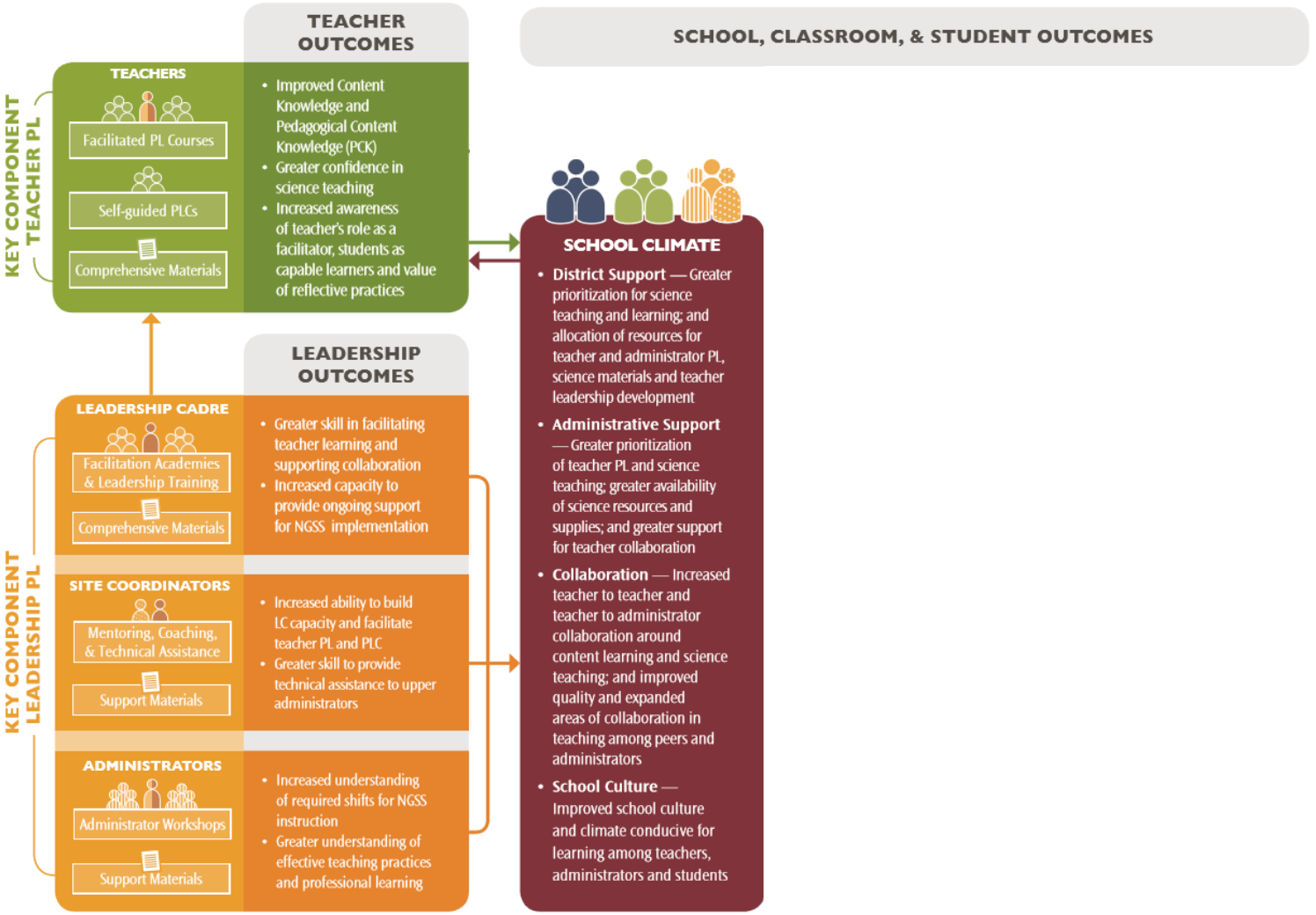

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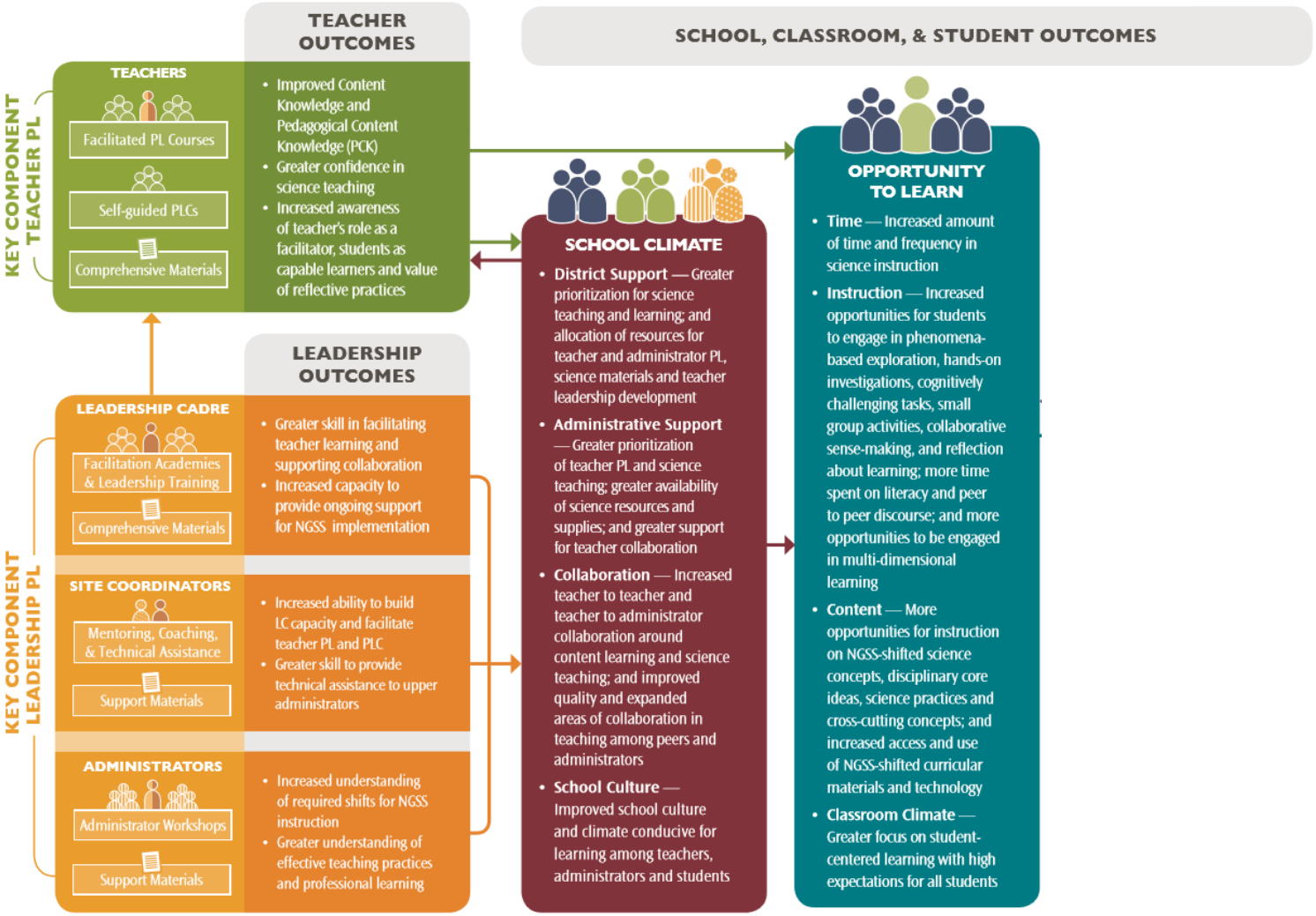

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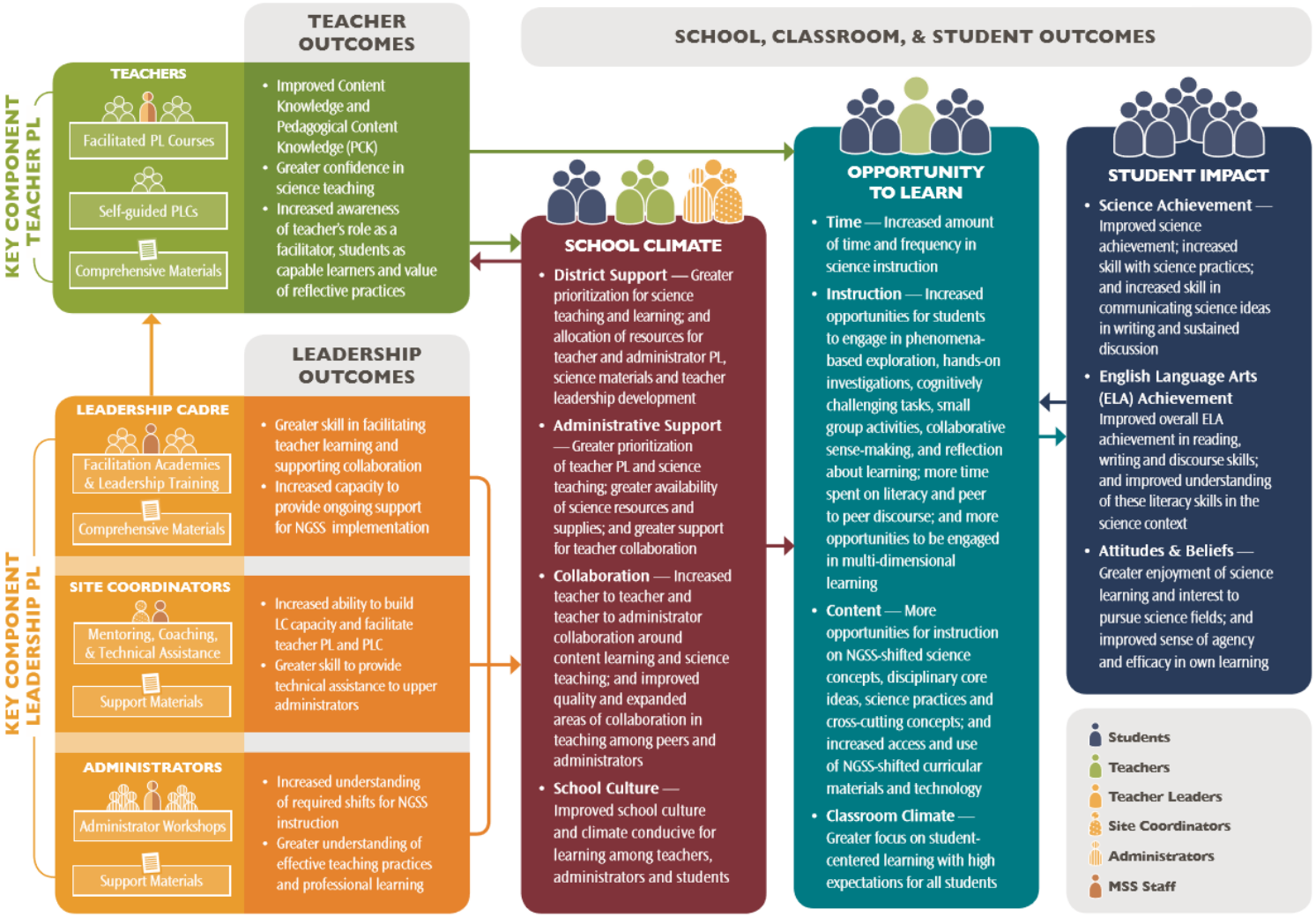


The Impact Study

i3 Validation grant (2015-2019) to WestEd

Cluster (school-level) randomized control trial

Elementary schools (4th and 5th grades)

Research Questions

Confirmatory research questions:

What is the impact of MSS after two years of implementation on:

1. **Teacher content knowledge** when compared to study participants in control schools receiving the business-as-usual science PD?
2. **4th and 5th grade students** science achievement in Earth and space science and physical science domains
3. **4th and 5th grade students with low incoming achievement** on science achievement in Earth and space science and physical science domains

Exploratory research question discussed today

- What is the impact of MSS on teacher attitudes and beliefs, on opportunity to learn, and on school climate?
- To what extent was MSS implemented with fidelity?

Data Collection

	Instrument	Time
Teachers	Pretest for Teacher Content Knowledge (TCK)	As teachers joined the study and prior to participation in any MSS PD
	Baseline survey	As teachers joined the study and prior to participation in any MSS PD
	Surveys (Beliefs about students, Teaching philosophies, Confidence and self-efficacy, OTLs science topics, School climate, Professional learning, Collaboration, Classroom discourse)	3 times a year in 2016-17 and 2017-18
	Posttest for TCK and Pedagogical Content Knowledge (PCK)	Spring 2016-17 and spring 2017-18
Students	Science achievement assessment that included selected response and constructed response components	Spring 2016-17 and spring 2017-18
	Survey Attitudes toward science (e.g., aspirations for careers in science, enjoyment of science, self-efficacy around science, and quality of science instruction)	Spring 2016-17 and spring 2017-18
Administrators	Baseline survey	As administrators joined the study and prior to the school's participation in any MSS PD
	Surveys	Spring 2016-17 and spring 2017-18

From school districts:

- Class rosters, student demographic data, and state assessment data from 2014-15 to 2017-18 for 3rd, 4th, and 5th graders
- Third grade Math and ELA assessment data ("pretest scores") for all students with a posttest in spring 2017-18
- Science state assessment administered only to 4th graders in WI and 5th graders in CA. No science test scores available for CA for 2016–17 and 2017–18

Analysis on Impact of Intermediate Outcomes: Methods

- Based on sample of 147 teachers
- Employs a three-level hierarchical linear model (teacher, schools and matched pairs) that regresses each of the 30 intermediate outcomes on an indicator of assignment status and a series of teacher- and school-level covariates.

Teacher covariates for precision

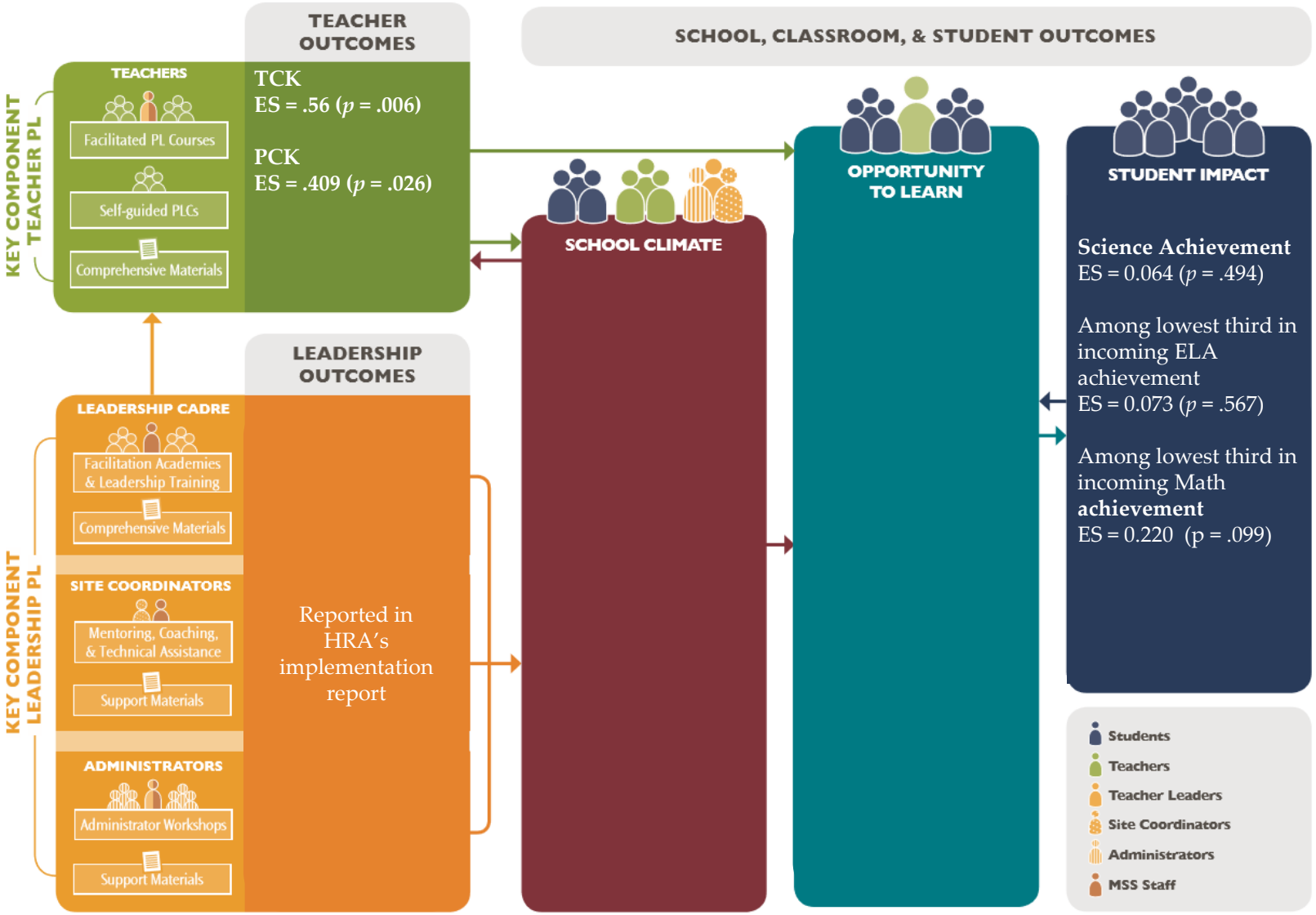
Ethnicity
Gender
Certification
Highest level of education
Confidence in teaching science
Teaching philosophies

School covariates for precision

School size
Locale
Title 1 eligibility

Unpacking the Logic Model

Unpacking the Logic Model



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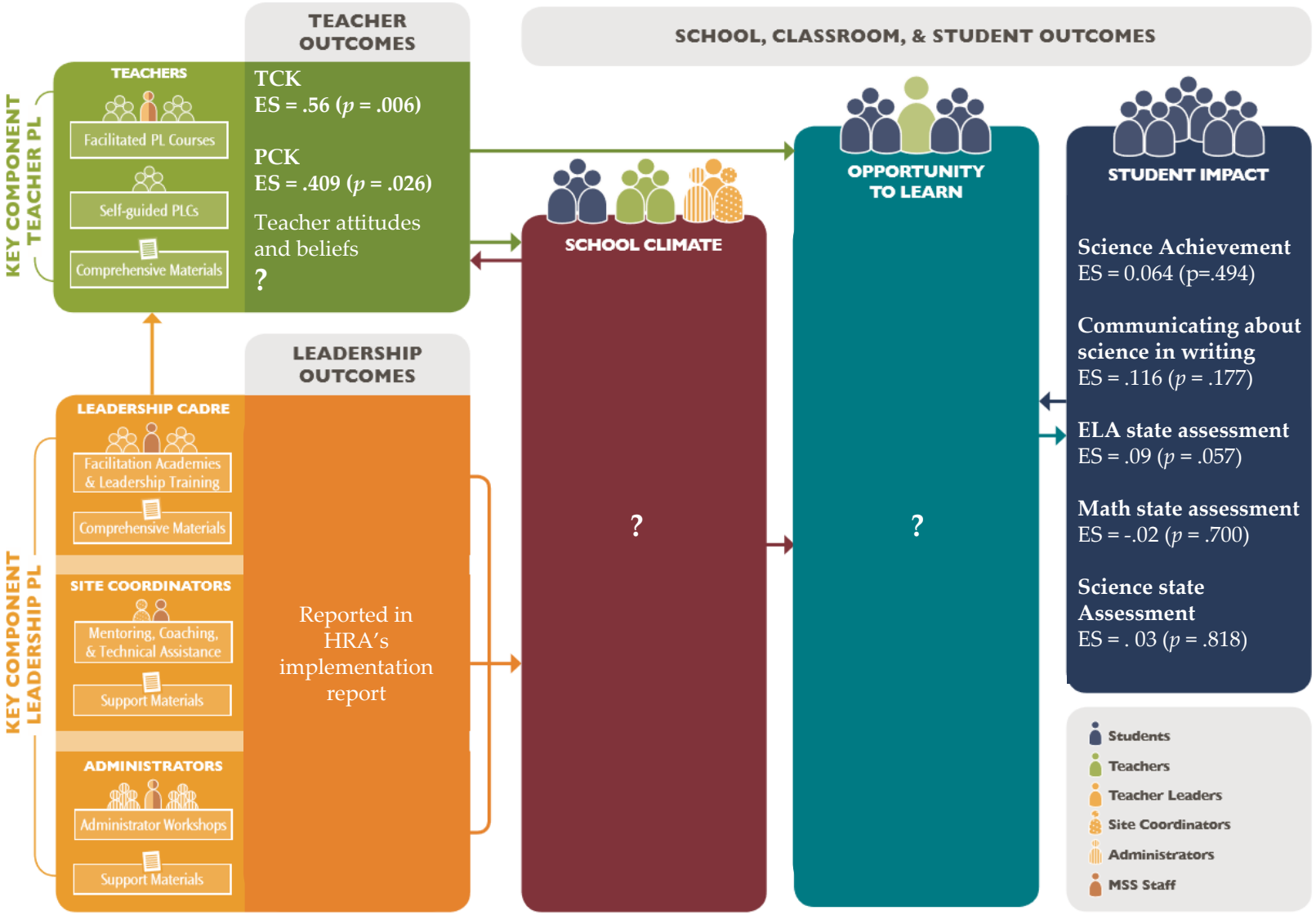
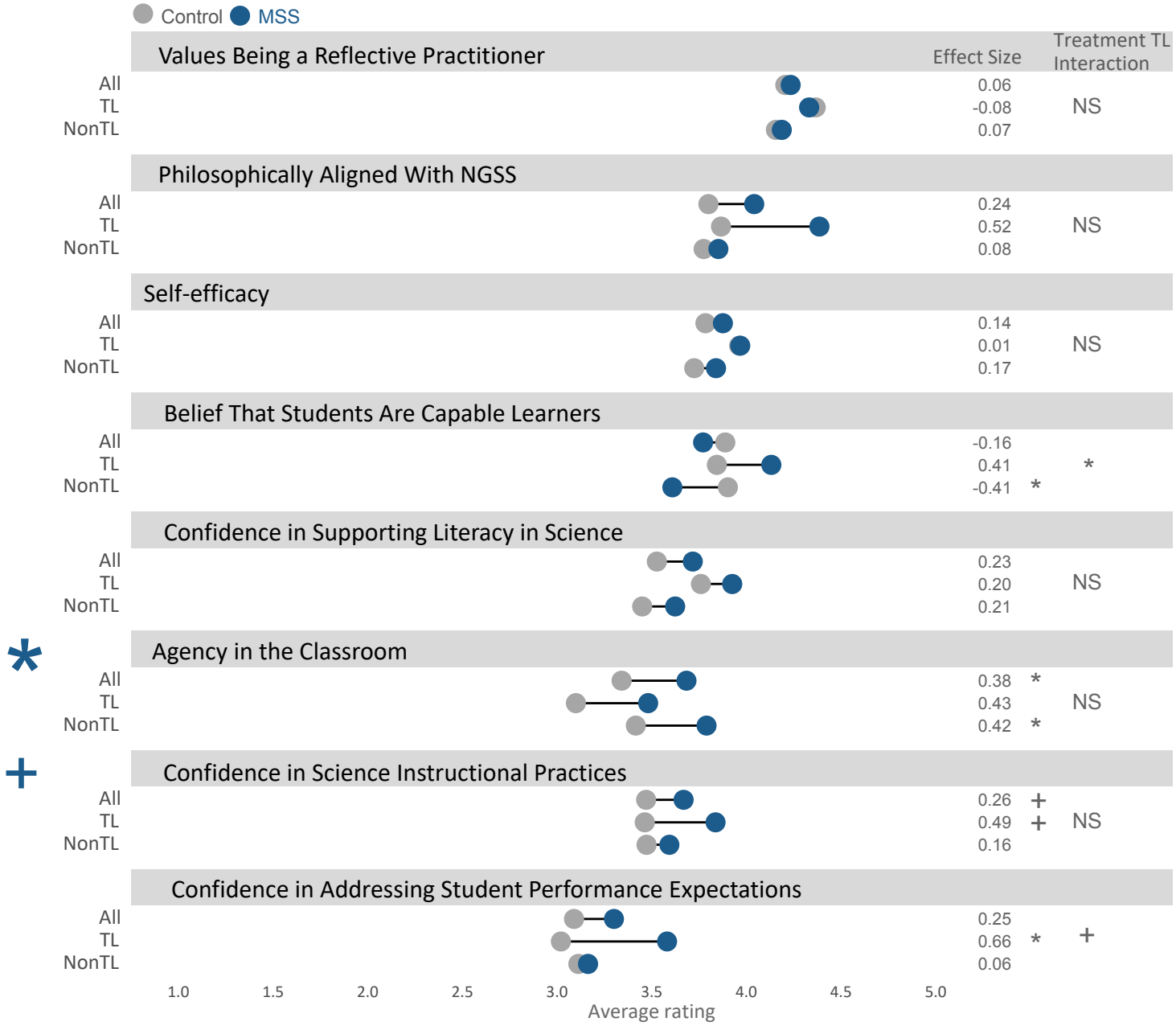
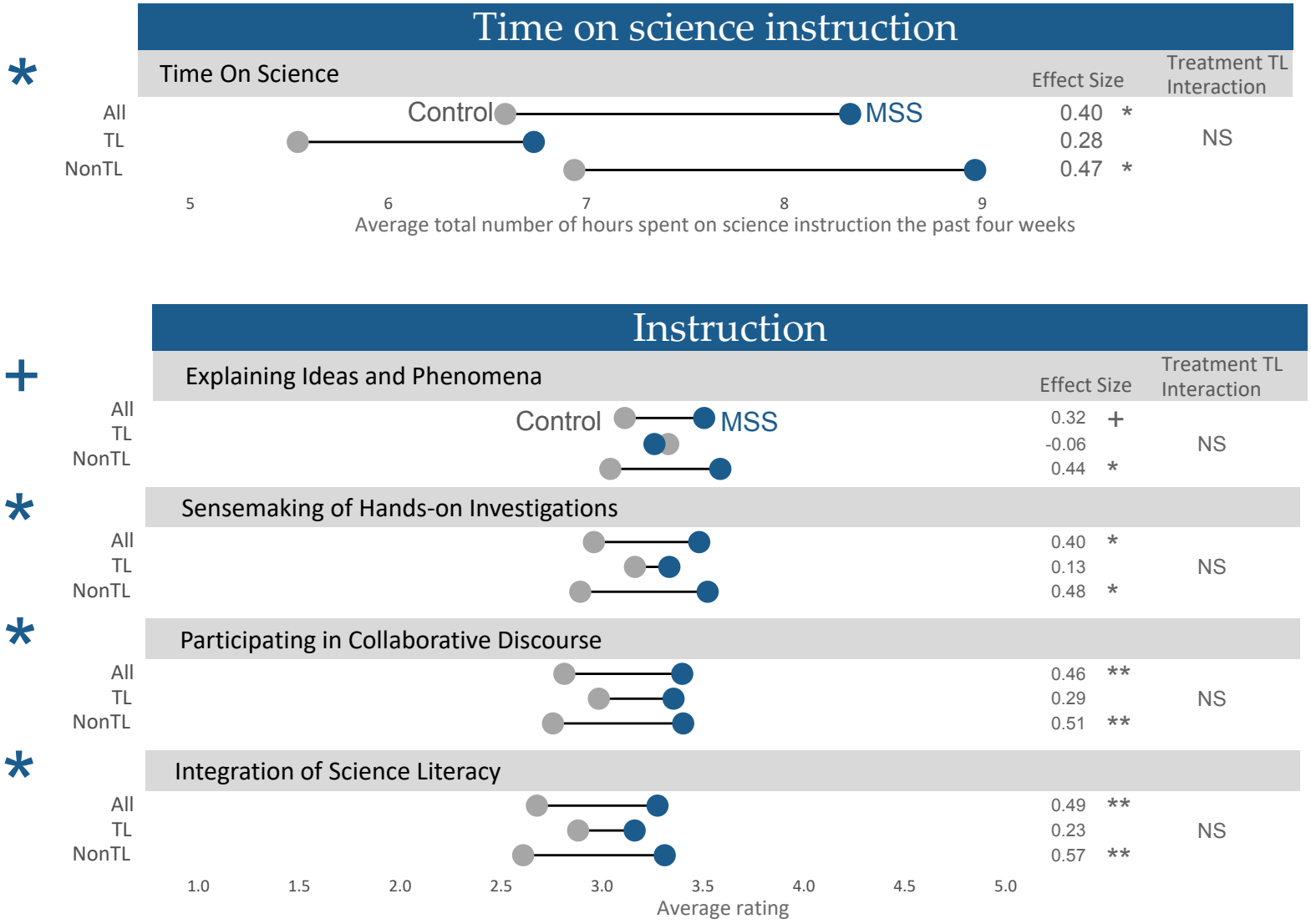


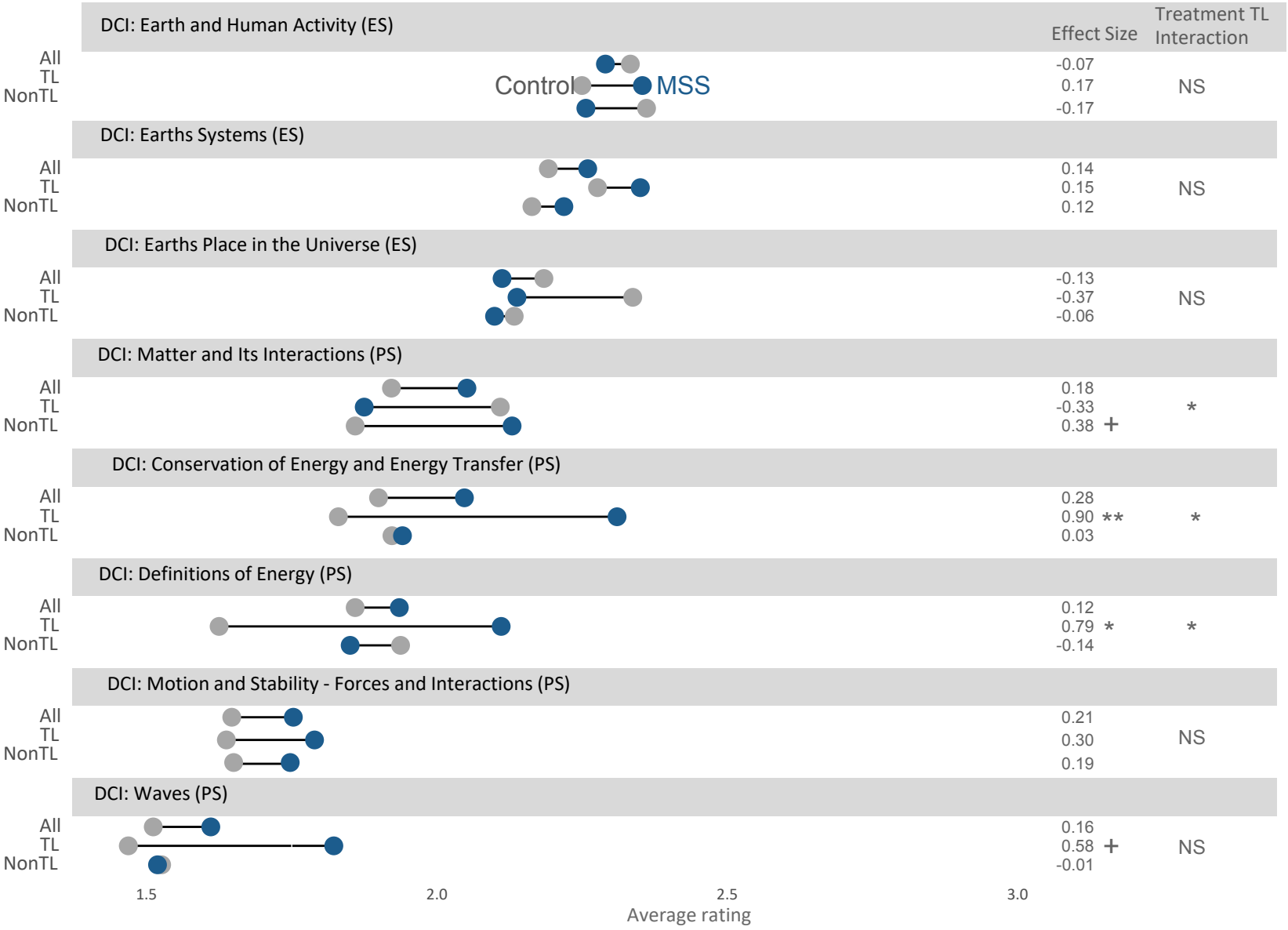
Impact on Teacher Attitudes and Beliefs



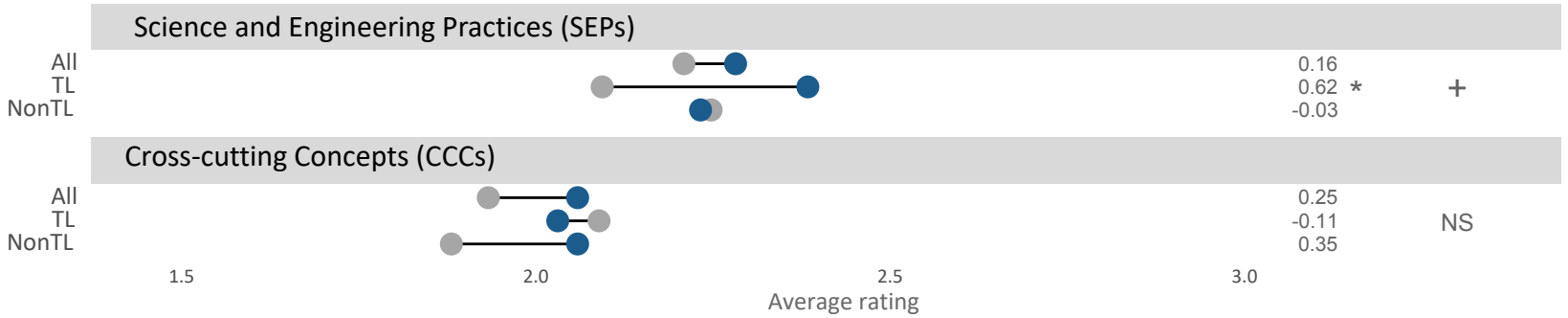
Impact on Opportunity to Learn – Time & Instruction



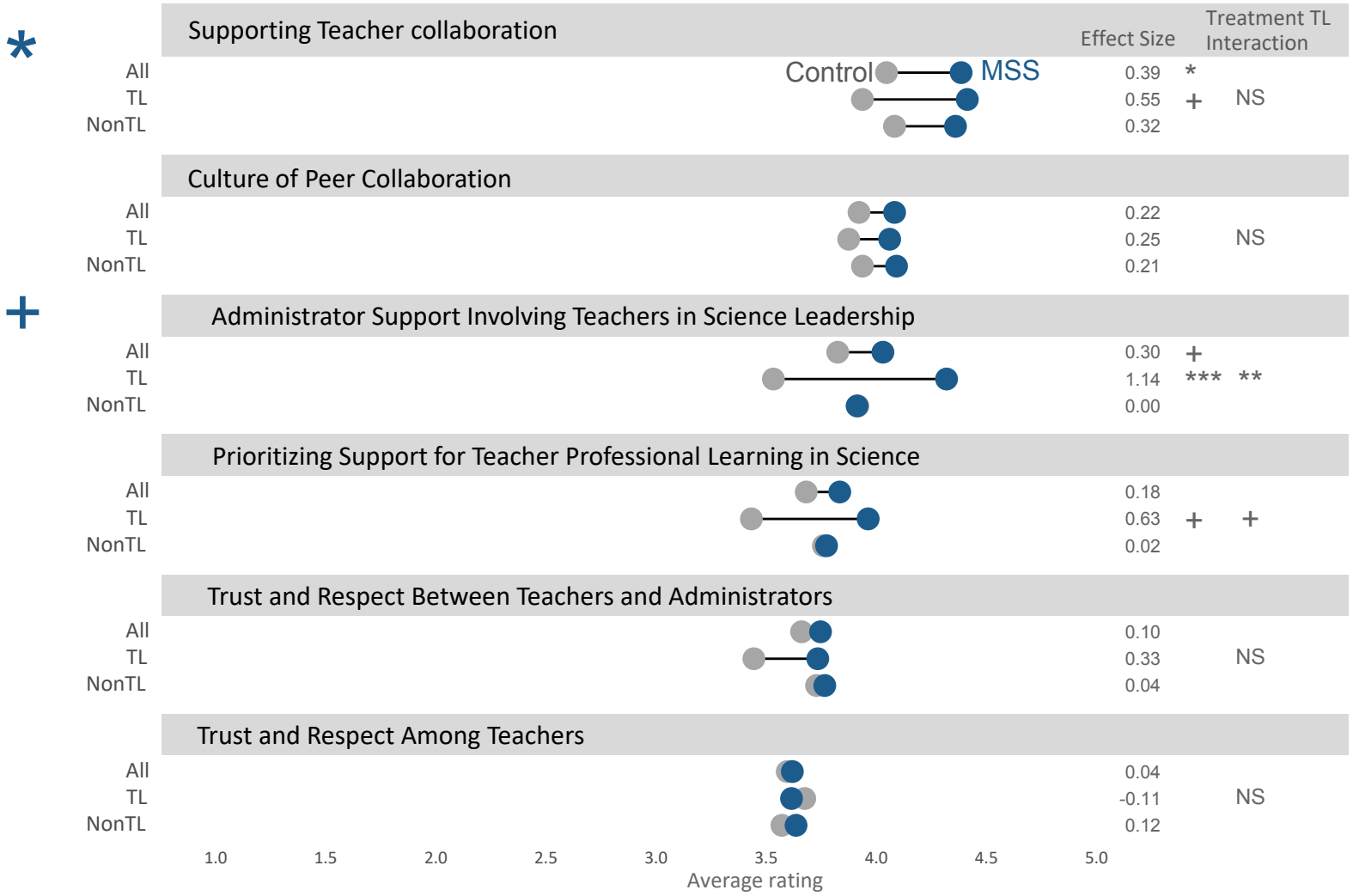
Impact on Opportunity to Learn – Content (ESS and PS)



Impact on Opportunity to Learn – Content: SEPs and CCCs



Impact on intermediate outcomes: Findings for School Climate



Impact on Intermediate Outcomes: Findings on Amount of Teacher Collaboration

***

Proximal outcomes

Direct effects of summer PD and PLCs

Positive Results

Teacher outcomes

- Teacher content knowledge
- Pedagogical content knowledge based on holistic ratings
- Greater sense of *Agency In the Classroom*
- Greater *Confidence In Science Instructional Practices* (marginally significant)

Opportunity to learn

- More time on science instruction
- Greater emphasis on NGSS-aligned instructional practices

School climate

- More collaboration beyond MSS PLCs
- Greater support of administrators for teacher collaboration
- More involvement by administrators of teachers in science leadership (marginally significant)

Null Results

Distal outcomes

Teacher's attitudes and beliefs

- Self-efficacy
- Values being a reflective practitioner
- Belief that students are capable learners

School culture

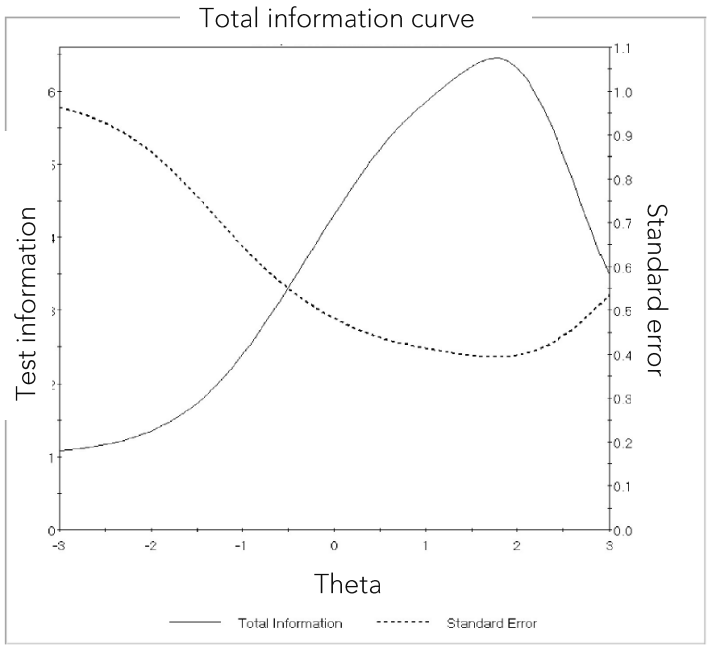
- Trust and respect among teachers
- Trust and respect between teachers and administrators
- Prioritizing support for teacher PL in science

Student science achievement and communicating about science in writing

So what happened? Hypothesis # 1

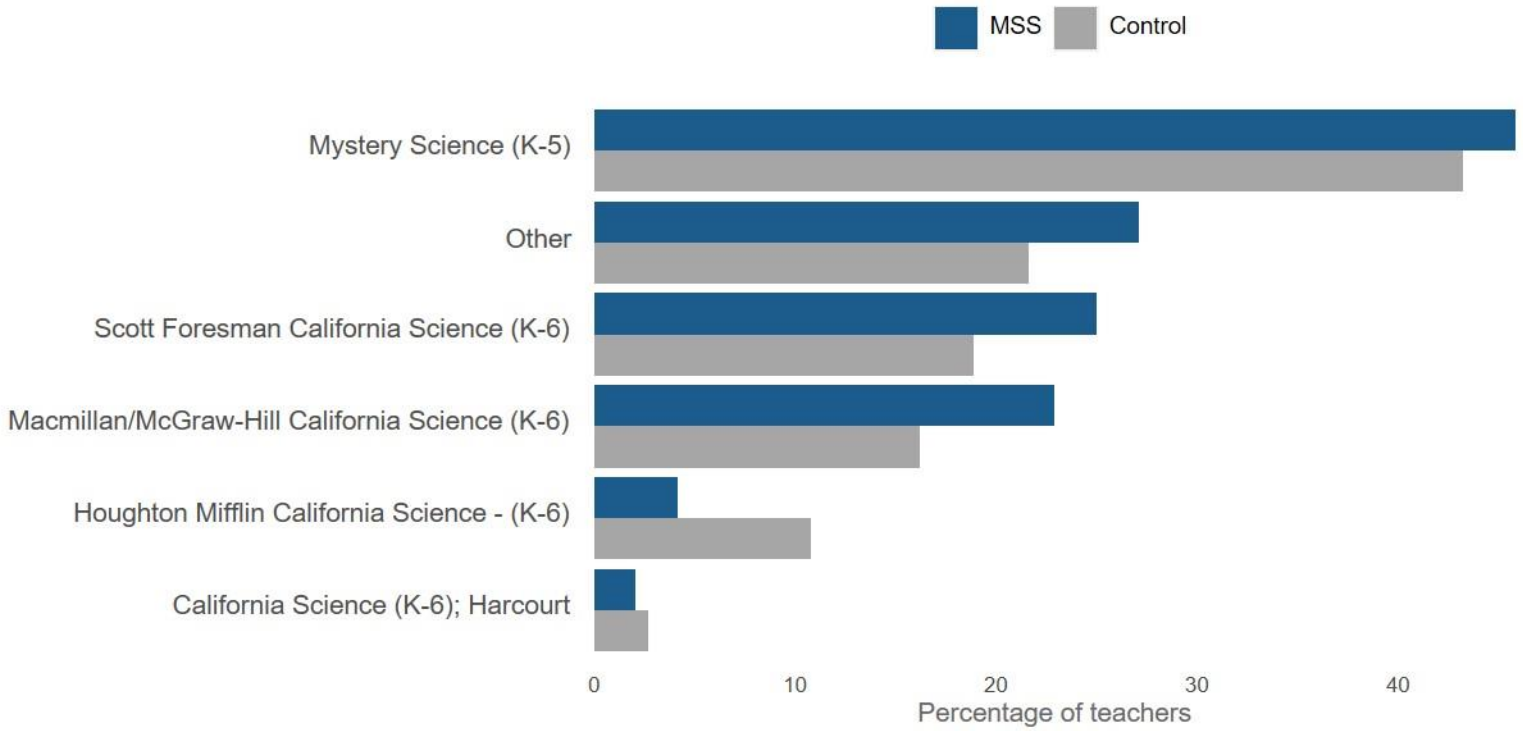
The assessment was difficult, and there was low test information (low score reliability) for students with low incoming achievement.

Decile	N	Mean	Std Dev	Minimum	Maximum
1	214	0.30	0.12	0.00	0.80
2	214	0.32	0.11	0.04	0.64
3	214	0.32	0.12	0.04	0.72
4	214	0.35	0.12	0.04	0.76
5	214	0.40	0.13	0.08	0.80
6	214	0.41	0.13	0.16	0.84
7	214	0.44	0.14	0.13	0.84
8	214	0.46	0.13	0.16	0.84
9	214	0.51	0.15	0.17	0.88
10	214	0.57	0.14	0.24	0.88



So what happened? Hypothesis # 2

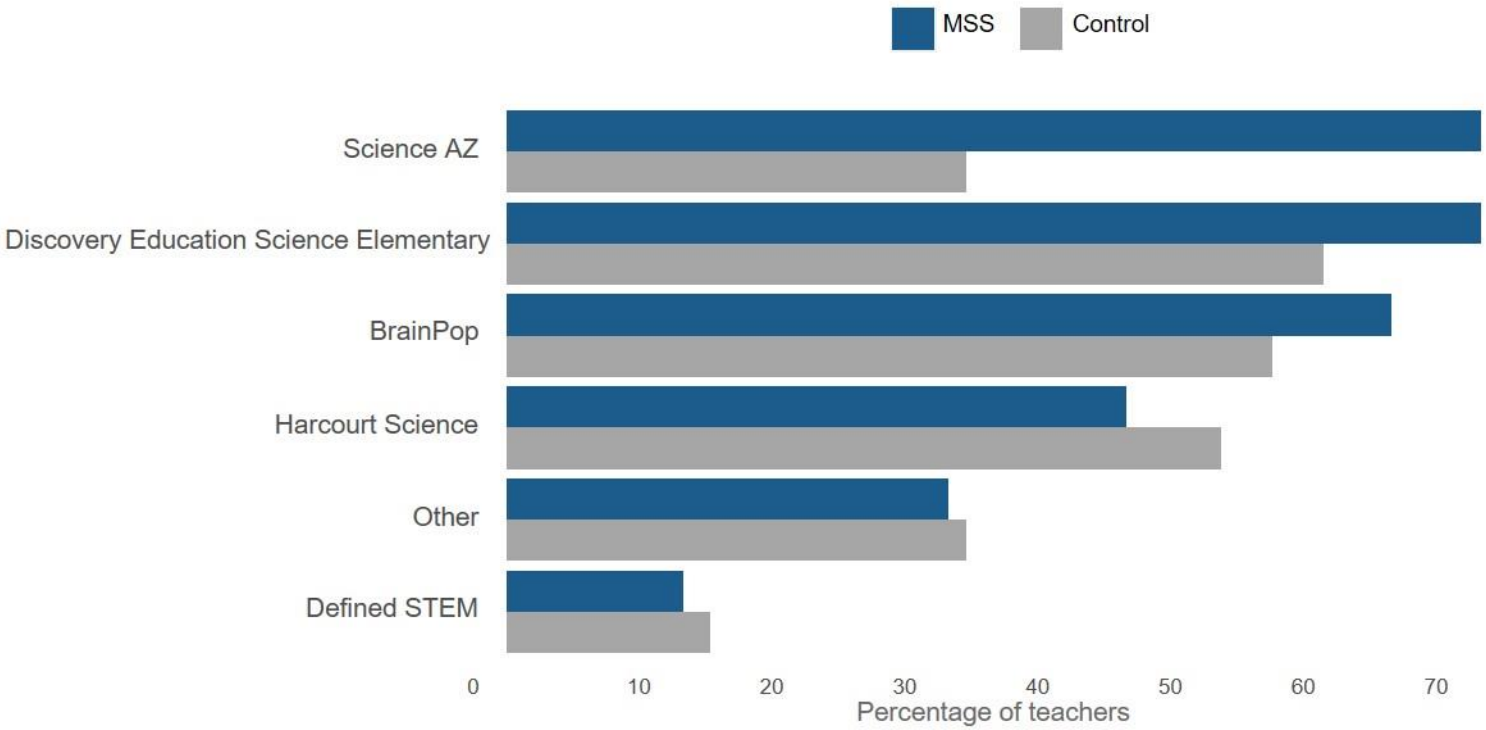
Coherent **curriculum and corresponding curriculum resources were not yet available in participating states/districts.**



Curriculum resources used in CA (as reported by teachers)

So what happened? Hypothesis # 2

Making Sense of SCIENCE should be accompanied by a *coherent* curriculum and corresponding curricular resources



Curriculum resources used in WI (as reported by teachers)

So what happened? Hypothesis # 3

The instability of the sample over two years compromised fidelity of implementation

Percentage of teachers who met the fidelity threshold			
	2016-17	2017-18	Across the two years
Attendance at summer courses	94% (118 of 125)	88% (100 of 114)	54% (100 of 185) of all study teachers 61% (83 of 136) of baseline teachers
Attendance at PLCs	97% (121 of 125)	90% (103 of 114)	56% (103 of 185) of all study teachers 58% (79 of 136) of baseline teachers

Thank you

Reference this presentation:

Jaciw, A. P., Nguyen, T., & Zacamy, J. (2020). *Uncovering the Black Box: Exploratory Mediation Analysis for a Science Teacher Professional Development Program.* Presentation delivered in a virtual symposium on September 9, 2020 for the annual spring conference of the Society for Research on Educational Effectiveness, Washington, DC. Retrieved from https://www.empiricaleducation.com/mss/

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Unpacking the Logic Model

Context and Pathways to Intended Outcomes

Anne Wolf | Abt Associates

September 9, 2020

Society for Research on Educational Effectiveness

BOLD THINKERS DRIVING REAL-WORLD IMPACT

Logic Model as a Tool for Evaluation Design

- Identifies the student outcomes that should be measured
  - To examine if the intervention works
- To unpack the logic model further
  - Need a clear understanding of the antecedents, components, and mechanisms of the model
    - To explore *how* the intervention works
    - *For whom* and *under what conditions*

Mediators and Moderators in the Logic Model

Moderators:
Antecedents: Pre-existing characteristics of teachers and/or students
Conditions: Differences in intervention features

Mediators: How the Intervention Works

School Climate	Effect on Teachers	Effects on Classroom Learning Environment	Intermediate Effects on Students

• Administrative support
• School culture
  • Teacher collaboration
  • Peer collaboration
	• Content knowledge
	• Confidence
	• Self-efficacy
	• Socioemotional skills
	  • Mindfulness,
	  • Commitment,
	  • Stress management
	• Teacher retention
		• Instructional practice
		• Curricular content
		• Classroom climate
			• Discipline
			• Student engagement
			• Social emotional learning

Examining Effects on Mediators

- Understanding if there is support for the proposed theory of change
- Examining the pathways toward achieving the targeted student outcomes

Challenges of Measuring Mediators

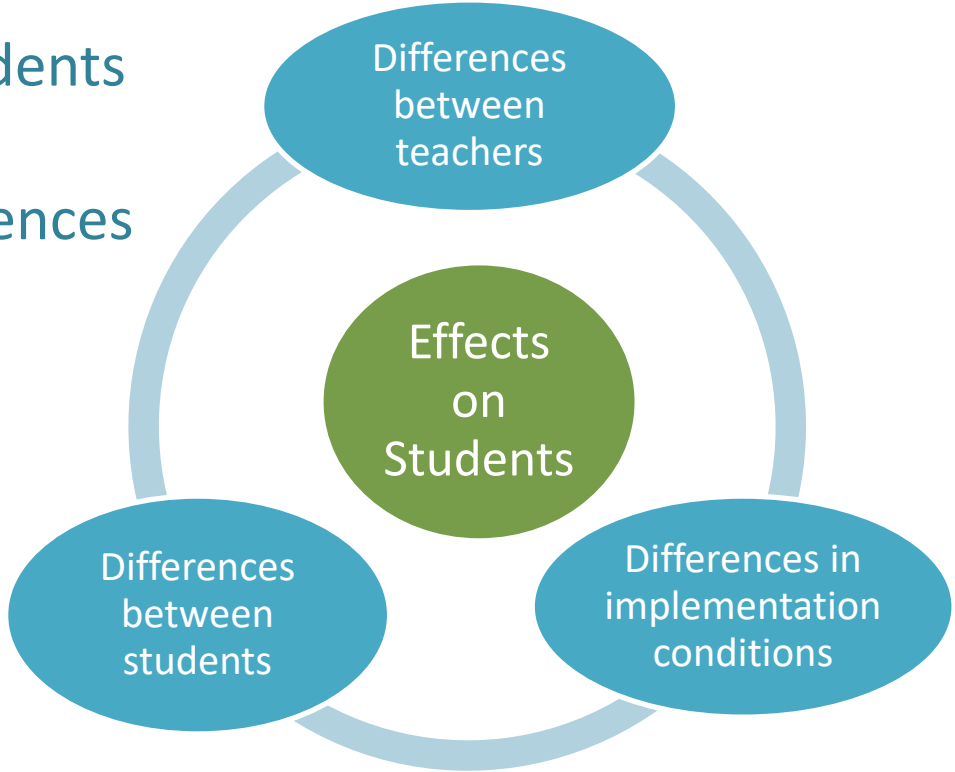
1. Cost
   - Intermediate outcomes are generally more expensive to measure than student achievement
     - Typically: Surveys and observations
2. Despite benefits to field & theory-building
   - Many intermediate outcomes are not reviewed by the WWC

Challenges of Measuring Mediators (2)

3. Evidence that changes in mediators affect students
   - Showing changes in mediators is not the full pathway
     - CACE, principal score weighting, instrumental variables analysis
4. Absence of substantial changes in mediators
   - Could be a failure of the theorized pathway
   - Failure of sufficient dosage of inputs
   - Measurement problem

Moderators: For whom & under what conditions it works

Effects on students based on pre-existing differences



And under what conditions

Exploring Differences in Impacts

- Examining intervention conditions that support effectiveness
- Investigating for whom the intervention works
  - Guided by hypotheses about why impacts might differ

Challenges

- Many statistical tests, increases Type I error
- Limited power
  - Impact evaluations usually designed for main effects
  - Example of MDEs for subgroups

Main effect for students (full sample)	**.15**
Students not low-achieving at baseline (larger group)	.26
Students low-achieving at baseline (smaller group)	.31
Minimum detectable difference (MDD) between subgroups	.40

Takeaways

- Analysis of mediators and antecedents inform
  - Refinement of the logic model
  - Modification of implementation
    - to impact intermediate outcomes
    - to work better for groups with no effect

Unpacking the Logic Model:
Context and Pathways to Intended Outcomes

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