



NATIONAL COMPREHENSIVE CENTER
FOR **TEACHER QUALITY**

Conducting a Cost Analysis for Educational Policies: **Teacher Effectiveness**

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INTRODUCTION

Applying cost-analysis methods in education can help states determine whether federal, state, and local dollars are being spent wisely. Cost analysis involves evaluating the costs of programs, innovations, policies, and projects in relation to the outcomes that result from them. The goal of cost analysis is to reach the desired outcomes while spending the least amount of money.

Many studies have suggested that money is a necessary, but not sufficient, factor in improving educational outcomes (e.g., Elliott, 1998; Ferguson & Ladd, 1996; Hanushek, Kain, & Rivkin, 1998). Decision makers need to understand how funds are targeted and what results can be reasonably associated with that spending. This overview of cost-analysis tools introduces policymakers to key terms and ideas about how to determine the impact of funds on desirable outcomes. In addition, the overview describes approaches to estimating the impact of spending in an effort to help states evaluate their spending and get the most “bang for the buck.”

APPROACHES TO COST ANALYSIS IN EDUCATION

In recent years, ensuring that all teachers are highly qualified for the classes they teach has been a key federal priority. Now that most teachers are highly qualified, there is increased emphasis on teacher effectiveness. States and districts are strategizing on ways to increase, measure, and reward teacher effectiveness. All of these activities require targeted spending, but how can states and districts ensure that they are making the most of their resources?

According to Levin and McEwan (2001), cost analysis in education consists of four different approaches: cost-effectiveness, cost-feasibility, cost-utility, and cost-benefit. District and state education leaders would be most likely to use cost-feasibility and cost-effectiveness analyses.

These cost-analysis tools are likely to be useful in the following circumstances:

- **Cost-feasibility.** This analysis is used when the goal is to reward effective teachers and determine whether the budget can support various types and levels of rewards.
- **Cost-effectiveness.** This analysis is used when the goal is to determine which of two alternatives is associated with the most improvement in overall student achievement: performance pay for effective teachers (those who raise student achievement) versus investing money in afterschool programs for at-risk students.





Table 1 illustrates how these approaches might be used in practice.

Table 1. Types of Cost Analyses

Type of Analysis	Description	Purpose/Uses	Cautions	Example
Cost-feasibility	<p>Assists in deciding whether a particular policy or program can reasonably be implemented, given funding streams and budget limitations.</p> <p>Does not consider outcomes, only initial costs and costs to sustain programs or policies for some period of time.</p>	<p>Rule out alternatives that are too costly.</p> <p>Compare alternatives based solely on the cost to implement and sustain them, not on outcomes.</p>	<p>Cannot be used to judge the worth of a project in terms of outcomes (like student achievement).</p> <p>Only as accurate as the cost estimates used to determine feasibility. If faulty figures are used, the results will be misleading.</p>	<p><i>Objective:</i> Reward effective teachers. Before considering which types of rewards to put into place and at what levels, education leaders must first determine whether their budget can support various types and levels of rewards. Questions to ask include the following:</p> <ul style="list-style-type: none"> • How much funding is currently available for awards? • Is that amount sufficient for <i>all</i> eligible teachers to receive rewards? • Is the funding sustainable over time? • What is the cost of implementation?
Cost-effectiveness	<p>Measures the value (in dollars) of resources relative to effectiveness as measured by progress on a specific objective (i.e., student achievement, teacher retention, change in teacher practices).</p> <p>May be expressed as a ratio in which the denominator is an outcome such as student achievement and the numerator is the cost associated with particular levels of that outcome.</p>	<p>Compare alternative strategies when there is only one objective.</p> <p>Compare strategies when there are only a few objectives.</p>	<p>Difficult to interpret results when there are several measures of effectiveness.</p> <p>Only useful when comparing alternatives for a specific objective.</p>	<p><i>Objective:</i> Determine which alternative program is associated with the greatest improvement in overall student achievement:</p> <ul style="list-style-type: none"> • Rewarding teachers for gains in student achievement. • Investing money in afterschool programs for at-risk students. • Providing targeted professional development aimed at improving instructional practice. <p>When using the same dollar amount for each program in comparable schools or districts, which of the alternatives correlates with better achievement results over a specified period of time?</p>

Educational policies and programs require an innovative, conceptual approach to costing because many resources and outcomes resist numeric values (Monk & King, 1993). Three aspects of costs need to be accurately assessed to ensure that the analysis yields valid results: time, context, and resources (Levin & McEwan, 2001; Monk & King, 1993).

Time

Costs are not fixed over the course of time. The cost for the first year of implementation of a program may be considerably different from the cost in subsequent years. Multi-year program costs should be annualized along with an analysis of discount and inflation effects.

Context

Context needs to be well understood because educational interventions that work in one community may not be as effective or efficient in another community. Context can affect the costs and outcomes (Monk & King, 1993). Also, state or district support may vary for local reforms. For example, political associations among groups can influence communication and the costs of training (Tsang, 1997). Context also mediates the interaction among resources, causing variability and possibly uncertainty. For example, a study by Duncombe and Yinger (1997) considered the many challenges associated with improving educational outcomes in urban areas, including a lack of appreciation for the high cost of educating students in central cities and how to ensure efficiency (i.e., ensure that dollars spent actually worked to improve student learning).

Resources

An analysis of resources is time-intensive but critically important for cost analysis. One approach to calculating the costs of resources is the “ingredients” approach, a comprehensive method proposed by Levin and McEwan (2001). Ingredients include the following:

- Personnel (teachers, support staff, aides, administrators, cafeteria workers, maintenance staff, counselors, mentors, coaches, consultants, special education service providers, curriculum supervisors, union representatives, and those providing various services from the district)
- Facilities (classrooms, computer labs, shared spaces, buildings, grounds, heating/cooling, lighting, repairs, maintenance, and cleaning)
- Equipment and materials (desks, chairs, white boards, curricular materials, computers, books, recreational equipment)
- Other program inputs (dollars, data, data analysts, evaluators, consultants, project managers)
- Required client inputs (“donated time” from teachers, students, parents, and other staff)

Ingredients should be estimated by gathering information on market prices (e.g., the hourly cost of personnel to implement a program or construct a database). However, there are many other less obvious resources such as “donated” teacher time (the extra time teachers spend working outside their contract hours), parental involvement, and opportunity costs.





Opportunity costs are the costs associated with doing one thing instead of the “next best thing.” For example, asking teachers to invest their time in lesson study with colleagues must be compared with the other activities that the teachers could be doing instead that might improve educational outcomes. Levin and McEwan (2001) explain opportunity costs as follows:

Every intervention uses resources that can be utilized for other valued alternatives. For example, a program for raising student achievement will require personnel, facilities, and materials that can be applied to other educational and noneducational endeavors. If these resources are used in one way, they cannot be used in some other way that may also provide useful outcomes....The value of what is given up or sacrificed represents the cost of an alternative. Accordingly, the “cost” of pursuing the intervention is what we must give up by not using these resources in some other way....It is this notion of opportunity cost that lies at the base of cost analysis in evaluation. (p. 44)

For instance, in an effort to improve teacher effectiveness, professional learning communities are implemented in schools. The opportunity cost is what the teachers could be doing instead (e.g., other forms of professional development, taking graduate courses, or working directly with struggling students).

MEASURING OUTCOMES

Teacher effectiveness can be defined in many different ways, depending on local preferences or legislation. However, it is not always possible to measure important outcomes directly. In states where teachers are not linked to individual student achievement scores, it may be impossible to use value-added or other types of growth models to determine teachers’ contributions to student achievement. In these cases, proxies must be used. For example, easily measured proxies for student success (e.g., graduation rates or the school-level percentage of students achieving mastery) may be used, but these may be poor substitutes for direct measures of student learning (for a discussion of proxies, see Hummel-Rossi & Ashdown, 2002).

UNINTENDED CONSEQUENCES

In the famous Perry Preschool Study, the researchers found that preschool participation for at-risk children had a positive impact on their engagement with school, behavior, and risk for delinquency well into their teen years (Farnworth, Schweinhart, & Berrueta-Clement, 1985). These far-reaching consequences were not predicted, but they were certainly welcomed. The Perry Preschool Study illustrates an important lesson for using cost-analysis tools: there may be consequences far beyond those intended. For participants in the Perry Preschool Study, the consequences were positive, but that is not always the case. For example, at a cost of more than \$1 billion, California implemented class-size reduction in Grades K–3. An unintended consequence was that newly created openings in wealthier schools were quickly filled with teachers transferring from high-poverty schools, and many of those openings were then filled with inexperienced, uncredentialed teachers working on emergency permits. Thus, gains in achievement made in wealthy schools came at a cost to students in less advantaged schools (Harris & Plank, 2000).

INTERACTION EFFECTS

Cohen and Ball (1999) offer a theory about instructional improvement based on the interactions among resources, rather than the introduction of new curriculum or instructional methods. Cohen and Ball suggest focusing on the “interactions among teachers and students around educational material” rather than focusing on curriculum or teaching in isolation (p. 2). Similarly, cost-analysis tools should consider how the new interventions or strategies they seek to fund will interact with existing resources (e.g., teachers and students). Improving teacher effectiveness may require multiple strategies working in concert—interacting—to produce improved student learning. For example, combining professional development with release time for teachers to implement strategies they learned and to observe or be observed by peers or coaches as they use those strategies, is likely to produce a greater impact than professional development without the additional resources.

Cost analysis can be extremely useful for determining whether funds are spent in ways that improve teaching and learning. However, it must be undertaken with great care to ensure valid results. The actions and recommendations in Table 2 may be used to guide the process of designing and conducting cost-benefit, cost-utility, or cost-effectiveness analyses.

Table 2. Recommendations for Using Cost-Analysis Tools*

Action Step	Recommendation
Define the scope.	Clearly articulate the goals of the evaluation.
Analyze costs.	Use the ingredients approach proposed by Levin and McEwan (2001).
Identify alternatives.	Refer to existing practice or reasonable alternatives.
Estimate program effects.	In addition to quantitative analysis, make sure to include qualitative and unintended outcomes, both positive and negative.
Distribute consequences.	Assign all types of costs and effects to appropriate parties.
Analyze time effects.	Annualize costs, consider inflation, and discount costs over time.
Apply decision rule (i.e., base decision to proceed on the set of findings from the previous action steps).	Cost analysis is an important source of information in decision-making but not sole criterion. The cost-utility of an intervention as well as interaction effects and unintended consequences also should be considered.
Document findings.	Report the process and findings for future reference.

*Adapted from “The State of Cost-Benefit and Cost-Effectiveness Analyses in Education” by Barbara Hummel-Rossi and Jane Ashdown in *Review of Educational Research*, 72(1), pp. 1–30. Copyright © 2002. *Review of Educational Research*. Used with permission.





To better illustrate how cost-analysis tools might be used, Zahorik, Molnar, Ehrle, and Halbach (2000) conducted a study that focused on reduced-size classrooms in Wisconsin, comparing teachers whose students gained more on achievement tests with teachers whose students gained less. Participants in the Student Achievement Guarantee in Education program had class sizes reduced to 15 students in 300 first-grade classrooms. After identifying high- and low-achieving classrooms, observers visited classrooms and observed teacher practices. They found that there were distinct differences in practices that might help explain achievement results. Table 3 applies the recommendations from Table 2 to the study conducted by Zahorik et al. and illustrates how a cost-effectiveness analysis might be conducted.

Table 3. An Illustration of the Practical Application of Cost-Effectiveness Analysis

Action Step	Recommendation
Define the scope.	The research focused on teacher practices. Although there are many factors that could contribute to differences in student achievement, the authors limited their study to teacher practices. The act of limiting the scope of a study to what is most important is crucial, and Zahorik et al. chose a variable that could conceivably be improved (perhaps through professional development focused on changing teacher practices).
Analyze costs.	Zahorik et al. could have analyzed costs by calculating the additional dollars spent per student and determining how much additional achievement was bought with those dollars. The study did find that achievement was higher for students in smaller classes, but it did not specify the cost.
Identify alternatives.	When the goal is improving student achievement, there are a number of possible interventions that might work, including improving teaching practices with or without reducing class size. Thus, a reasonable alternative strategy would be to simply provide professional development designed to improve teacher practices. Such a strategy would be considerably less expensive than reducing class size. Yet another alternative would be to do both—provide professional development and reduce class size. It would be possible to conduct a study that includes all of these alternatives and compare the cost-effectiveness of the strategies.
Estimate program effects.	Zahorik et al. had reason to believe that class-size reduction might improve student achievement, based on published research, and they also may have been aware of research on teacher practices that affect student achievement. Using prior research to guide the design of the intervention makes it possible to better estimate the potential learning differences that might result.
Distribute consequences.	Many factors may have an impact on student outcomes, and it is important to accurately identify what part of the outcomes can—and cannot—be associated with the intervention. In addition, there are intended and unintended consequences that must be considered, such as the need to hire many more teachers resulting in hiring less-qualified teachers, which in turn affects student outcomes.
Analyze time effects.	The costs of class-size reduction are high because of the need to hire more teachers and build more classrooms, but there may be long-term gains for students, the teaching profession, and society (for a discussion of these factors, see Witte, 2000).
Apply decision rule.	What is the value to students and society of reduced class sizes? There is considerable evidence that economically disadvantaged students benefit most from class-size reduction—in achievement and behavior, as well as teacher and parent satisfaction—and spending focused on this group of students may be easier to justify than across-the-board spending on class-size reduction.
Document findings.	Zahorik et al. have contributed substantially to what is known about the relationship of teacher practices to student achievement in reduced-size classes. Although they did not calculate student achievement gains per dollar spent, it would be possible to do so in a related study. Such findings can inform states and districts in the decision-making process and allow them to refine their targets and interventions to capitalize on their resources.

Finally, although cost analysis is useful for deciding which strategies to use, it should not constitute the sole basis for decision making (Hummel-Rossi & Ashdown, 2002; Levin & McEwan, 2001). Hummel-Rossi and Ashdown (2002) urge caution, noting that, "...societal values, such as equal opportunity for learning and developing high student self-esteem, may not always be consistent with economic efficiency and, consequently, these values must be weighed against costs" (p. 22). Clearly, teachers' responsibilities go far beyond what is measured in student test scores, and cost analysis may not be able to account for all of the activities in which they are engaged. Teachers help their students to learn more than reading and mathematics; they help them learn to work cooperatively, appreciate diverse viewpoints, and express their creativity. These contributions are not as easy to measure as learning content, and thus are difficult to include in cost calculations.

CONCLUSION

Cost analysis offers a highly useful method to ensure that matters of economic investment in education are handled efficiently. Through cost-effectiveness and cost-feasibility analyses, educators can systematically estimate cost ingredients for a program or policy in relation to effects of time, context, opportunity costs, and interactions among resources while monitoring unintended consequences. This approach is particularly appropriate to assessing the costs and outcomes of programs and policies supporting teacher effectiveness, such as changes to preparation programs, evaluation protocols, or professional development time. At a juncture where resources of people, time, and money are limited, it is essential to examine educational investments and their returns in both fiscal and nonmonetary terms. Policymakers and administrators need to accomplish educational goals resourcefully, balancing the most effective intervention with the most feasible course of action.





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About the National Comprehensive Center for Teacher Quality

The National Comprehensive Center for Teacher Quality (TQ Center) was created to serve as the national resource to which the regional comprehensive centers, states, and other education stakeholders turn for strengthening the quality of teaching—especially in high-poverty, low-performing, and hard-to-staff schools—and for finding guidance in addressing specific needs, thereby ensuring that highly qualified teachers are serving students with special needs.

The TQ Center is funded by the U.S. Department of Education and is a collaborative effort of ETS, Learning Point Associates, and Vanderbilt University. Integral to the TQ Center's charge is the provision of timely and relevant resources to build the capacity of regional comprehensive centers to help states effectively implement state policy and practice by ensuring that all teachers meet the federal teacher requirements of the 2001 reauthorization of the Elementary and Secondary Education Act (ESEA).

The TQ Center is part of the U.S. Department of Education's Comprehensive Centers program, which includes 16 regional comprehensive centers that provide technical assistance to states within a specified boundary and five content centers that provide expert assistance to benefit states and districts nationwide on key issues related to ESEA.



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