Examining the Role of Teacher Efficacy in the Implementation of a Large-Scale Technology-Based Literacy Intervention

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Introduction

- Puzzle: Why are effects of educational interventions often diluted when scaled up in actual classroom settings?
- One often cited hypothesis: **poor fidelity of implementation**
  - Especially salient in technology-based intervention (Dynarski et al., 2007)
  - Tech-based interventions rarely report fidelity of implementation
- Teacher efficacy may predict fidelity
  - Tech efficacy & literacy teaching efficacy (Liu, Lin, Zhang, & Zheng, 2017)

Research goals

Investigating **implementation fidelity** within the context of a district-wide, teacher-implemented, technology-based literacy intervention

Context: Technology-based literacy intervention

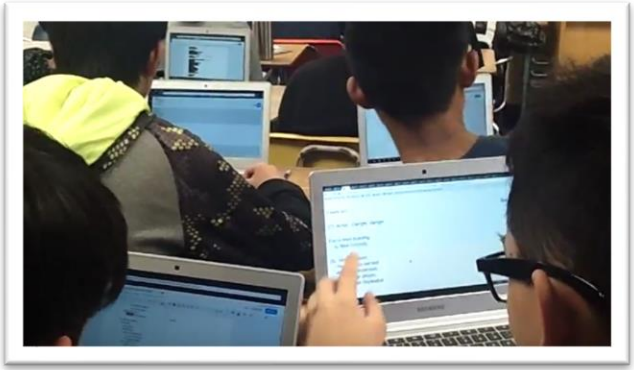
Teacher efficacy

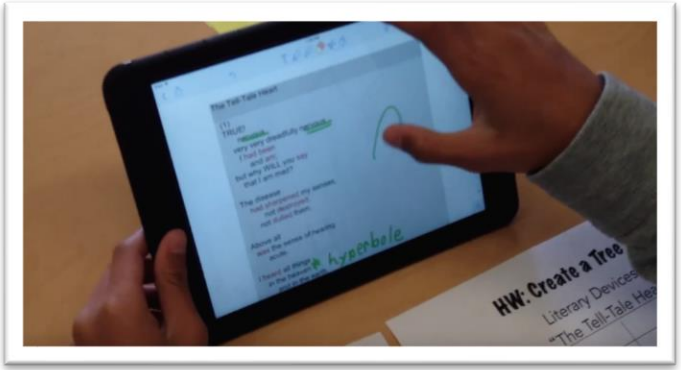
Student achievement gains

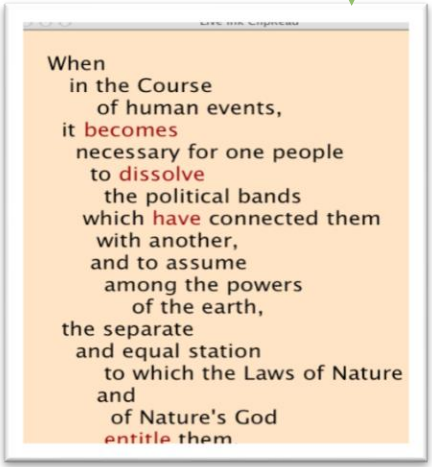
Implementation fidelity

Research context

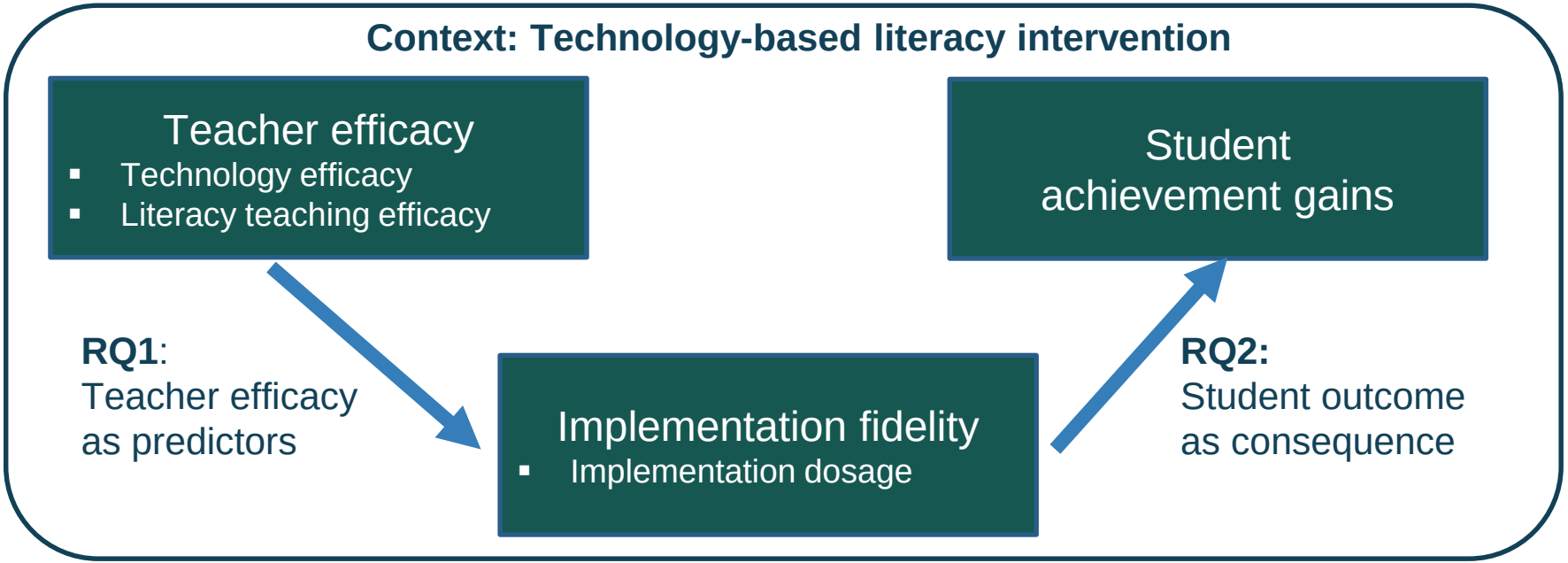
- **Digital Scaffolding for English Language Arts (funded by IES)**
  - RCT study in10 low-income middle schools in western USA
  - Year-long intervention with a digital text formatting tool
  - A recommended minimum exposure of 50 mins per week
  - 1:1 devices for all participants







Research Questions



Method

- **Participants:**
  - 52 middle school teachers
  - 1696 7th and 8th grade students in treatment sample

Teacher sample	Student sample
96.2% female	51.1% female
Mean age = 41 years	28.4% English learners
Ave. teaching experience of 12 years	75.4% free/reduced lunch

Method (cont')

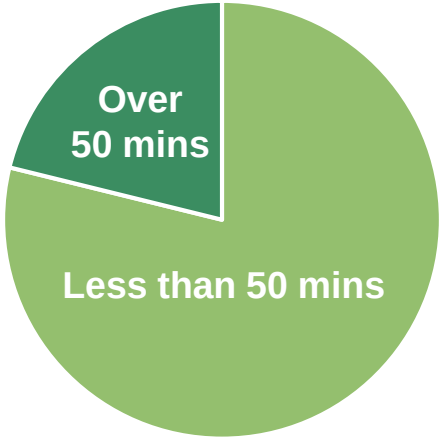
- **Measures**
  - **Fidelity of implementation (dosage):** time spent on the tool each week; collected through weekly reflection forms
  - **Teacher efficacy:** technology efficacy scale (Benton-Borghi, 2015) & literacy teaching efficacy scale (Olson et al., 2012)
  - **Student literacy achievement**: Smarter Balanced Assessment Consortium (SBAC) Test
    - **Gains** from pre- to post-intervention
- **Covariates**
  - Teacher & student demographics

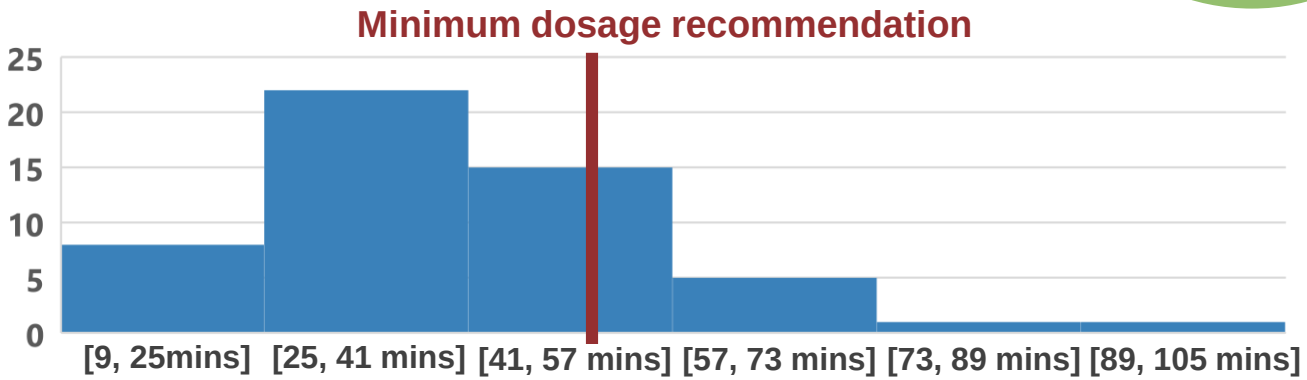
Method (cont')

- **Analytic Plan: hierarchical linear modelling**
  - RQ1: teachers & school level
    - Key independent variable: teacher efficacy
    - Dependent variable: implementation dosage
    - Controls: teacher demographics
  - RQ2: student, teacher, & school level
    - Key independent variable: implementation dosage
    - Dependent variable: student achievement gain
    - Controls: teacher demographics & student demographics

Descriptive Statistics

- **Patterns of implementation dosage**
  - 40 mins of use per week (80% of the recommended time)
  - 11 (21%) teachers met the recommended use time
  - Great variation among teachers





Descriptive Statistics

- **Comparison between fidelity vs non-fidelity teachers**

	Non-fidelity teachers ($n = 41$)		Fidelity teachers ($n = 11$)				
	M	*SD*	*M*	*SD*	Mean difference	*t*-value	
Teacher Level							
Average implementation time	33.076	10.151	65.312	12.549	32.235	8.894***	Longer use time
Technology efficacy	8.951	9.523	13.272	10.326	4.322	1.310†	Higher tech eff.
Literacy teaching efficacy	9.512	6.622	11.727	6.068	2.215	1.001	
Student Level							
SBAC score gains	23.389	49.559	35.107	48.794	11.718	3.436***	Larger gains

RQ1 Results: efficacy and dosage

- **Association between efficacy and implementation dosage**

Model Predictors	*b*	*SE*
Fixed Effects		
Technology efficacy	0.434†	0.258
Literacy teaching efficacy	0.216	0.345

- Technology efficacy is positively, albeit marginally, associated with average implementation time
- Literacy teaching efficacy has half the effect and is not statistically significant

RQ2 Results: dosage and student gains

- **Association between dosage and student achievement gains**

Model Predictors	*b*	*SE*
Fixed Effects		
Teacher Level		
Average implementation time	0.262*	0.104

- Significant positive association between the implementation time and students' achievement gains from pre- to posttreatment

Discussion

- **Moderate fidelity pattern**
  - Consistent with implementation issues of many tech-interventions.
- **Teacher efficacy and implementation**
  - Positive link between attitude and classroom tech use
  - In this tech-based setting, tech efficacy appears to be more predictive than subject-specific teaching efficacy
- **Implementation and student gains**
  - Intervention effectiveness may be shaped by implementation

Future Directions

- **Implementation quantity and quality**
  - Our study only focuses on dosage, while implementation quality is also important (may be ***more*** important)
  - Future studies may compare the impacts of quality vs. quantity of implementation on intervention effectiveness
- **Contextual factors**
  - school-level characteristics such as school technology resources and support networks

Thank you!

We would also like to thank all the ELA teachers and their students who participated in this study.

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