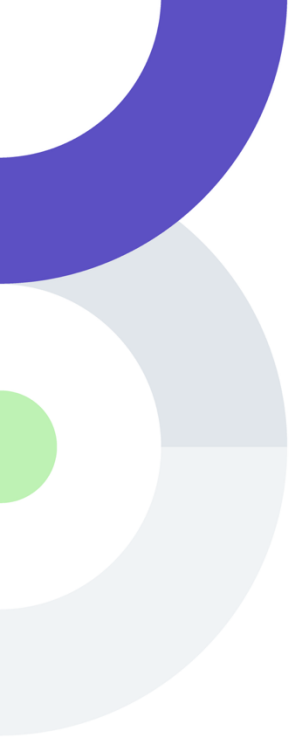


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The Impact of the Illustrative Math Curriculum on Math Achievement in Massachusetts

A matched comparison study

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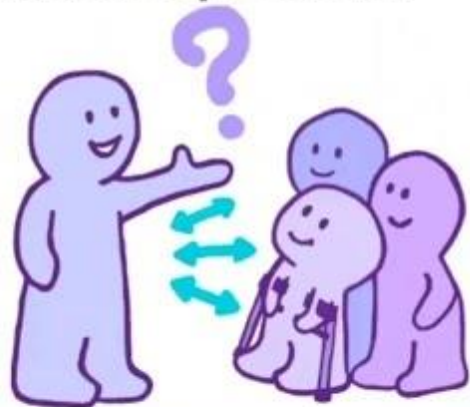


Background

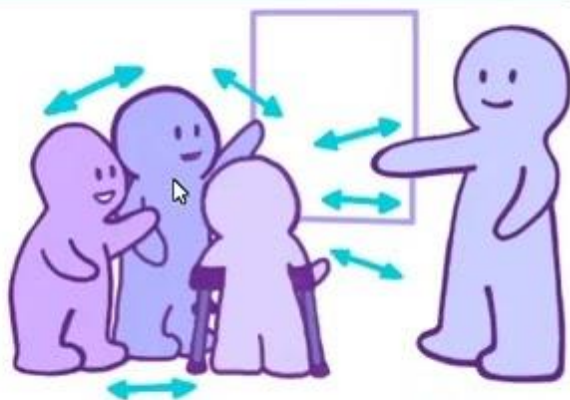
- Significant movement across country towards adoption of **high-quality instructional materials** (HQIM)
- **Illustrative Math** (IM) one of the most widely adopted HQIM in middle school grades (Dilberti et al., 2023)
 - Students learn math by solving problems, developing conceptual understanding, and discussing and defending their reasoning
 - Lessons are designed to tell a coherent mathematical story across units and grade levels
 - Publishers include Imagine Learning, Kendall Hunt, Kiddom
- **Lack of rigorous, causal evidence** on the impact of using IM as the core math curriculum on student outcomes

Problem-Based Teaching and Learning

1. Teacher ensures students understand the question.



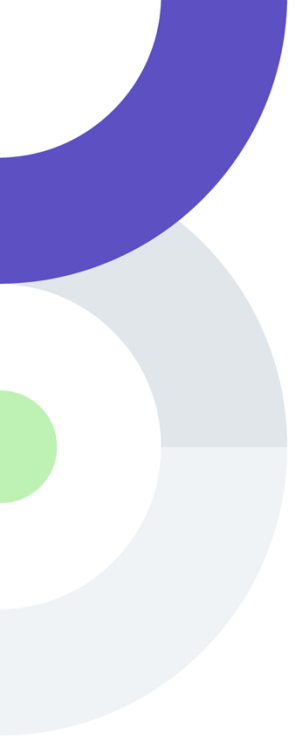
2. Students work individually. Teacher monitors, listens, questions.



4. Teacher helps students synthesize their learning.



3. Students work in groups. Teacher monitors, listens, and asks questions to understand students' thinking.



Motivation for The Study

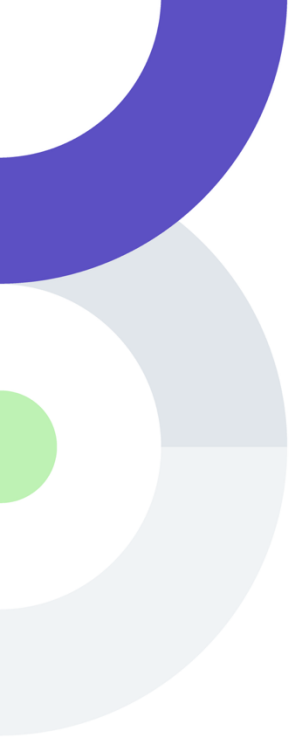
There is a **Lack of rigorous, causal evidence** on the impact of using IM as the core math curriculum on student outcomes.

Study Overview – Why Massachusetts?

- Most states do not systematically collect curriculum data from districts, but **Massachusetts does.**



- Beginning in 2018, MA educators evaluate instructional materials for **content, learner support, and usability**. More selective than EdReports, which rates focus and coherence, **rigor and math practices, and teacher & student supports.**
- Half of districts currently use a curriculum rated as “meeting expectations.” All IM versions rated as meeting state expectations. Districts may use multiple curriculums across schools and grade levels.



Study Overview – Data Generation

- We surveyed MA districts who reported using IM for at least one middle-grades school. We asked them about the frequency of usage and their perception of implementation quality.
- We determined when IM implementation started for each district.

Study Overview – Analysis

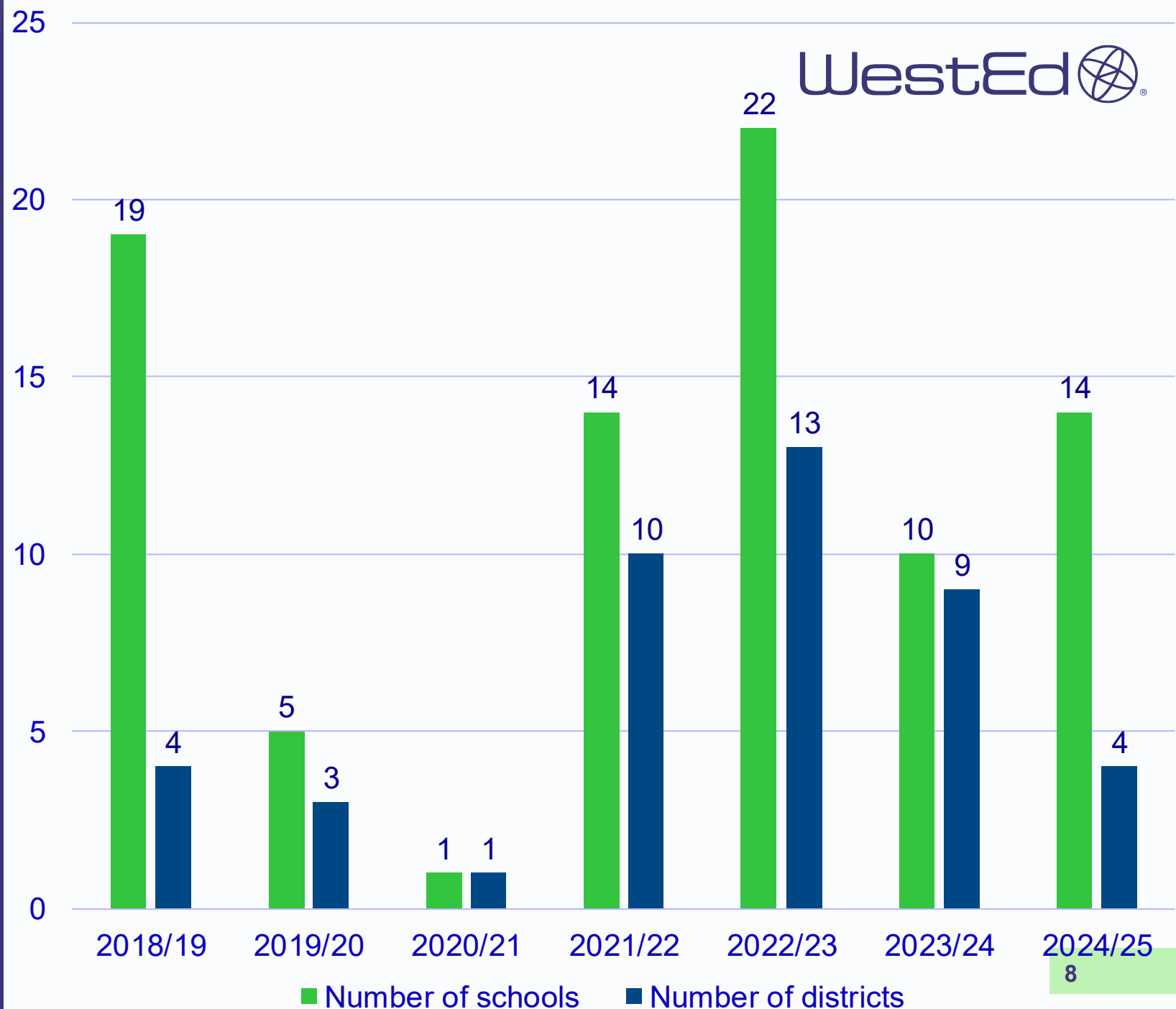
- We explored the impact of IM adoption on school-level math outcomes in MA districts who started using IM **between the 18-19 and 23-24** school years.
- We employed a **quasi-experimental design** to compare school outcomes before and after IM adoption relative to performance of comparable schools that did not use IM—both HQIM, non-IM schools and non-HQIM schools. Excluded schools that had “multiple materials” reported even if IM was one of them.
- Matched schools that adopted IM between 18-19 and 23-24 school years to those that used another HQIM on following pre-IM baseline characteristics: **Math proficiency, % of low-income students, and % of students with disabilities**
- Compared middle-school math performance on state Spring assessment between IM and matched comparison group after 1, 2, and 3 years of implementation adjusting for matched variables with linear regression with special attention to **time of adoption and grade level**.

**101 districts using IM
in at least one middle-
grades school.**

**71 adopted between
18-19 and 23-24.**

**58 districts using IM
as the district core
curriculum during 24-
25.**

**30 Answered the
Survey.**



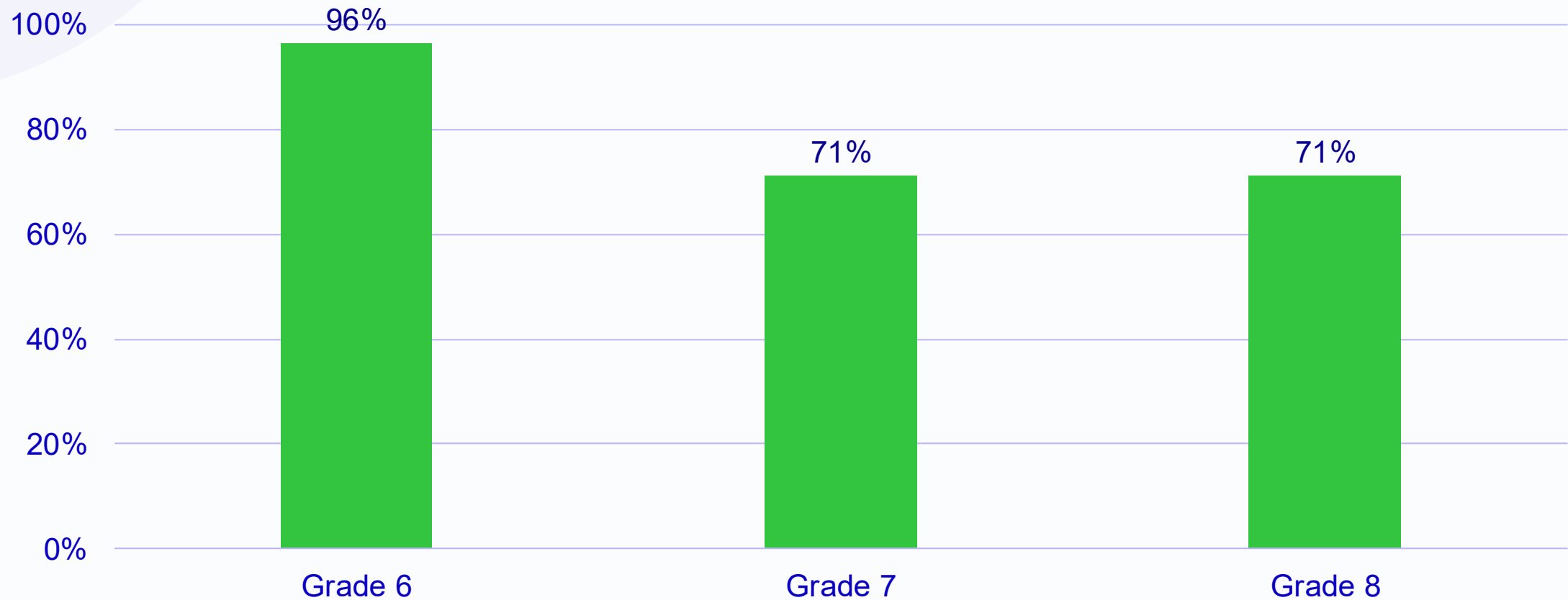
IM schools varied in some statistically significant ways from HQIM, non-IM schools and IM Schools

Characteristic	IM schools	HQIM, not IM schools	Non-HQIM schools
Percentage of students achieving proficiency on math MCAS	39%	34%**	43%**
Math z-score ^a	0.15	-0.09***	0.32**
English Learners	12%	12%	9%***
Students from households with low income	40%	48%***	38%
Students with disabilities	20%	20%	20%

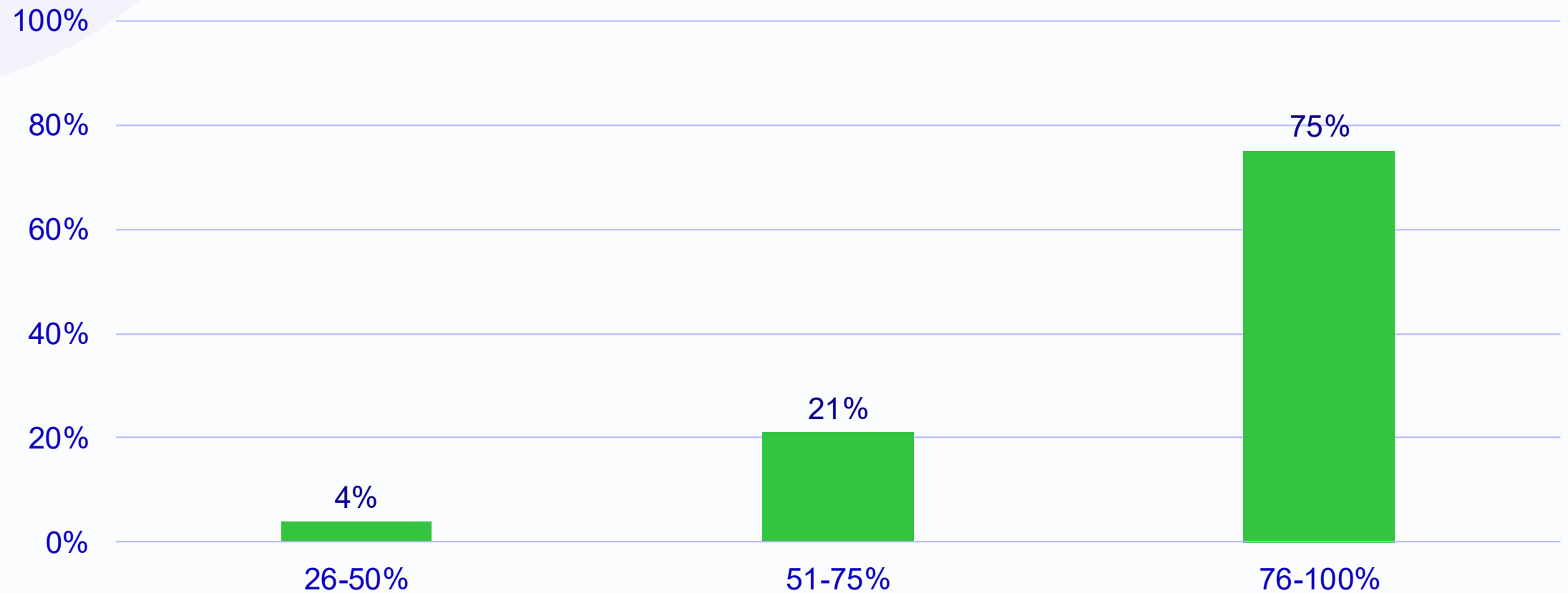
IM schools varied in some statistically significant ways from HQIM, non-IM schools and IM Schools

Characteristic	IM schools	HQIM, not IM schools	Non-HQIM schools
Black students	9%	15%***	8%
White students	53%	53%	59%**
Hispanic students	23%	24%	21%
Total grade-school observations	250	294	531
Total schools	101	142	238

Districts reported that IM was most often used in grade 6



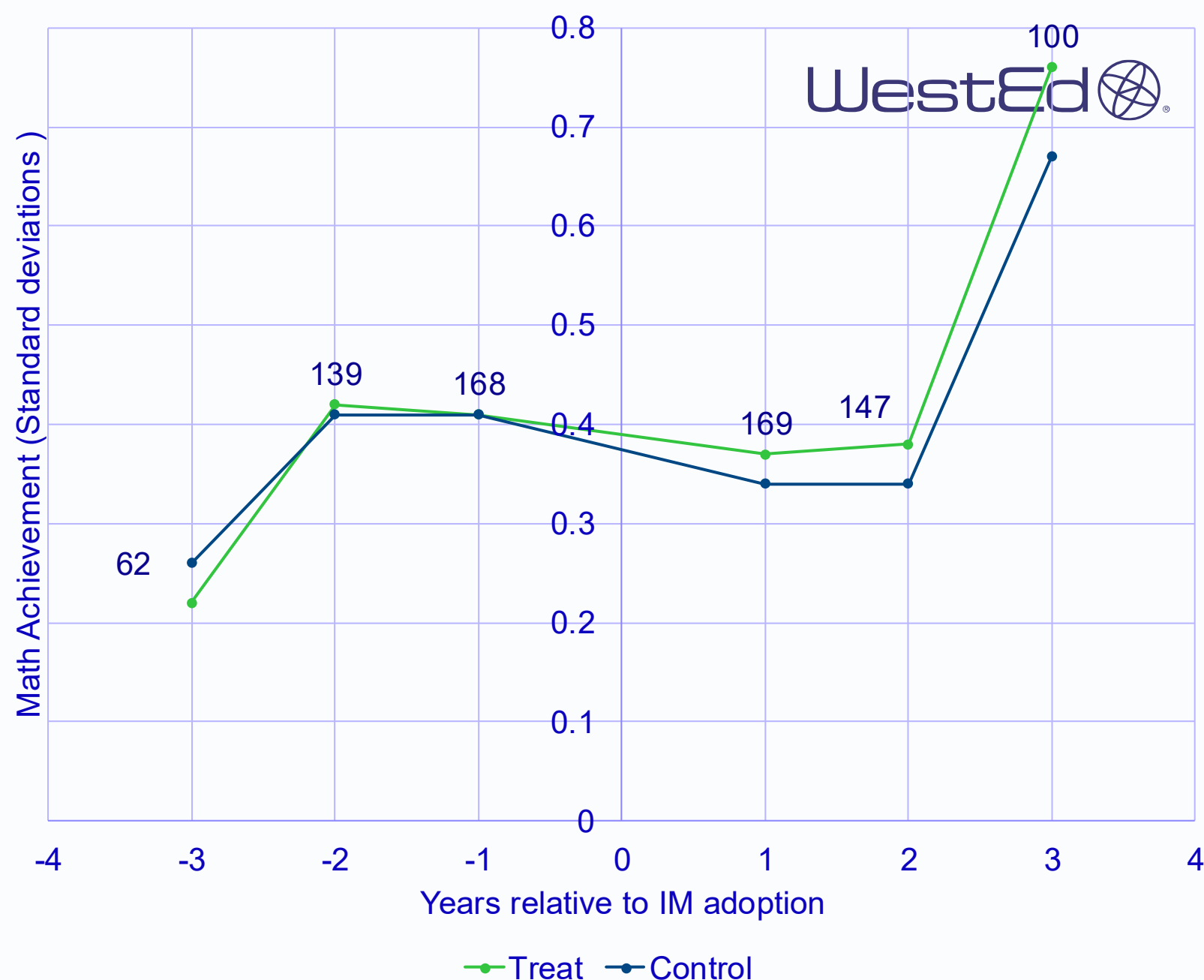
Most districts indicated that IM was used 76-100% of the time on a weekly basis



IM schools were successfully matched to other HQIM schools at baseline

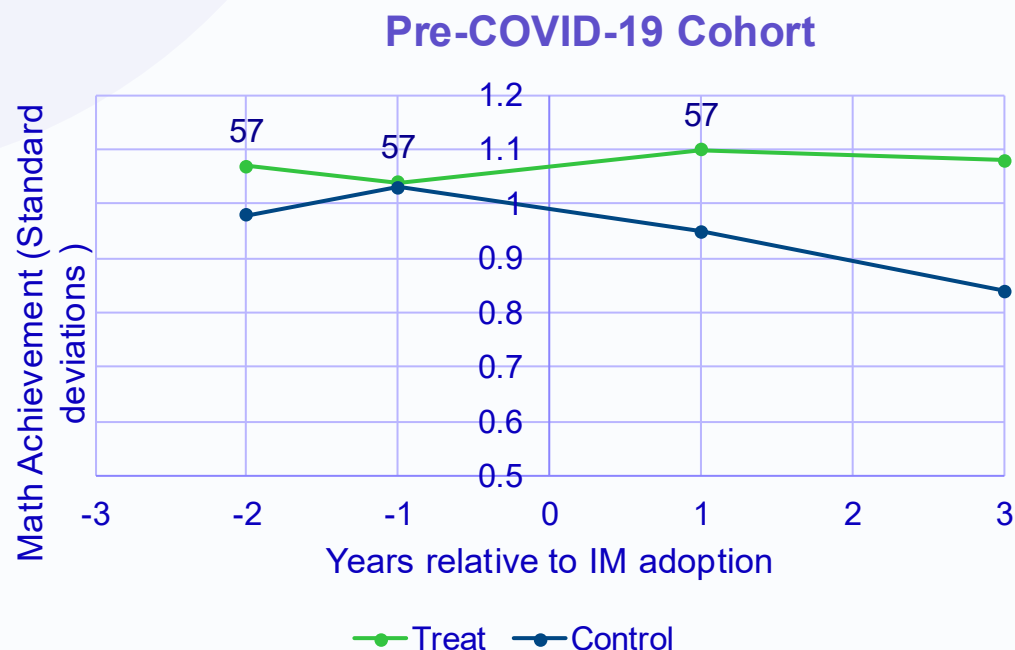
Characteristic	IM	Other HQIM	Effect size difference
Math achievement (z-score)	0.41	0.41	0.00
Low-income	32%	31%	0.03
Students with disabilities	19%	19%	0.11
Sample size (grade-schools)	169	169	-

On average, IM schools performed 0.19 standard deviations better on math relative to their matched comparison group by the third year of IM adoption.

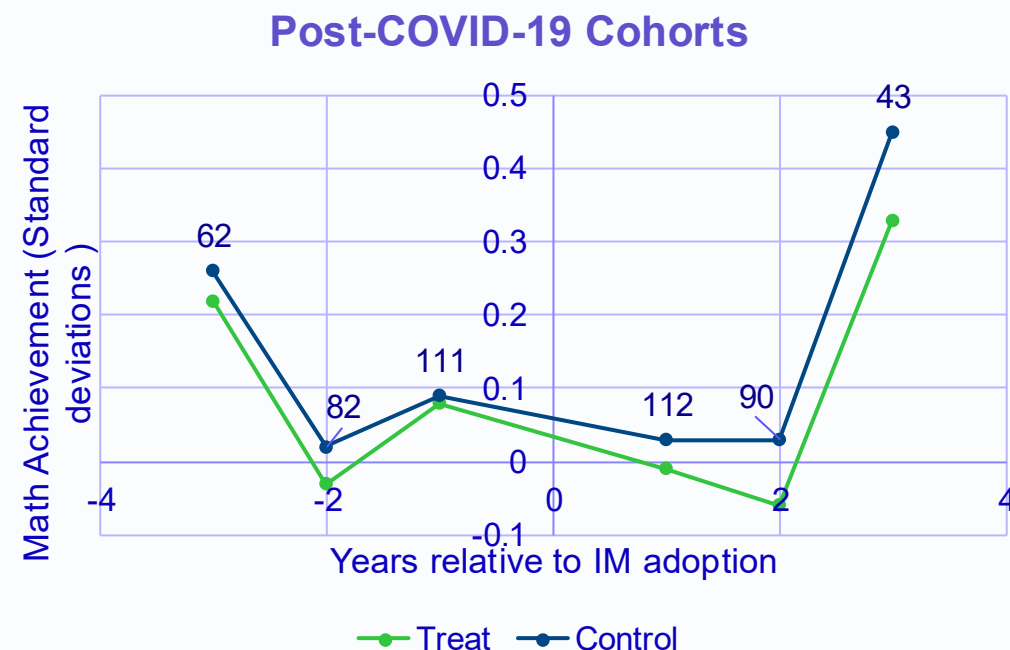


Note. Data labels indicate sample size of treatment group

Impacts were driven by the schools that adopted IM *before* COVID-19



- The adjusted IM impact for the pre-COVID-19 cohort was **0.18 SDs** in Year 1 and **0.39 SDs** in Year 3.
- Effects were largest in grades 7 and 8, particularly by the third year



- There was a small negative effect, but not statistically significant, for schools that adopted IM after COVID-19
- Similar negative effects were found at each grade level



Limitations

- Matched study does not fully rule out selection bias.
- IM schools may differ from other HQIM schools in unmeasured ways that may be correlated with math achievement.
- IM schools in the sample reflect the demographics of the state, but few schools from low-income and more diverse backgrounds are represented.
- Survey suggests schools are using IM with high frequency, but integrity and fidelity of implementation was not captured.



Implications

- IM showed significantly better math achievement impacts by year 3 compared to other HQIM in Massachusetts.
- Pandemic impact: Disrupted PD, coaching, planning, remote learning, and turnover may have undermined implementation for later adopters.
- Impacts grew over time.
- **These findings suggest that IM is worthy of continued study and investment AND the significant influence of implementation supports on improving math achievement through HQIM.**



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