Session 14: Economic Evaluation

BE BOUNDLESS

Introduction – my background – why cost analysis?

Background:

From Canada, grew up in Lawrence, KS, grad school in Los Angeles, CA, four years in El Paso, Texas (first job at UT El Paso)

Research Agenda on **School Finance Policy**… three strands:

1. School funding equity
2. Educator labor markets
3. Economic evaluation (cost analysis)

Goals for today regarding cost analysis:

- Learn about economic evaluation research and where this work fits within the broader academic literature
- Understand the basic steps to complete a cost analysis
- Practice using the results of cost analysis to make an educational decision

What is “economic evaluation”?

Definition: Economic evaluation is evaluation that inco
measurement of **cost**, in addition to impact. You can al

…so, what’s evaluation?

Evaluation simply refers to the assessment of whether
intervention, program, or policy is effective at producir

…so, what do you mean by “intended outcomes”?

Evaluators must determine the specific outcomes that users of a product, practice, intervention, program, or policy are hoping to achieve (e.g., increased test scores, graduation rates, postsecondary enrollment, labor market outcomes


Opinion | Every Tech Tool in the Classroom Should Be Ruthlessly Evaluated - The New York Times

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Jessica Grose

OPINION

Every Tech Tool in the Classroom Should Be Ruthlessly Evaluated

April 24, 2024

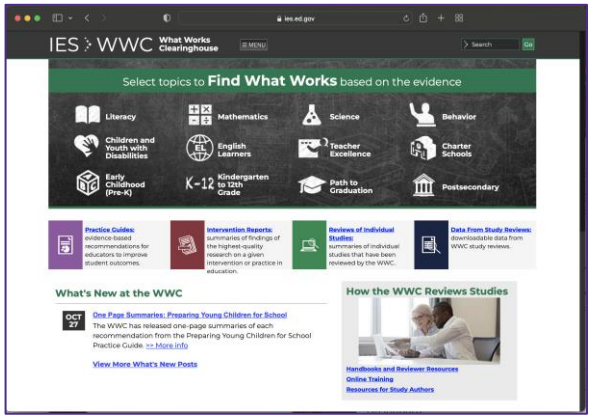
https://www.nytimes.com/2024/04/24/opinion/ed-tech-classroom.html?unlocked_article_code=1.nk0.lA7D.mAjHIhj6X6YS&smid=url-share

Outline of lecture/ discussion

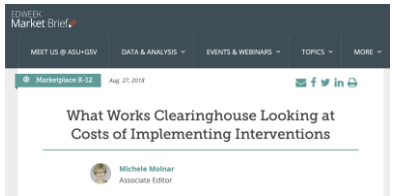
1. Background on economic evaluation
2. Key concepts and basic steps for how to conduct an economic evaluation
3. Practice using the results of economic evaluation

Does the government keep a list of programs that "work" in K-12 education?

Yes, the the **What Works Clearinghouse** includes a list of educational products or programs that have shown positive impacts on student outcomes through rigorous evaluation

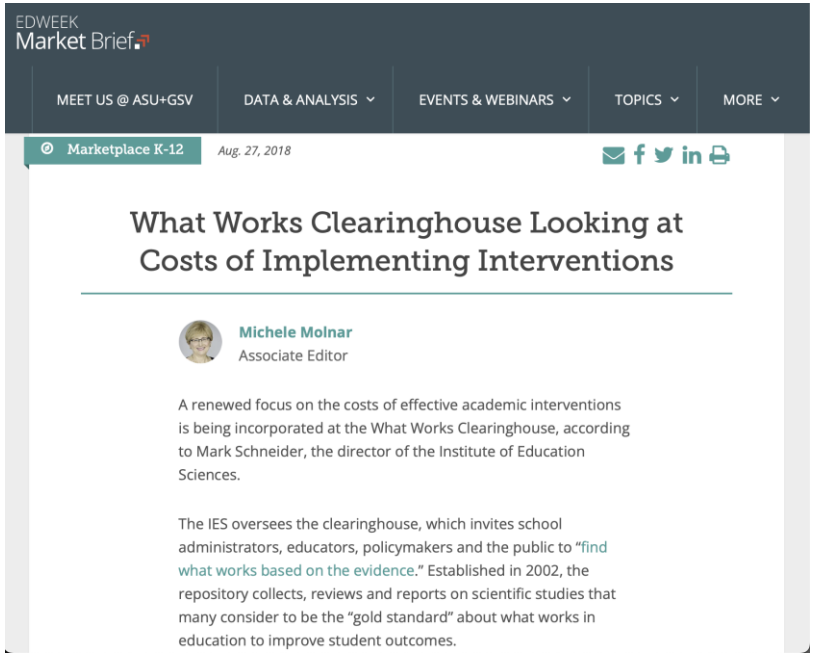


https://ies.ed.gov/ncee/WWC



https://marketbrief.edweek.org/marketplace-k-12/works-clearinghouse-looking-costs-implementing-interventions/

Does the government keep a list of programs that "work" in K-12 education?



EDWEEK Market Brief

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Marketplace K-12 Aug. 27, 2018

What Works Clearinghouse Looking at Costs of Implementing Interventions

Michele Molnar
Associate Editor

A renewed focus on the costs of effective academic interventions is being incorporated at the What Works Clearinghouse, according to Mark Schneider, the director of the Institute of Education Sciences.

The IES oversees the clearinghouse, which invites school administrators, educators, policymakers and the public to "find what works based on the evidence." Established in 2002, the repository collects, reviews and reports on scientific studies that many consider to be the "gold standard" about what works in education to improve student outcomes.

https://marketbrief.edweek.org/marketplace-k-12/works-clearinghouse-looking-costs-implementing-interventions/

The IES oversees the clearinghouse, which invites school administrators, educators, policymakers and the public to "find what works based on the evidence." Established in 2002, the repository collects, reviews and reports on scientific studies that many consider to be the "gold standard" about what works in education to improve student outcomes.

But while searching for what is effective in boosting student achievement among rigorous research studies, it can be difficult if not impossible to find how much it costs to use the products or techniques found to be effective, Schneider said in a phone interview.

The importance of this effort is a flashpoint for Schneider.

"To tell someone this is an effective treatment, but not tell them how much it costs, it's like saying, 'Go to the moon,' without acknowledging how much that might cost," he said.

In a message on the site about changes in the works at the clearinghouse, Schneider had this to say:

"Two interventions with the same outcomes but different costs should be viewed differently by education administrators who must make spending decisions within budget constraints. IES has been paying more attention to cost in the last few years, and we will continue to sharpen that focus in both the WWC and other IES work, including our grants."

Where does cost analysis / econ. eval. fit within the broader education policy literature?

- Much of educational research involves the evaluation of policies or programs;
- Evaluation can be quantitative, qualitative, or mixed;
- Quantitative evaluations generally come in **two forms***:

1. Policy evaluation

- What was the impact of NCLB?
- What is the impact of affirmative action?
- What is the effect of teacher tenure reform?
- Are alt-cert teachers as effective as traditionally prepared teachers?

2. Program or intervention evaluation

- What is the impact of class size reduction?
- What is the impact of Guided Math for fourth graders?
- What is the effect of the AI curriculum planner tool?
- Is instructional coaching more effective than traditional teacher workshops?

* CEA can be used in both but is generally a much better fit for #2.

Where does cost analysis / econ. eval. fit within the broader education policy literature?

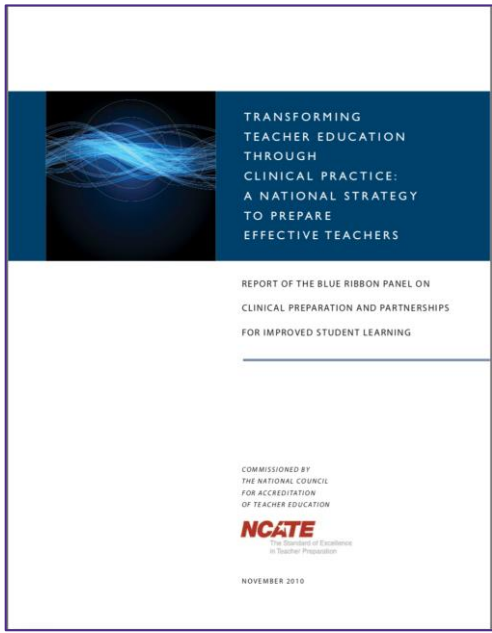
- Mostly rhetoric
- More studies emerging

Rhetorical Use of the term “Cost-Effective”

NCATE’s 2010 report:

National Council for Accreditation for Teacher Education (2010). Transforming Teacher Education Through Clinical Practice: A National strategy to prepare effective teachers. Report of the Blue Ribbon Panel on Clinical Preparation and Partnerships for improved student learning.

http://caepnet.org/~/media/Files/caep/accreditation-resources/blue-ribbon-panel.pdf



Rhetorical Use of the term “Cost-Effective”

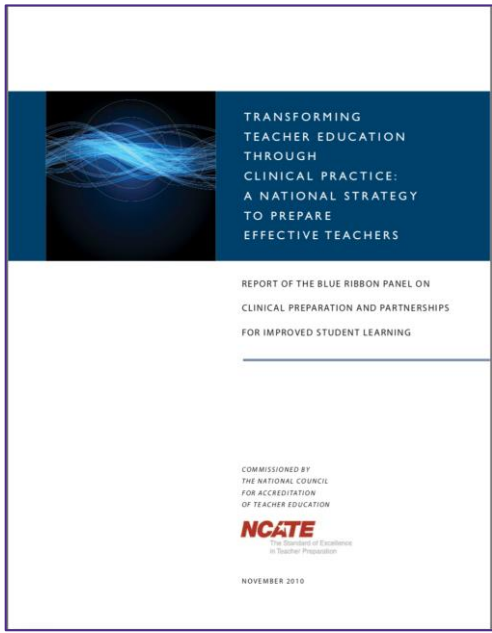
NCATE’s 2010 report:

Hard Choices and Cost Implications

Implementing this agenda is difficult but doable. It will require reallocation of resources and making hard choices about institutional priorities, changing selection criteria, and restructuring staffing patterns in P-12 schools. Clinically based programs may cost more per candidate than current programs but will be more cost-effective by yielding educators who enter the field ready to teach, which will increase productivity and reduce costs associated with staff development and turnover.

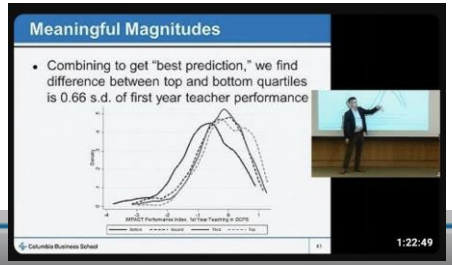
We urge states, institutions, and school districts to explore alternative funding models, including those used in medicine to fuse funds for patient care and the training of residents in teaching hospitals. We also urge states and the federal government to provide incentives for programs that prepare teachers in high-need content and specialty areas and for teaching in schools with the most challenging populations.

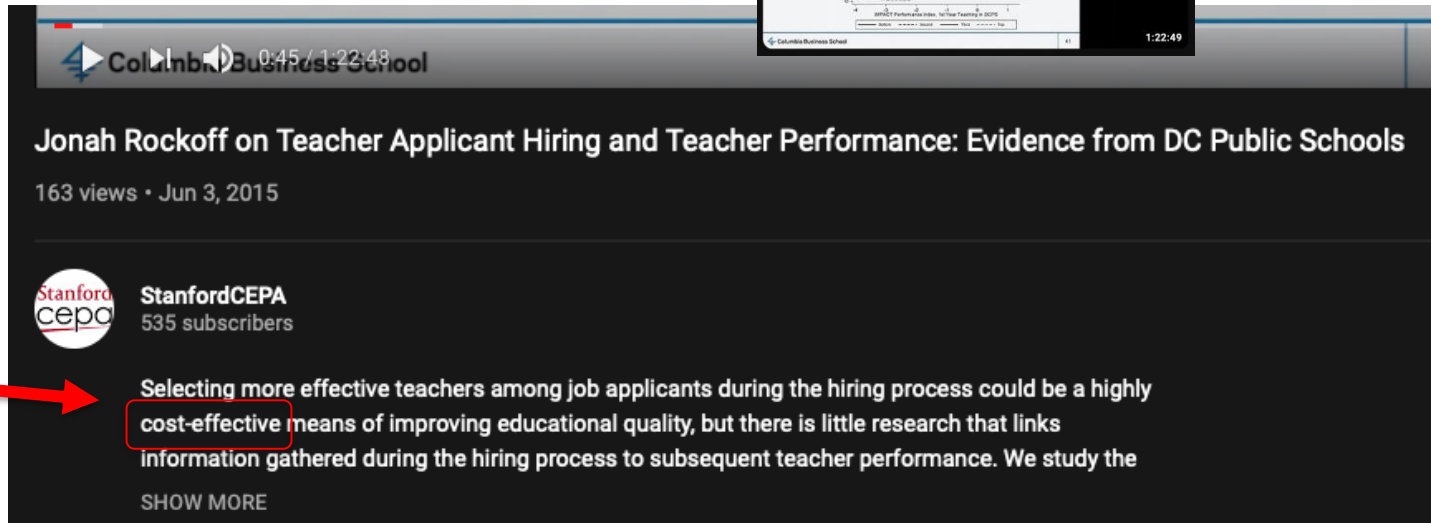
http://caepnet.org/~/media/Files/caep/accreditation-resources/blue-ribbon-panel.pdf



Rhetorical Use of the term “Cost-Effective”

Jonah Rockoff’s (2015) presentation for Stanford CEPA





NO!!!!!

https://www.youtube.com/watch?v=8p4xzKiftIU

Rhetorical Use of the term “Cost-Effective”

- What the author usually means:
  - Adopting a policy that appears “cost free”
  - Something that is low expense (vs. low cost)

- Other examples of people incorrectly saying something is necessarily more “cost-effective”?
  - Asking principals to use an AI-based tool to building lesson plans
  - Implementing a new low-cost technology tool
  - Choosing more effective job applicants
  - Laying off less-effective teachers
  - Improving teacher professional development

Outline of lecture / discussion

1. Background on economic evaluation
2. Key concepts and basic steps for how to conduct an economic evaluation
3. Practice using the results of economic evaluation

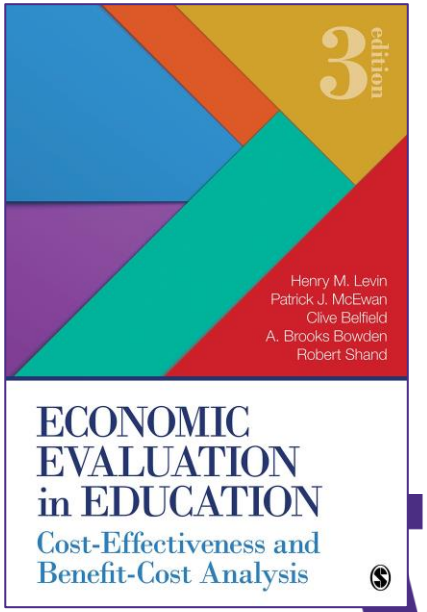
Types of Cost Analysis

The main two:

- **Cost-Effectiveness Analysis (CEA)**
- **Benefit Cost Analysis (BCA)**

Other kinds

- Cost Analysis (when you don't have impact measure)
- Cost-Feasibility Analysis (less common)
- Cost-Utility Analysis (rarely used)
- "Cost of quality" studies in early childhood education
- Cost of adequacy studies for K-12 school finance litigation or finance formula calibration



Types of Cost Analysis

- **Cost-Effectiveness Analysis (CEA)**

Compares multiple products/ interventions that have a common outcome measure, such as increase in test scores. Example:

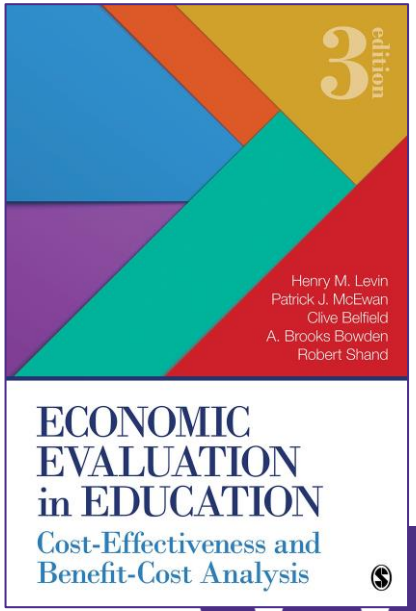
EC ratios: $\frac{0.2 \text{ SD test scores increase}}{\$500 \text{ per student per year}}$ vs. $\frac{0.3 \text{ SD}}{\$500}$ vs. $\frac{0.4 \text{ SD}}{\$1{,}000}$ vs. $\frac{0.5 \text{ SD}}{\$1{,}000}$

- **Benefit Cost Analysis (BCA)**

BC ratio: $\frac{2.7 \text{ pp incr in HS grad , which increase wages by } \$52{,}000}{\$800 \text{ per student per year}} = \frac{\$52{,}000}{\$800} = \$6.50$

Key concepts

- Ingredients method: how costs are measured
- Ingredient: a resource used as part of a policy, practice, intervention, or program
- Shadow pricing: estimating the price of something when a market doesn't exist, e.g., parent volunteer, old school building, used computers, certain skill sets
- Induced costs: costs that result some receiving additional services that weren't part of the initial program/policy
- Annualization: adjusting the price of an ingredient



Basic steps to complete a cost analysis

The ingredients method (three steps):

1. Identify all the resources required to implement the program, including the quantity of those resources and quantity per student
2. Determine the price of those resources
3. Multiply all prices by quantities; determine who bears the costs

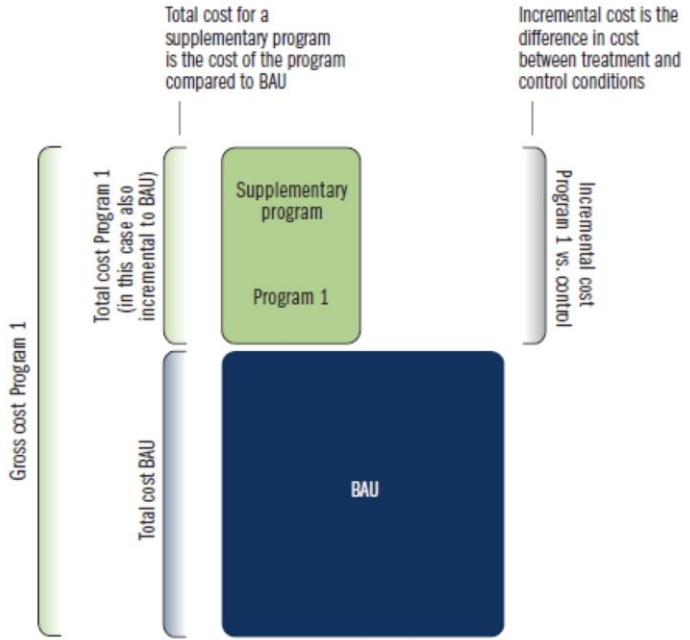
Considerations

- National average salaries vs. local salaries
- Adjust for inflation
- Annualize materials lasting multiple years
- Scale staff investments over number of students served

Conceptual framework: Many products are not "supplementary," but actually "partially substituting"

Example of a program that **fits neatly on top of existing practice**

Exhibit 1.1. Incremental, Total, and Gross Costs When Considering a Single Supplementary Program With BAU as the Control Condition

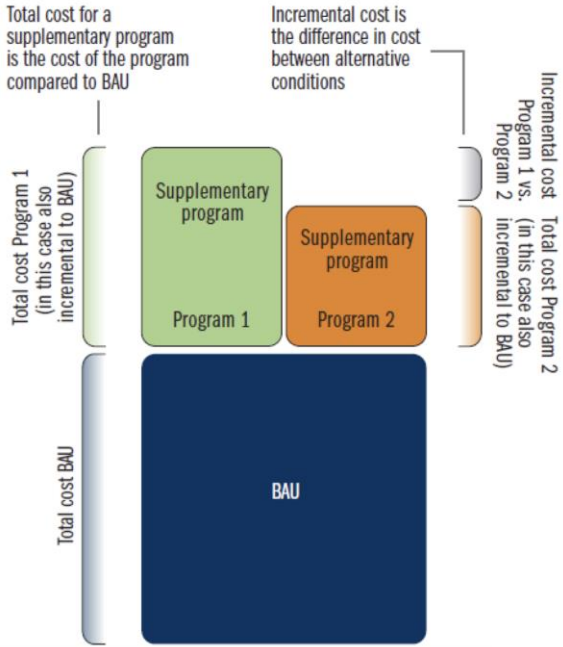


Source: https://www.air.org/sites/default/files/Standards-for-the-Economic-Evaluation-of-Educational-and-Social-Programs-CASP-May-2021.pdf

Conceptual framework: Many products are not "supplementary," but actually "partially substituting"

Example of a program that **fits neatly on top of existing practice**

Exhibit 1.2. Incremental and Total Costs When Considering Two Alternative Programs That Supplement Underlying Programming (BAU)

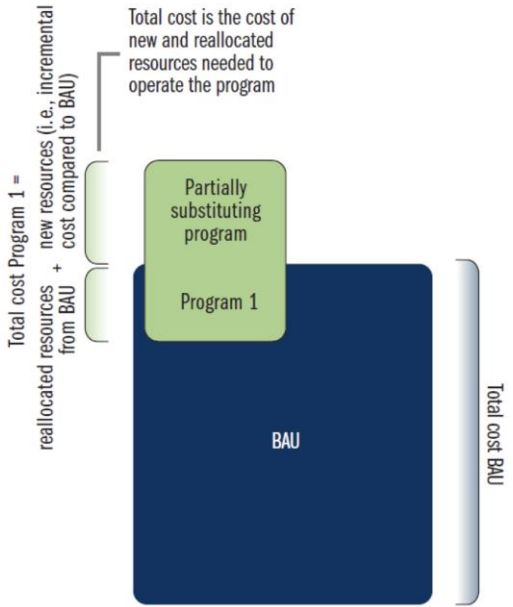


Source: https://www.air.org/sites/default/files/Standards-for-the-Economic-Evaluation-of-Educational-and-Social-Programs-CASP-May-2021.pdf

Conceptual framework: Many products are not "supplementary," but actually "partially substituting"

Example of a program that is **partially substituting**

Exhibit 1.3. Incremental and Total Costs When Considering an Alternative Program That Partially Substitutes Underlying Programming



Source: https://www.air.org/sites/default/files/Standards-for-the-Economic-Evaluation-of-Educational-and-Social-Programs-CASP-May-2021.pdf

Example of a cost table

Table 4. Total Cost and Average Cost Per Teacher for a Model School and for Schools 1, 2 and 3

Ingredients	Cost of One Input	Model School			School 1			School 2			School 3		
		FTE	Inputs	Yearly Costs of Ingredient	FTE	Inputs	Yearly Costs of Ingredient	FTE	Inputs	Yearly Costs of Ingredient	FTE	Inputs	Yearly Costs of Ingredi-ent
Personnel													
Teachers	$68,068	0.57%	40	$15,497.58	0.51%	23	$7,927.29	1.29%	30	$26,281.10	0.84%	42	$23,967.97
Coach	$68,685	100.00%	1	$68,685.11	96.48%	1	$66,268.93	97.30%	1	$66,830.61	90.00%	3	$185,449.79
Principal	$109,707	2.50%	1	$2,742.67	0.22%	1	$241.35	1.88%	1	$2,057.00	1.03%	1	$1,129.98
Curriculum specialist	$68,068	0.50%	1	$340.34	0.00%	0	$0.00	0.00%	0	$0.00	0.17%	3	$348.71
Materials													
Manuals / Copies	Varies			$100.00			$119.96			$65.00			$852.39
Equipment													
Laptop	$1,099		1	$253.87		1	$253.87		1	$253.87		3	$761.61
Professional Development (PD) for Coaches													
Ongoing PD	$7		0	$0.00		80	$567.31		80	$567.31		240	$1,701.94
Start-Up PD	$1,675		1	$1,675.29		1	$1,675.29		1	$1,675.29		3	$5,025.87
3-Day Workshop	$1,320		2	$2,640.00		0	$0.00		0	$0.00		0	$0.00
Total Cost				**$91,934.86**			**$77,054.00**			**$97,730.18**			**$219,238.26**
Collaborating Teachers			40			23			30			42	
Cost Per Teacher				$2,298.37			$3,350.17			$3,257.67			$5,219.96

Outline of lecture / discussion

1. Background on economic evaluation
2. Key concepts and basic steps for how to conduct an economic evaluation
3. Practice using the results of economic evaluation

Practice using the results of cost analysis to make an educational decision

Imagine you are the Director of a Head Start center…

You have some remaining ESSER funds that amount to a 20% increase in your typical funding level…

You were supposed to spend it by September 2024, but you've successfully acquired a one-year extension…

Practice using the results of cost analysis to make an educational decision

You are trying to decide how best to invest funds. You are considering teacher professional development (called TEEM), a home visit and parent coaching program (called PALS), or both… You're handed the following research findings…

TABLE 5

Effectiveness of two pre-school interventions on child outcomes, and their combined effect

	Effects	
TEEM (Texas Early Education Model)	0.092	
PALS (Play and Learning Strategies)	0.123	
TEEM and PALS total effect	0.301	(Kids who received both had synergistic effects)

Source: Knight, D. S., Landry, S. H., Zucker, T. A., Merz, E. C., Guttentag, C. L. & Taylor, H. B. (2019). Cost-effectiveness of early childhood interventions to enhance preschool: Evidence from a randomized experiment in Head Start centers enrolling historically underserved populations. Journal of Policy Analysis and Management, 38(4), 891-917. DOI: 10.1002/pam.22145.

Practice using the results of cost analysis to make an educational decision

You are trying to decide how best to invest funds. You are considering teacher professional development, a home visit program, or both

You're handed the following research findings…

TABLE 6

Cost-effectiveness comparisons of the TEEM and PALS interventions

	Effects	Cost	Effectiveness-cost ratio (SD / $1,000)
TEEM	0.092	$541	0.171
PALS	0.123	$3,131	0.039
TEEM and PALS total effect	0.301	$3,672	0.082

Source: Knight, D. S., Landry, S. H., Zucker, T. A., Merz, E. C., Guttentag, C. L. & Taylor, H. B. (2019). Cost-effectiveness of early childhood interventions to enhance preschool: Evidence from a randomized experiment in Head Start centers enrolling historically underserved populations. Journal of Policy Analysis and Management, 38(4), 891-917. DOI: 10.1002/pam.22145.

An example of a benefit-cost analysis (Miller et al., 2018)

Background: Texas expanded dual credit education, which are courses that provide both high school and college credit. Was that a wise investment?

FINDINGS

- Students who took DC courses finished their 4-year degree **1.0 months earlier** on average.
- Students who took DC courses **were 2.2 percentage points more likely** to finish a 2-year degree.

- Our cost analysis showed that the resources allocated toward DC summed to a total value of $121 million, or about $111 per semester credit hour.

Source: Miller, T., Kosiewicz, H., Tanenbaum, C., Atchison, D., Knight, D. S., Ratway, B., Delhommer, S., & Levin, J. (2018). Dual-Credit education programs in Texas: Phase II. Washington, D.C.: American Institutes for Research..

Examples of cost analyses from the literature

Background: Texas expanded dual credit education, which are courses that provide both high school and college credit. Was that a wise investment?

Table 4.8. Benefits Attributed to Dual-Credit Enrollment Resulting From Reduced Time to Degree

	Benefits of Graduating 1 Year Earlier	Benefits per Student Attributed to Dual-Credit Enrollment	Benefits per SCH
Student	$44,732	$898	$95
Public	$16,858	$338	$36
Overall	$61,590	$1,236	$131

Source: Miller, T., Kosiewicz, H., Tanenbaum, C., Atchison, D., Knight, D. S., Ratway, B., Delhommer, S., & Levin, J. (2018). Dual-Credit education programs in Texas: Phase II. Washington, D.C.: American Institutes for Research..

Examples of cost analyses from the literature

Background: Texas expanded dual credit education, which are courses that provide both high school and college credit. Was that a wise investment?

Table 4.9. Lifetime Benefits of a Two-Year Credential

	Benefits of 2 Years of Higher Education	Benefits per Student Attributed to Dual-Credit Enrollment	Benefits per SCH
Panel A. Estimates from McMahon, 2009			
Private Market	$347,746	$7,581	$801
Private Nonmarket	$424,769	$9,260	$979
Social	$309,280	$6,742	$713
Overall Benefits	$1,081,795	$23,583	$2,493
Panel B. Estimates from Agan, 2014 and from Carroll and Erkut, 2009			
Private Market	$144,884	$3,158	$334
Social	$62,759	$2,067	$219
Overall Benefits	$207,643	$5,226	$552

- Students who took DC courses were also 2.2 percentage points more likely to finish a 2-year degree.
- Our cost analysis showed that the resources allocated toward DC summed to a total value of $121 million, or about $111 per semester credit hour.

Source: Miller, T., Kosiewicz, H., Tanenbaum, C., Atchison, D., Knight, D. S., Ratway, B., Delhommer, S., & Levin, J. (2018). Dual-Credit education programs in Texas: Phase II. Washington, D.C.: American Institutes for Research..

Examples of cost analyses from the literature

Background: Texas expanded dual credit education, which are courses that provide both high school and college credit. Was that a wise investment?

Benefit type	Monetary Value per SCH	Cost per SCH	Benefit-cost ratio
Reduced time to 4-year degree	$131	--	$1.18
More 2-year degrees	$552	--	$4.98
Total	**$683**	**$111**	**$6.15**

Source: Miller, T., Kosiewicz, H., Tanenbaum, C., Atchison, D., Knight, D. S., Ratway, B., Delhommer, S., & Levin, J. (2018). Dual-Credit education programs in Texas: Phase II. Washington, D.C.: American Institutes for Research..

What questions do you have about cost-effectiveness analysis in education?

What about program evaluation and the WWC?

Wrapping up…

Pop quiz!

When poll is active respond at: **PollEv.com/davidknight790**

https://www.polleverywhere.com/activities

https://www.polleverywhere.com/competitions/cAwucSUyqYhoQOCDqennv

Extra slides

Pop quiz

1. What is the main difference between benefit-cost analysis (BCA) and cost-effectiveness analysis (CEA)?
2. What is does it mean to annualize a cost estimate of a particular ingredient?
3. What does induced costs refer to?
4. What does shadow pricing refer to?
5. In what ways does cost analysis improve an impact evaluation?

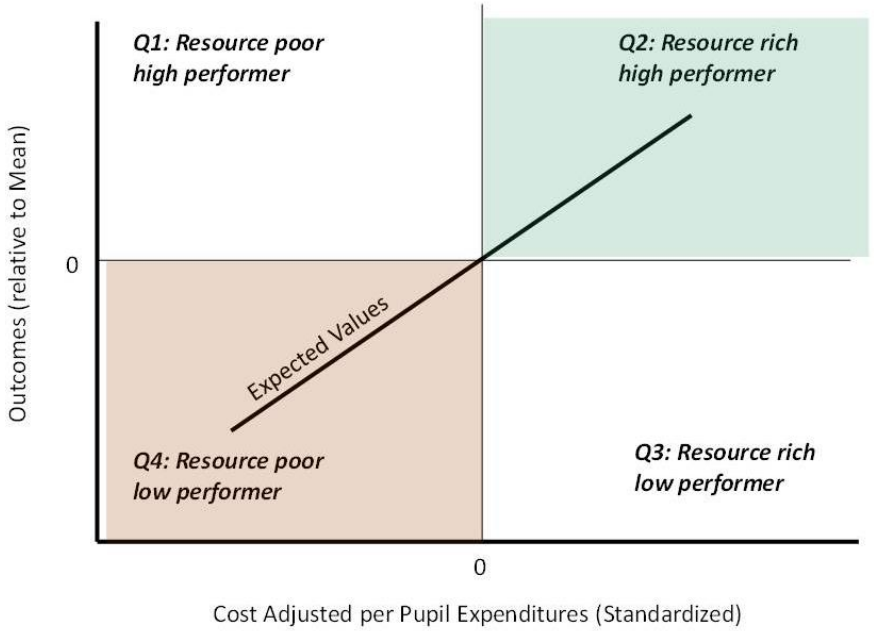
We can measure cost and "outcomes" at the school level and create a scatter plot showing different "school-level effectiveness-cost ratios"

But first a quick note about "productivity" in education

$$\text{"Productivity"} = \text{"efficiency"} = \frac{\text{Outcomes}}{\text{Spending per student}}$$

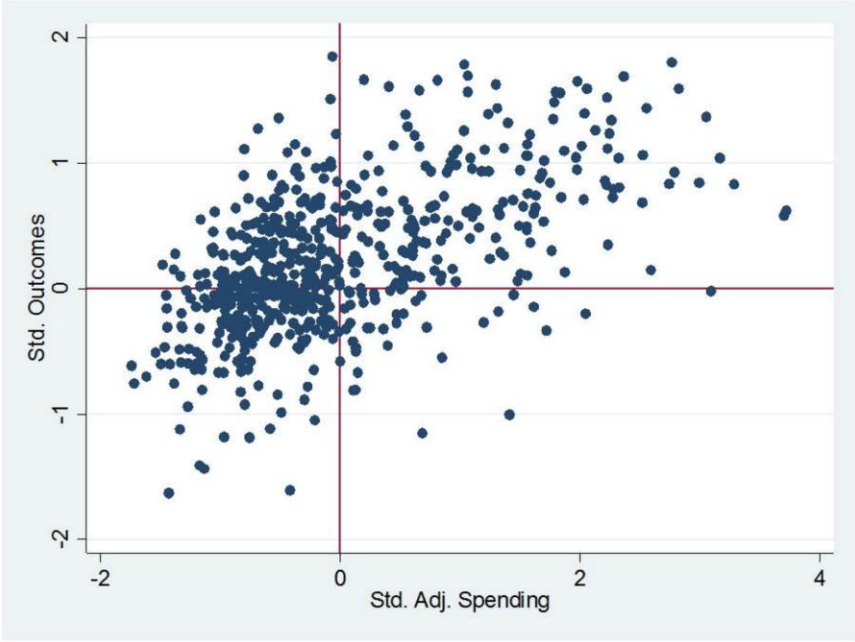
We can measure cost and “outcomes” at the school level and create a scatter plot showing different “school-level effectiveness-cost ratios”

But first a quick note about “productivity” in education



Small Group Activity: Tradeoffs in School Budgets

But first a quick note about “productivity” in education



We can measure cost and “outcomes” at the school level and create a scatter plot showing different “school-level effectiveness-cost ratios”

But first a quick note about “productivity” in education

Imagine you are a school that is high spending but has high outcomes (the green happy face).

We can measure cost and “outcomes” at the school level and create a scatter plot showing different “school-level effectiveness-cost ratios”

But first a quick note about “productivity” in education

Your goal is to move from the green happy face, over to the green sunglasses happy face.

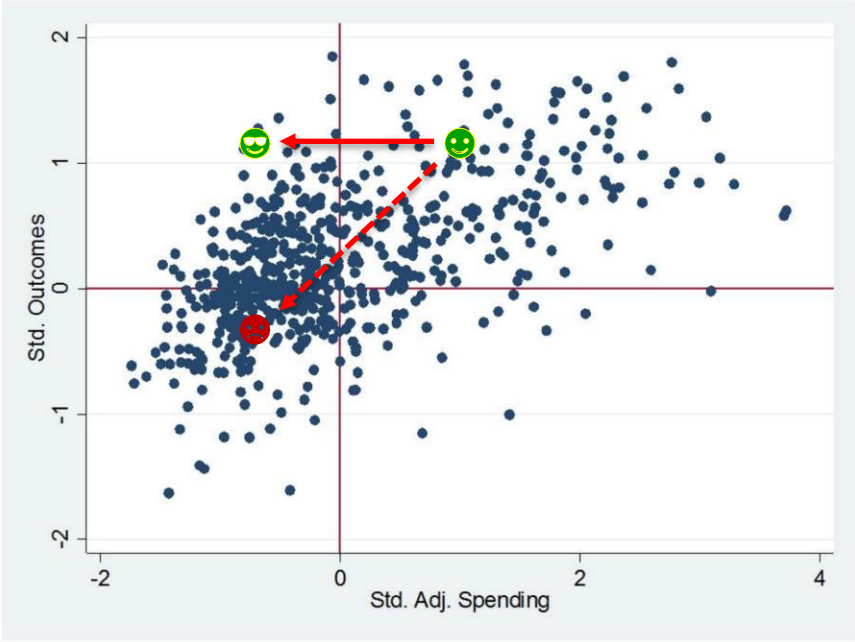
[Cut spending without reducing outcomes]

We can measure cost and “outcomes” at the school level and create a scatter plot showing different “school-level effectiveness-cost ratios”

But first a quick note about “productivity” in education

You want to avoid cutting resources that would move you to the red frowny face.

[Cutting spending but reducing outcomes; honor equity]



Belfield and Bowden (2019) article

Six domains in which cost analysis can contribute to educational evaluation

1. Outcome specification
2. Treatment contrast
3. Implementation fidelity
4. Role of mediators
5. Statistical vs. economic power
6. Meta analysis

Belfield and Bowden (2019) article

Six domains in which cost analysis can contribute to educational evaluation

1. Outcome specification: test scores vs. behavior changes
2. Treatment contrast: what is the control group
3. Implementation fidelity: did the intervention take place as planned
4. Role of mediators: the why (e.g., vouchers or “mediated service interventions”
5. Statistical vs. economic power: MDES vs. MCES
6. Meta analysis: an average of good and bad studies and good and bad interventions