Tutoring: Supplemental computer-assisted instruction for struggling readers

Pre-K to 12 Education

Benefit-cost estimates updated December 2019. Literature review updated June 2016.

Current estimates replace old estimates. Numbers will change over time as a result of model inputs and monetization methods.

The WSIPP benefit-cost analysis examines, on an apples-to-apples basis, the monetary value of programs or policies to determine whether the benefits from the program exceed its costs. WSIPP's research approach to identifying evidence-based programs and policies has three main steps. First, we determine "what works" (and what does not work) to improve outcomes using a statistical technique called meta-analysis. Second, we calculate whether the benefits of a program exceed its costs. Third, we estimate the risk of investing in a program by testing the sensitivity of our results. For more detail on our methods, see our Technical Documentation.

Program Description: We included computer assisted instruction that was a supplement rather than a replacement for regular instruction. Studies that were focused exclusively on special education populations were excluded. Of the four studies that we included, three were evaluations of Fast ForWord and one was an evaluation of FLASH. On average, the reviewed programs required 4.03 hours of teacher time per student, and effects were reported after one school year.

Benefit-Cost Summary Statistics Per Participant

Benefits to:

Taxpayers	$1,083
Participants	$2,545
Others	$1,343
Indirect	($285)
Total benefits	$4,686
Net program cost	($571)
Benefits minus cost	$4,115

Benefit to cost ratio	$8.21
Benefits minus costs	$4,115
Chance the program will produce benefits greater than the costs	60 %

The estimates shown are present value, life cycle benefits and costs. All dollars are expressed in the base year chosen for this analysis (2018). The chance the benefits exceed the costs are derived from a Monte Carlo risk analysis. The details on this, as well as the economic discount rates and other relevant parameters are described in our Technical Documentation.

Detailed Monetary Benefit Estimates Per Participant

Benefits from changes to:[1]	Benefits to:				
	Participants	Taxpayers	Others[2]	Indirect[3]	Total
Labor market earnings associated with test scores	$2,545	$1,083	$1,343	$0	$4,971
Adjustment for deadweight cost of program	$0	$0	$0	($285)	($285)
Totals	$2,545	$1,083	$1,343	($285)	$4,686

[1]In addition to the outcomes measured in the meta-analysis table, WSIPP measures benefits and costs estimated from other outcomes associated with those reported in the evaluation literature. For example, empirical research demonstrates that high school graduation leads to reduced crime. These associated measures provide a more complete picture of the detailed costs and benefits of the program.

[2]"Others" includes benefits to people other than taxpayers and participants. Depending on the program, it could include reductions in crime victimization, the economic benefits from a more educated workforce, and the benefits from employer-paid health insurance.

[3]"Indirect benefits" includes estimates of the net changes in the value of a statistical life and net changes in the deadweight costs of taxation.

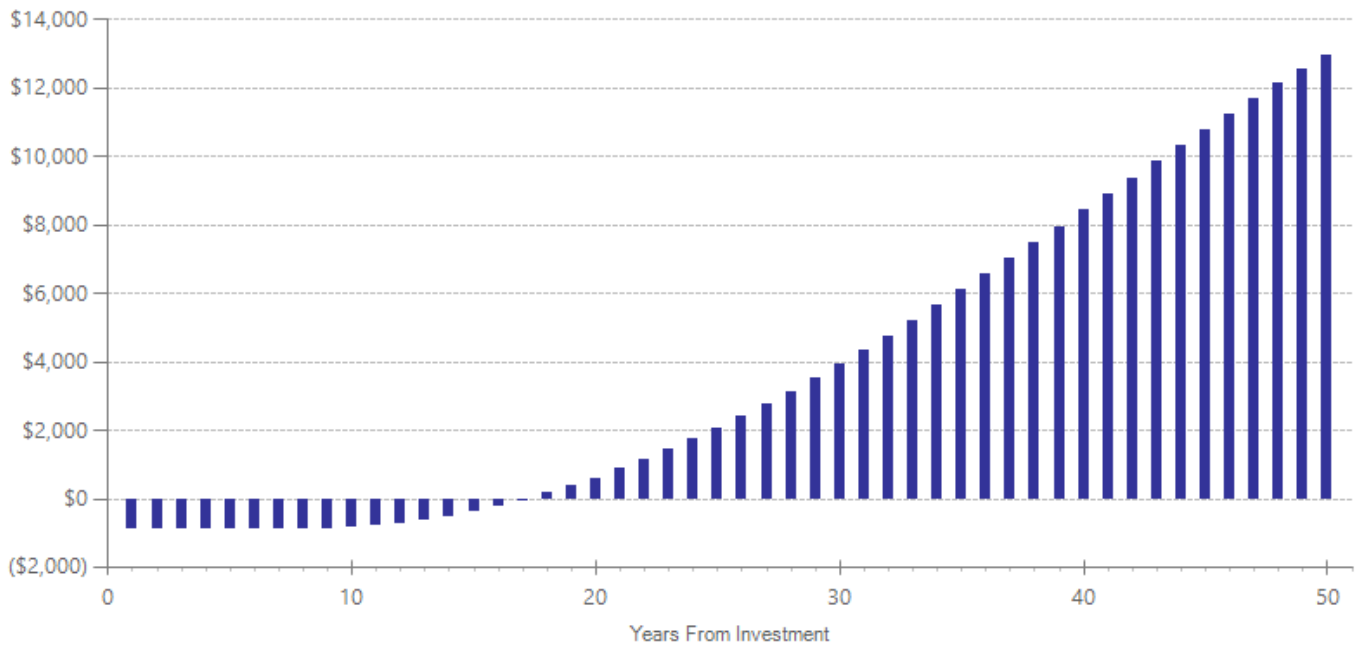
Detailed Annual Cost Estimates Per Participant

	Annual cost	Year dollars	Summary	
Program costs	$535	2013	Present value of net program costs (in 2018 dollars)	($571)
Comparison costs	$0	2013	Cost range (+ or -)	50 %

In this review, studies reported the effect of one year of the program. The cost of the supplemental computer assisted instruction can vary widely based on the number of students in each school using the program and the number of students using the program at one time. The interventions included in this review required an average of 4.03 hours of teacher time per student. The per student staff costs were calculated by multiplying the staff hours/student by the hour rate of a K-8 teacher in 2013 (https://www.k12.wa.us/safs/PUB/PER/1314/tbl34.pdf). We estimated that the per student licensing cost was $210 per student for a program like Fast ForWord in 2016 based on a school license of $21,000 assuming that 100 students in each school use the program (personal communication with Gayle Davies, Scientific Learning, March 30, 2016).

The figures shown are estimates of the costs to implement programs in Washington. The comparison group costs reflect either no treatment or treatment as usual, depending on how effect sizes were calculated in the meta-analysis. The cost range reported above reflects potential variation or uncertainty in the cost estimate; more detail can be found in our Technical Documentation.

Detailed Annual Cost Estimates Per Participant



The graph above illustrates the estimated cumulative net benefits per-participant for the first fifty years beyond the initial investment in the program. We present these cash flows in non-discounted dollars to simplify the "break-even" point from a budgeting perspective. If the dollars are negative (bars below $0 line), the cumulative benefits do not outweigh the cost of the program up to that point in time. The program breaks even when the dollars reach $0. At this point, the total benefits to participants, taxpayers, and others, are equal to the cost of the program. If the dollars are above $0, the benefits of the program exceed the initial investment.

Meta-Analysis of Program Effects

Outcomes measured	Treatment age	No. of effect sizes	Treatment N	Adjusted effect sizes and standard errors used in the benefit-cost analysis						Unadjusted effect size (random effects model)	
				First time ES is estimated			Second time ES is estimated				
				ES	SE	Age	ES	SE	Age	ES	p-value
Test scores	9	4	326	0.047	0.089	9	0.028	0.098	17	0.136	0.317

Meta-analysis is a statistical method to combine the results from separate studies on a program, policy, or topic in order to estimate its effect on an outcome. WSIPP systematically evaluates all credible evaluations we can locate on each topic. The outcomes measured are the types of program impacts that were measured in the research literature (for example, crime or educational attainment). Treatment N represents the total number of individuals or units in the treatment group across the included studies.

An effect size (ES) is a standard metric that summarizes the degree to which a program or policy affects a measured outcome. If the effect size is positive, the outcome increases. If the effect size is negative, the outcome decreases.

Adjusted effect sizes are used to calculate the benefits from our benefit cost model. WSIPP may adjust effect sizes based on methodological characteristics of the study. For example, we may adjust effect sizes when a study has a weak research design or when the program developer is involved in the research. The magnitude of these adjustments varies depending on the topic area.

WSIPP may also adjust the second ES measurement. Research shows the magnitude of some effect sizes decrease over time. For those effect sizes, we estimate outcome-based adjustments which we apply between the first time ES is estimated and the second time ES is estimated. We also report the unadjusted effect size to show the effect sizes before any adjustments have been made. More details about these adjustments can be found in our Technical Documentation.

Citations Used in the Meta-Analysis

Borman, G.D., Benson, J.G., & Overman, L. (2008). A randomized field trial of the Fast ForWord language computer-based training program. *Educational Evaluation and Policy Analysis, 31*(1), 82-106.

Fuchs, L.S., Douglas, F., Carol, L.H., Sarah, R.P., Andrea, M.C., & Pamela, M.S. (2006). The effects of computer-assisted instruction on number combination skill in at-risk first graders. *Journal of Learning Disabilities, 39*(5), 467-475.

Rouse, C.E., & Krueger, A.B. (2004). Putting computerized instruction to the test: a randomized evaluation of a "scientifically based" reading program. *Economics of Education Review, 23*(4), 323-338.

Slattery, C.A., & Widener University. (2003). *The impact of a computer-based training system on strengthening phonemic awareness and increasing reading ability level.*

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