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What is the cost of Personalized Learning - and is it worth it?

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National Student Success Accelerator

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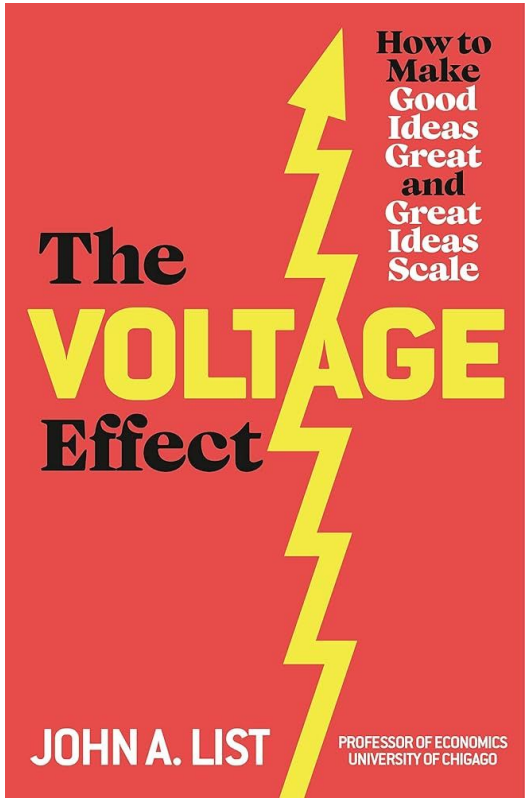
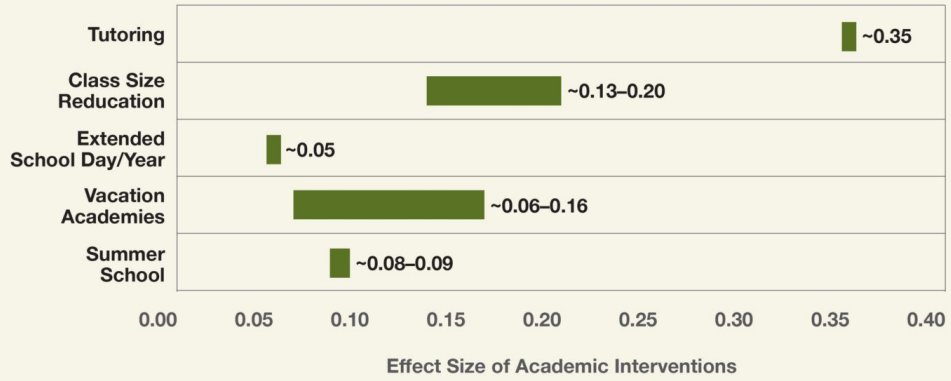
Scale is the holy grail of social science research - and social impact



High dosage tutoring is one of the most consistently studied and consistently effective interventions in education

Figure 2. Academic Interventions by Effect Size

Tutoring has an outsized impact when compared with other interventions meant to help students reach grade level.



Source: NASBE https://www.nasbe.org/leveraging-community-based-organizations-for-high-dosage-tutoring/

~40%

of US public schools reporting they offer high dosage tutoring

Source: https://nces.ed.gov/surveys/spp/

~10%

of US public school students receiving high dosage tutoring

Source: https://nces.ed.gov/surveys/spp/

~70%

of US public school students not meeting grade level expectations

Source:NCES

Two main challenges with scaling high-dosage tutoring:

Cost

Staffing

The Personalized Learning Initiative

31,236 randomized students in **130** schools

Scaling Up High-Dosage Tutoring

Tutoring Interventions

Least intensive:

Computer-Assisted Learning

Hybrid:

Alternating In-Person and Computer-Assisted Learning

Most intensive:

High-Dosage In-Person Tutoring

How do we know which interventions to assign to which students?

Cost study research questions

- What would it cost for another site, somewhere else, to replicate a basically identical program?
- What were the cost of the resources that went into producing observed effects?

How are costs determined?

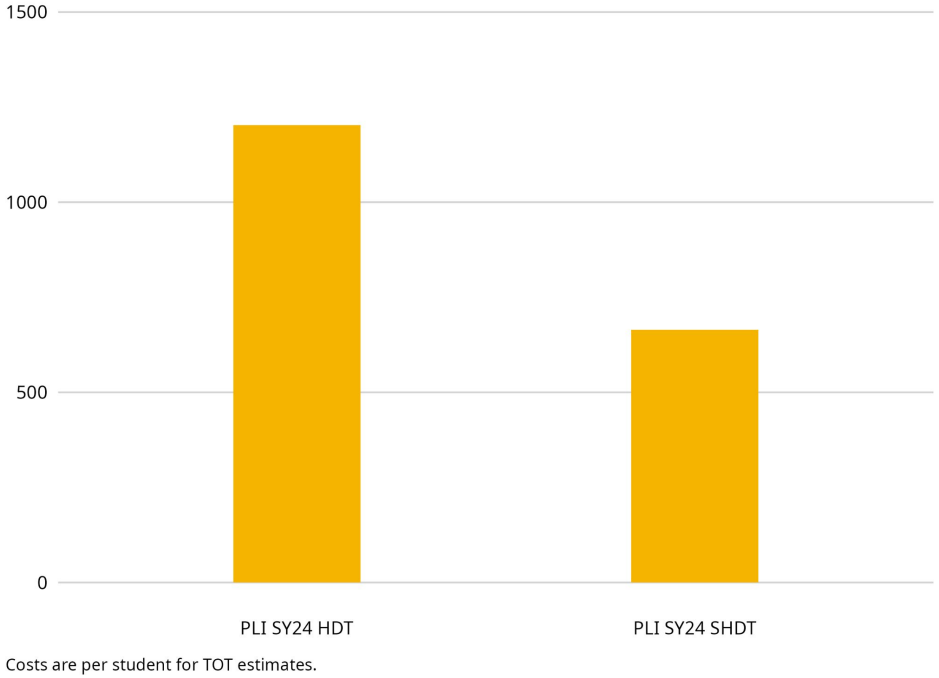
Ingredients Method (Levin et al., 2017)

- Make a list of all of the resources (ingredients) that went into the tutoring program
- Document the quantity of these ingredients used.
- Apply standardized national prices in 2023 dollars (i.e. our best estimate of what it would cost someone else to pay for a similar resource in 2023)
- Calculate the total cost per student i.e. the value of all the resources that went into tutoring a student.
- Examine the share of these resources that were “funded” by reallocated existing resources, and those donated by the tutors.

How are benefits determined?

- **Percentiles to Dollars** - in Chetty et al. (2011)
  - Finds that an (in sample) percentile increase of kindergarten test scores is associated with a $154 wage earnings increase at ages 25-27 using national percentiles (2009 dollars).
- **Standard Deviations to Dollars** - in Hanushek & Woessmann (2008) survey paper
  - Finds a 1 SD increase in test scores is associated with a ~12% increase in earnings from mid 20s to early 30s.

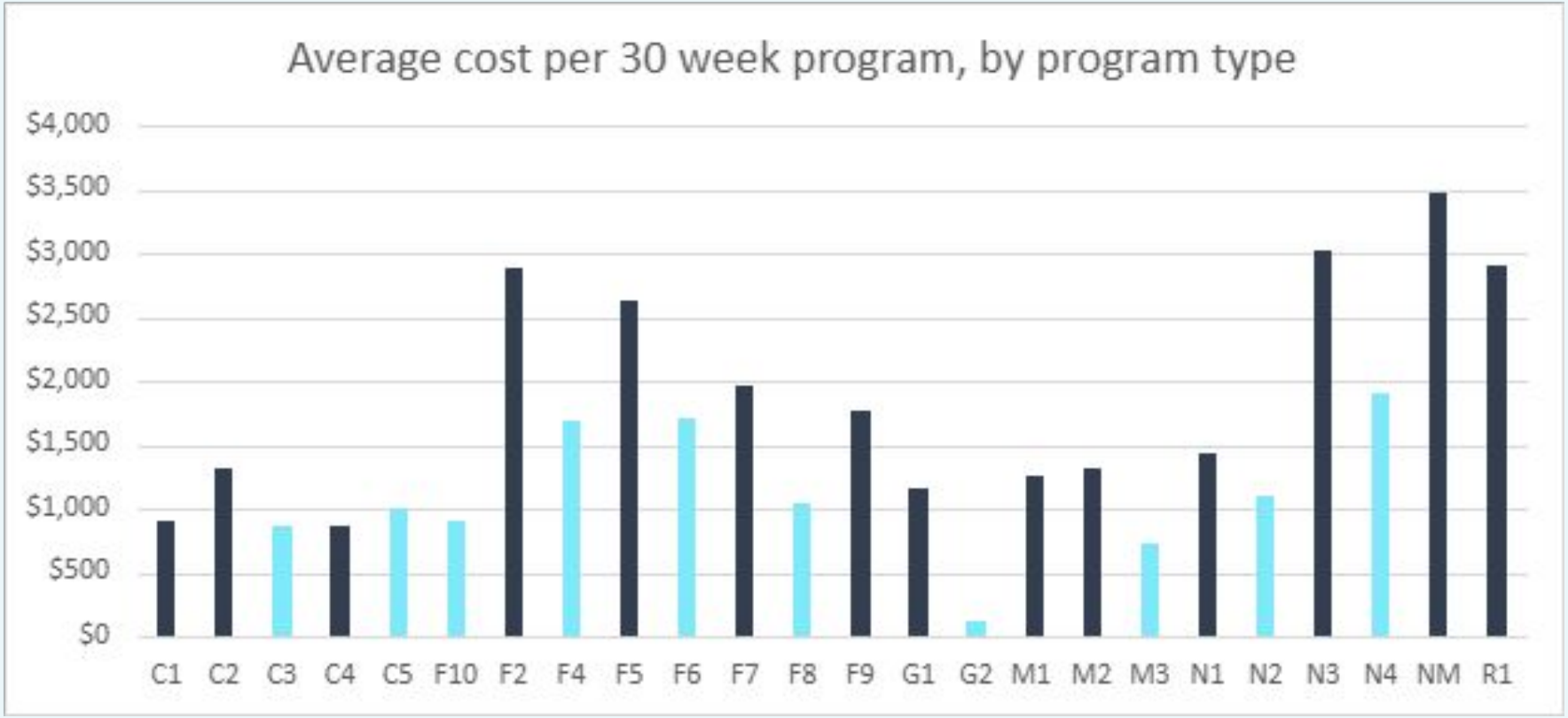
Tutoring per pupil costs ranged from $110 - $2,310 per student, *as designed*



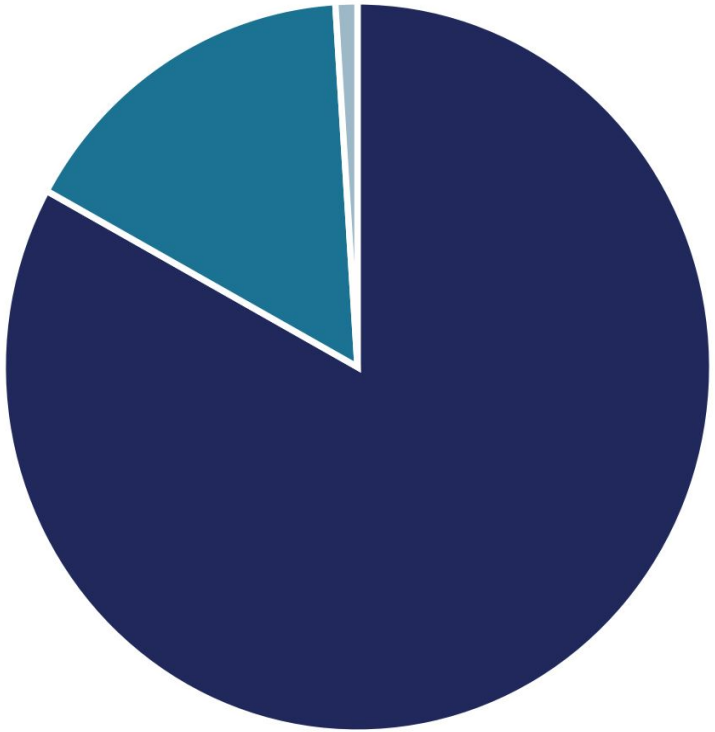
Costs are per student for TOT estimates.

- **HDT: $1,203** ($430-$2,310)
- **SHDT: $665** ($110-1,350)

Considerable variation across program type



The real pain point

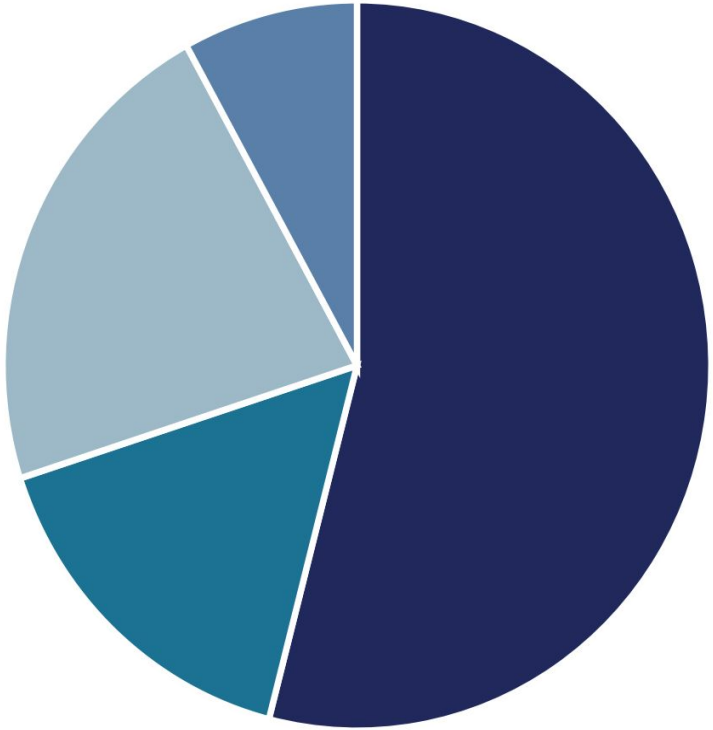


83%
New Costs

16%
Reallocated Costs
(staff time)

1%
In Kind Tutor Resources

Tutor time is the costliest of these new inputs



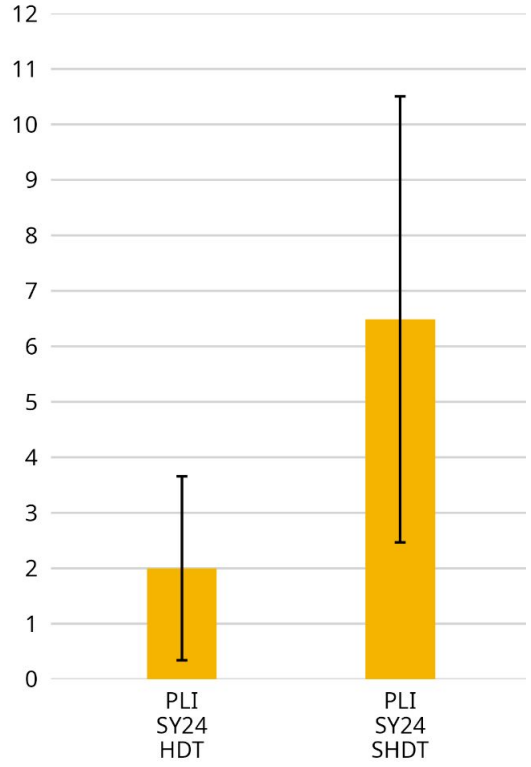
54%
Tutor Time

16%
School Staff Time

22%
Other Management Time
(Training, non-school level management)

8%
Materials & Equipment

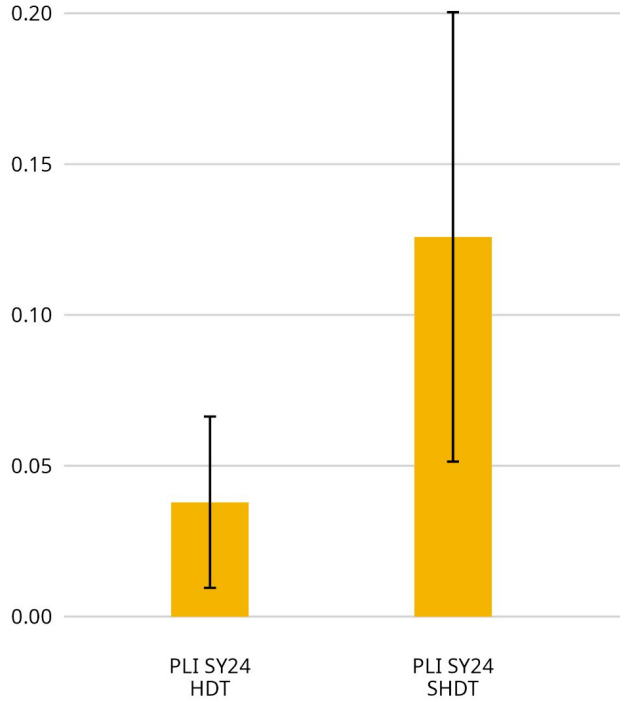
But tutoring still is a high ROI investment…



Benefit to cost ratio range of (depending on the valuation used) for PLI sites:

- HDT: For every $1 invested in HDT, we estimate benefits of $1.54- $2.08
- SHDT: For every $1 invested in SHDT we estimate benefits of $5.10- $6.90

… and yield high returns on learning per $1,000 spent



Cost effectiveness was computed using TOT estimates.

If we instead measure how many standard deviations were gained per $1000 spent, we get a cost effectiveness ratio of:

- HDT: 0.04 standard deviations per $1000.
- SHDT: 0.13 standard deviations per $1000.

So how can we solve this puzzle?

Tutoring Interventions

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Hybrid:

Alternating In-Person and Computer-Assisted Learning

Most intensive:

High-Dosage In-Person Tutoring

How do we know which interventions to assign to which students?

The Real Key: Same cost, more learning

Scenario	Cost per pupil	Intervention design + Learning Gain unit	Total students served	Total cost	Increase in learning
HDT Only	$100	6 tutors deliver HDT (4:1) at 2 units per student	24	$2,400	48 units
SHDT Only	$50	3 tutors deliver SHDT (8:1) at 1 unit per student	48	$2,400	48 units
Newly imagined personalized learning, with targeting	$100 $50	3 tutors deliver HDT (4:1) at 3 units per student 3 tutors deliver SHDT (8:1) at 3 units per student	36	$2,400	108 units

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Thank You

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Appendix

Cost methodology

Sampling

In every site, sample 2 schools that are using the same "model" of tutoring, where "model" is defined by school level (elementary, middle, or high school), subject, HDT or SHDT, use of technology or not.

Note: some models only operated in one school in a site.

Data sources

Quantities of inputs:

- Interviews with the School Coordinators
- Surveys from tutors

Standardized Prices

- Bureau of Labor Statistics and national retailers

Cost methodology

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Methods Review

- **Percentiles to Dollars** - in Chetty et al. (2011)
  - Finds that an (in sample) percentile increase of kindergarten test scores is associated with a $154 wage earnings increase at ages 25-27 using national percentiles (2009 dollars).

We create a percentile ranking of test score

estimate new regressions with percentile as outcomes

calculate earnings increase each year for ages 25-59

$$Earnings\ increase\ each\ year = percentile\ estimate \times \underbrace{\$218}_{\text{2023 dollars}} \times discount\ terms$$

sum earnings increase for each year for ages 25-59 together

} get $ benefit

Methods Review

- **Standard Deviations to Dollars** - in Hanushek & Woessmann (2008) survey paper
  - Finds a 1 SD increase in test scores is associated with a ~12% increase in earnings from mid 20s to early 30s.

We download ACS data and get average earnings for ages 25-59

calculate earnings increase each year for ages 25-59

$$Earnings\ increase\ each\ year = standard\ deviation\ estimate \times 12\% \times discount\ terms$$

sum earnings increase for each year for ages 25-59 together

} get $ benefit