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Anthony Villar and Michael Strong
New Teacher Center, University of California, Santa Cruz

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Is Mentoring Worth the Money? A Benefit-Cost Analysis and Five-Year Rate of Return of a Comprehensive Mentoring Program for Beginning Teachers

Anthony Villar
Michael Strong

This study describes a benefit-cost analysis of a comprehensive mentoring program for beginning teachers conducted in a medium-sized California school district. Using actual program cost information and data on student achievement, teacher retention, and mentor evaluations, the authors performed a benefit-cost analysis to determine whether comprehensive mentoring for beginning teachers makes financial sense. The data showed that, contrary to expectations, increases in teacher effectiveness yielded greater savings than the reduction in costs associated with teacher attrition. Overall, the benefit-cost analysis showed that, after five years, an investment of one dollar produces a positive return to society, the school district, the teachers, and the students, and the state almost recovers its expenses. Implications are drawn for both education and public policy.

Introduction

Most states mandate, and several also fund, some form of support for new teachers during their period of induction into the profession (Education Week, 2004). Over the past 15 years, the type of support that school districts have most often chosen to provide is mentoring by a veteran teacher (Fideler & Haselkorn, 1999). Mentoring programs take many different forms, ranging from informal buddy systems to intensive models with fully released, highly trained mentors. In spite of existing evidence that mentoring programs in general may have a beneficial effect on teacher retention (Colbert & Wolff, 1992; National Commission on Teaching & America's Future, 1996; Odell & Ferraro, 1992; Pearson & Honig, 1992, Strong & St. John, 2001), and even on student achievement (Fletcher, Strong & Villar, 2008; Strong, Fletcher, & Villar, 2004), school district administrators often balk at the apparent high cost of mentoring programs, especially the intensive versions where resources are required for recruitment, training, and hiring teacher replacements for veteran mentors. Their decisions on program choice are made, by necessity, without recourse to information about the potential returns on investment in mentoring. Legislators, also, are interested in understanding the potential returns on educational investments, since often a financial justification is needed to pass costly reforms.

Until now there have been no benefit-cost studies of mentoring programs for beginning teachers that can provide legislators, educational administrators, and program leaders with the kind of economic information they need for informed decision making. Benefit-cost analysis is an analytic tool used by economists to measure the life cycle costs and benefits of competing alternative approaches, expressing value in monetary terms. Gramlich (1998) notes:

> Benefit cost analysis is a framework for organizing thoughts, or considerations: nothing more nothing less. For any real world choice, there will always be some considerations that cannot be easily enumerated or evaluated, where the analysis becomes quite

Anthony Villar is an Associate Researcher, Division of Social Sciences, at the University of California, Santa Cruz, New Teacher Center. Email avillar@ucsc.edu. Michael Strong is the Research Director at the University of California, Santa Cruz, New Teacher Center. Email mastrong@ucsc.edu. The authors would like to thank Carlos Dobkin, Assistant Professor of Economics at UC Santa Cruz, Jennifer Imazeki, Associate Professor of Economics at San Diego State University, Rebecca London, Lecturer in Sociology at UC Santa Cruz, and David Henderson, a research fellow with the Hoover Institution and Associate Professor of Economics at the Naval Postgraduate School in Monterey, California for their valuable feedback on earlier drafts of this paper.

> conjectural. Benefit cost analysis does not, and should not, try to hide this uncertainty.

Benefit-cost analyses, simply stated, estimate the financial benefits of a given course of action against the actual costs, and use the resulting balance to guide decision making. Costs are either onetime or ongoing. Benefits are most often received over time. In its simple form, benefit-cost analysis is carried out using only actual financial costs and financial benefits. A more sophisticated approach attempts also to put a financial value on intangible costs and benefits, a process that can be highly subjective.

We do not intend to contribute to arguments regarding the morality of adopting benefit-cost practices. Rather, we take the perspective that one may employ the economic practice of benefit-cost analysis to enable educational decision makers to evaluate the merits of an intervention (in this case comprehensive mentoring support for beginning teachers) with regard to its potential return on investment, under the assumption that no moral or ethical principle is violated. Most people, if asked whether teachers should receive the support of a trained mentor during their first two years in the classroom, would probably vote in favor. This article provides the analysis to demonstrate whether it also makes financial sense to the district, state, and to society.

Background and Literature Review

Since nobody has yet performed a benefit-cost analysis of mentoring programs for beginning teachers, our literature review is necessarily restricted. Over the past 10 years other specific areas of education have been examined for their benefit-cost relationships. For example, Heaton and Throsby (1998) looked at the flow of foreign postgraduates studying in Australia; Lambur, Rajgopal, Lewis, Cox, & Ellerbrock (2003) studied the costs and benefits of nutrition education programs in the state of Virginia; Whalen and Wright (1999) examined web-based training and estimated the number of students needed to recover costs over a five-year period; Daneshvary and Clauretie (2001) estimated the relative costs and benefits of year-round versus traditional educational programs; and a number of studies have been conducted over the years to examine the investment value of preschool programs and early childhood care. These studies include The Abecedarian Program (Masse & Barnett, 2002); the Chicago Child-parent Centers (Fuerst & Fuerst, 1993); and the Perry Preschool Program (Barnett, 1985). There is also literature covering the return on investment of training programs in general (Munoz & Munoz, 2000). The existence of studies such as these serves to legitimize this kind of analysis for educational interventions.

Hummel-Rossi and Ashdown (2002) surveyed the then current state of cost-benefit analysis in education. Their article is important for several reasons. First, they make a case for applying economic analyses to evaluate educational interventions. Second, they lay out clearly the methodological issues that are critical to cost-effectiveness studies in education, emphasizing the complexities inherent in assessing the inputs and outputs of education compared with other public policy fields such as hospital admission procedures or child support collection. Third, they discuss the seminal cost-benefit analysis that has been done in education, that of the Perry Preschool Program (Barnett, 1985), and review four cost-effectiveness educational studies, as well as relevant literature from benefit-cost work in other fields. Their emphasis on cost-effectiveness studies rather than benefit-cost analysis does not fit squarely with our needs, since we are not seeking to choose whether to make an investment by measuring the relative cost-effectiveness of different programs, rather we are interested in weighing the costs and benefits of a single educational intervention in order to determine whether to invest at all. This was the goal of Barnett (1985) in his study of the Perry Preschool Program.

Barnett (1985) was able to design an experimental study whereby three- and four-year- old black children were randomly assigned either to a preschool program or to a control group with no program. Barnett tracked the children through age 19. He compared the costs and benefits for each group including program costs, child care, all education, delinquency and crime, earnings and employment, and welfare. He found a positive net present value of benefits and costs, indicating that the preschool program achieved a positive social investment of up to seven dollars for every taxpayer dollar spent on early education.

In a later study, Masse and Barnett (2002) used a similar experimental design to estimate the long-term return on investment of the Abecedarian Preschool Program, started in North Carolina in the early 1970s. Masse and Barnett isolated the costs of special services offered to the children in high quality programs, and concluded that the average annual cost of the Abecedarian program was about $13,000 per child in 2002 dollars, or about twice the cost of the average Head Start program. Yet even at that high cost, by the time the preschoolers had reached age 21, the benefits outweighed the costs by a factor of four dollars for every dollar spent. Both the Perry and the Abecedarian studies are significant for their longitudinal nature and their experimental design. The Abecedarian study is important because it is a comprehensive program whose costs appear prohibitive. However, when long-term benefits are weighed against those initial high costs, the program is seen to provide a significant return on society's original investment.

The most sophisticated benefit-cost analyses in education are the studies of early childhood services. As with comprehensive mentoring programs for beginning teachers, these programs appear costly, although comparisons with other educational programs can be misleading since the methods for calculating costs may vary and different program characteristics may be included in the analyses (Fraser, 2003). For example, costs may be calculated by averaging the expenditures by a funding source, or by the market prices paid by consumers, or by using the actual costs of delivering the program. Even these more rigorous studies have not taken into account all of the outcomes that might influence the benefit-cost ratios. The Perry Preschool studies, for example, did not consider effects on caregivers' education, parenting skills, well-being, and health (Fraser). Nonetheless, these careful studies demonstrate the gains for children and society that result from preschool programs, and point the way for similar studies to be conducted in other areas of education, while at the same time suggesting a methodology for the studies.

Setting for the Study of a Comprehensive Mentoring Program

State Setting

In 1992 California's legislature created and funded with SB1422 the Beginning Teacher Support and Assessment (BTSA) program. The initial funding of $4 million allowed for 29 programs serving about 7% of California's beginning teachers. Subsequently SB 1266 increased the funding to $11 million covering 72 programs. In 1998, SB 2042 allotted $66 million, which increased to $85 million the following year, thereby funding 120 programs serving 85% of all beginning teachers. As of 2004, all credentialed beginning teachers are eligible to receive support from the BTSA system.

Administered jointly by the California Commission on Teacher Credentialing (CCTC) and the California Department of Education, BTSA proposes to provide an effective transition into teaching, improving students' educational performance, increasing teacher retention rates, and ensuring teachers' professional success, according to the California Standards for the Teaching Profession. The guidelines for programs are comprised of 20 standards set forth by the CCTC (2002a), but allow flexibility within those standards so that there may be considerable variability throughout the state in how they are operationalized.

The New Teacher Project

The New Teacher Project (NTP), founded in 1988, operates as a consortium providing induction support for the Central Coast and Bay Area of California, representing five counties and over 25 independent school districts, serving nearly 1,000 new teachers in K-12 in the most recent year (2005). The relatively large size of the consortium creates opportunities for economies of scale. Program training for new teachers and mentors is organized centrally at the local County Office of Education and offered at two regional sites. The portion of the NTP consortium under investigation in this article represents one district program. Therefore, program ingredients, costs, and benefits are derived only for that portion the participating district represents after establishing total costs and per-teacher expenditures for the entire consortium. As a result, costs reflect some of the advantages of economies of scale derived from participating in the consortium.

Like the larger project, the district program provides direct, comprehensive support for teachers during the first two years of their careers. The program describes itself as having the following features: it selects experienced teachers to be released from the classroom for three to four years to mentor a caseload of 15 new teachers; it provides specific and ongoing training to mentors over the entire period of service; it frames training and work activities collaboratively among mentor cohorts to maximize networking opportunities and facilitate a professional environment and culture; and it informs site administrators about the program parameters, goals, and activities. Over the three- to four-year commitment, mentors are released from all teaching responsibilities and adjunct duties associated with home schools and districts.

Mentors in the consortium during the study period average 20 years of teaching experience and are 68% female. The majority of mentors are white (76%), with Latinos comprising the second largest group (12%); Filipinos, East Indians and non-respondents comprise the remaining 12%. In terms of education, the majority of mentors (56%) possess postgraduate degrees. On average mentors work in four schools within two districts.

Mentors meet with their mentees at least once a week for two hours to observe and coach the new teacher, offer emotional support, assist with short- and long-term planning, design classroom management strategies, teach demonstration lessons, provide curriculum resources, and facilitate communication with the principal. Twice a year mentors formally observe new teachers' planning, teaching, assessing, and adjusting a lesson of the teachers' choice. Drawing from the observed data, teachers address shortcomings in the lesson and redesign the lesson to accommodate what they have learned and adjust working assumptions. Also, mentors and new teachers maintain interactive journals to enhance communication, problem-solve, and reflect.

Monthly seminars are designed to build a support network and ongoing professional dialogue among beginning teachers and all mentors. Mentors organize and conduct seminars according to their specific expertise. Release time is provided to new teachers to observe veteran teachers, plan curriculum, attend professional development meetings, and assess their progress. In addition, a Formative Assessment System — aligned with the beginning teacher's evaluation process and district calendar — guides the ongoing work of the new teacher and mentor, and is informed by content standards and student needs. Programs offering a similar range of features are consistent with Smith and Ingersoll's (2004) highest level of induction support, a level that is enjoyed by less than one percent of the new teachers in Smith & Ingersoll's national sample.

The NTP Induction Program Outcome Line

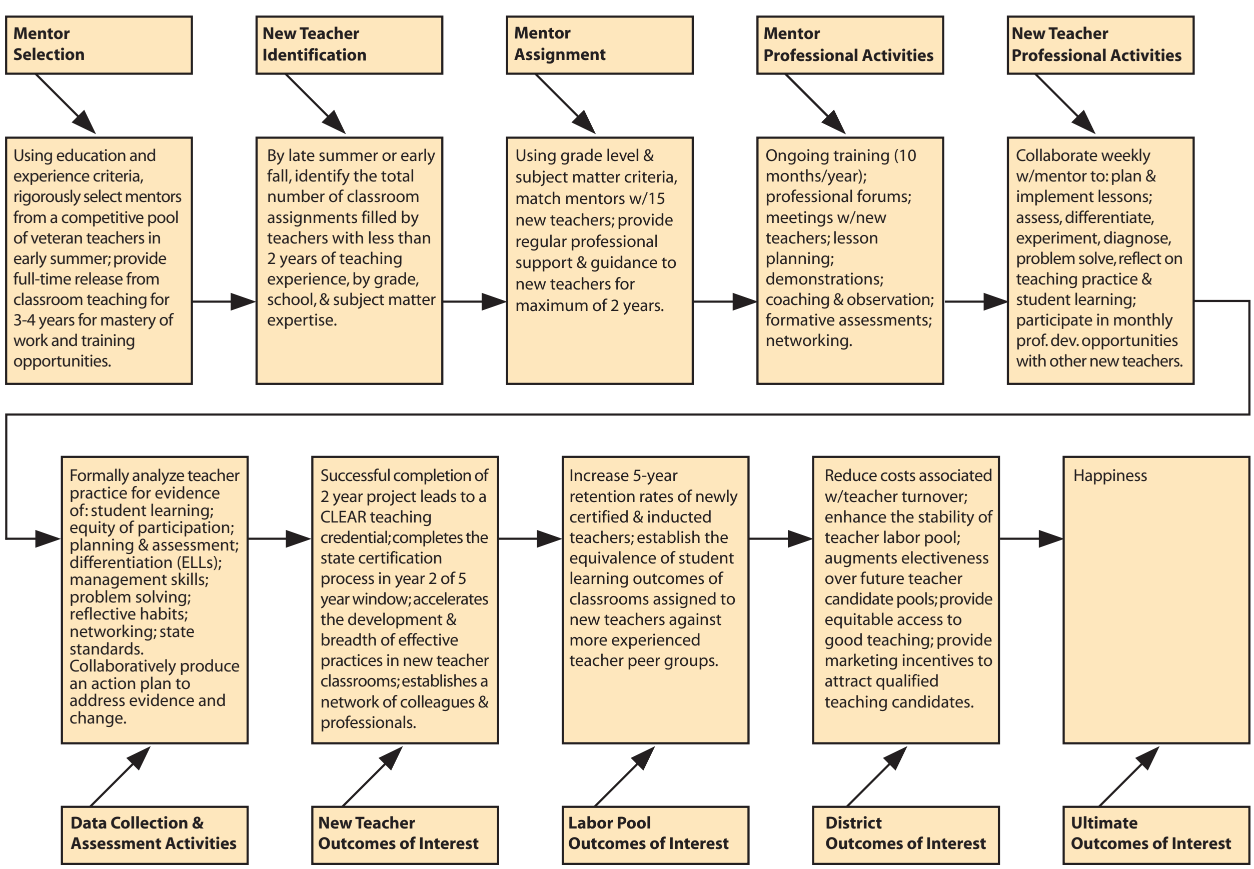
Figure 1 displays the essential details of the program features and outcomes for the NTP in the form of an outcome line whose purpose is to produce a conceptual framework of the induction program solution (after Mohr, 1988, p. 14). These lead to the ultimate desired outcome 'happiness,' which is simply a composite term for the many complex benefits that are likely to unfold as a consequence of lowered teacher turnover, increased labor pool stability, equitable student access to good teaching, and so on.

School District Characteristics, Student Demographics, & Classroom Information

The school district, serving adjacent suburban and semi-rural communities, is comprised of 25 mainstream schools of which 18 are elementary schools, 5 middle schools, and 2 high schools. The district is considered low-achieving relative to state testing measures. Across all elementary grades tested in the district, less than one-third of students managed to test at or above the 50th percentile ranking in reading when aggregated to the district level.

In terms of teacher characteristics, over four-fifths of district teachers (84%) possess full teaching credentials, 11% teach on an emergency credential, 3% are pre-interns and 1% are either on waiver or teach as university interns. Ethnically, teachers are about 80% white, 15% Latino, and 4% Asian. Teachers have steadily averaged about 12 years of total teaching experience and 10 years specifically in the district during the period of study. New teachers, as a percent of the teaching population, have decreased each year from 1999 to 2002 going from a proportion of 19.4% in 1999, to 17.9% in 2000, to 16.2% in 2001, and 14.5% in 2002.

Figure 1: Program Outcome Line for a Full Release Model of New Teacher Induction



The student population is three-quarters Latino, with whites making up a little more than 20%, and three other groups registering about 1% each. Fifty-four percent of students participate in the free or reduced lunch program, 20% higher than the county average rate.

When the sample of elementary students in the study is distributed by assignment and teacher years of service (Figure 2), it is apparent that a significant proportion of students are served by relatively novice teachers. The largest percentages of elementary students in Figure 2 are associated with classroom teachers in their first five years of practice. As a matter of practical relevance, evaluating the program's impact at the elementary level is appropriate, since it is so heavily staffed with novice teachers.

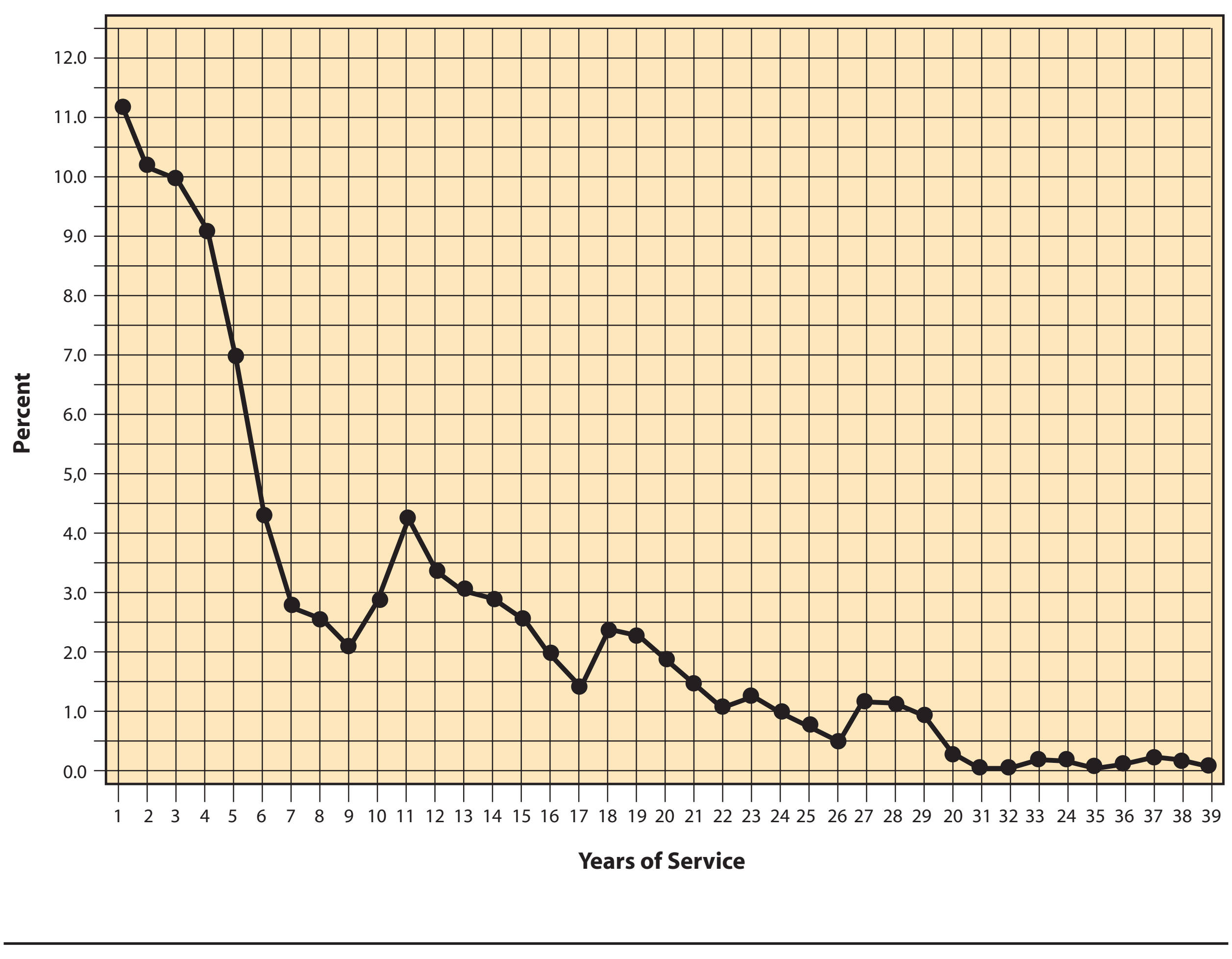
Economic Analysis

The question remains whether the relative cost of a comprehensive mentoring program for new teachers represents a good return on investment, particularly when there are many competing demands for scarce (and declining) school district funds. Most studies of educational interventions investigate the comparative costs of two or more programs, often assuming a similar level of service delivery. In more ambitious instances, programs are analyzed for their effects, establishing a cost per unit of effectiveness. The purpose of this study is not to compare the costs between or among programs. Rather, it is designed to specify costs as they relate to one example of a comprehensive program, measure the effectiveness of the program's intervention, allocate benefits to different constituencies, and weigh them against the costs in order to arrive at a measure of net benefit.

The strategy we provide here for assessing programs recognizes that the monetary estimate of benefits is the most challenging part of the comparison and offers an approach for minimizing some of the more obvious uncertainty, where possible. The question that anchors the economic analysis is: What is the rate of return after five years of a comprehensive model of new teacher induction?

Since education may be considered, in economic theory terms, "both a consumption good that confers immediate benefits and an investment good that confers personal and social benefits well into the future" (Becker, 1964; Have-

Figure 2: Percent of Student Sample Taught by Teacher Years of Experience



man & Wolfe, 1984; Masse & Barnett, 2002), some would suggest that applying the "fundamental principle" of benefit-cost analysis as outlined by Gramlich (1998, p. 41) means that a mentoring program for beginning teachers should be assessed for its net value as a social investment. However, since different constituencies are liable to assess outcomes relative only to their own specific investments in the program, a more practical approach is to assess the net present value of a program from the perspective of the different constituencies that have a stake in the program and who control the decision to invest or not. An analysis of this nature requires three kinds of information: a description of the educational intervention (see above), a full listing of program inputs or ingredients and costs for each, and an estimation of program benefits, based on the program's measured outcomes.

Information on actual expenditures come from the County Office of Education (COE) and the State of California, Department of Education as well as teaching salary schedules for the specific district. Program effects and benefits were generated using data we previously collected regarding teacher retention, student achievement, and mentor development. We set a somewhat arbitrary time parameter of five years for this evaluation although the benefits of the intervention may extend out over the entire career of the teacher and well into the earning years of students.

Components of the Program: Total Ingredients Approach

The main components of organizing and implementing a comprehensive model of new teacher induction fall into five categories: personnel, facilities, equipment and materials, program inputs, and client inputs. Program inputs refer to other expenditures that are integral to the program objectives, such as professional development. Client inputs refer to the contributions that new teachers and principals of new teachers offer in terms of their own time to coordinate and participate in the program.

Inputs, Costs & Per Teacher Costs

We first calculated total inputs and costs for the NTP consortium, and then for the district under analysis which serves approximately 12.3% of the consortium's new teacher population. Using the established per teacher costs of the consortium, they are applied to the proportion of teachers (n=119) supported by the district project, and a cost account of total ingredients is calculated (Table 1).

As can be seen in Table 1, "Total Ingredients Costs" for a district project supporting 119 new teachers are approximately $780,000, representing a per teacher cost of $6,605. Disaggregated by the funding constituencies, the district pays about $274,000 (35%), the state pays about $436,000 (56%) through the BTSA program, and the remaining $76,000, 9%, comes from time inputs imposed on new teachers and site administrators as part of implementing the program. Principals working with new teachers in their schools commit time to new teachers regardless of the presence of mentor induction programs. We rationalized that the amount of time principals dedicate to new teachers in the mentor induction program, clearly a cost, would decline as a result of the program and could be listed as a likely benefit on the other side of the ledger. Similarly, new teachers in the project commit time to participate in the project after school and evenings, times that impose on their available personal time and must be accounted for. As with the conditions for administrators, we anticipate that the benefits outweigh the personal costs of their participation.

Evaluation Design

Mixed Models

A mixed model is required for addressing the various research questions and program outcome data that relate to the valuation of benefits. The two most important sources of data for valuing benefits — new teacher attrition and student achievement data — relate directly to four questions: a) Comparatively, how effective are new teachers as a group when participating in a districtwide comprehensive induction program?, b) How are new teacher classrooms distributed among the most effective classrooms?, c) How, if at all, do new teacher attrition rates change as a result of a district wide induction program for new teachers?, and d) What are the best predictors of student achievement in a district with a comprehensive induction program? Additionally, we draw on survey data reported by district administrators of the corresponding period to compare differences in time spent supervising new teachers. Each question is associated with a different counterfactual question and pursues different methods of analysis. This has implications for the strength of the overall design and the validity of the outcomes.

Student achievement data were organized to answer three of the four questions listed above. Starting with the first question, 'How effective are new teachers as a group?' we organized student achievement data by class over a five-year period. The particular challenges of this evaluation, namely a retrospective time frame for assessment and a lack of control over key assignment variables, forced us to use an ex post facto design to provide us with the best estimates of program impact. Strict assignment to the program and good record keeping allowed us to establish distinct groups that could be compared exclusively with one another, so avoiding many of the threats to validity that would normally be associated with an ex post facto model.

Table 1: District Level Inputs & Total Costs by Constituencies

Ingredients	Project Total Cost	District/Project Cost	State BTSA Project Cost	Contributed Private Inputs	Imposed Teacher & Site Administrator Costs
Personnel:					
Directors Salaries	$ 27,094	$ 10447	$ 16,648		
Coordinator of Prof. Dev.	$ 12,758	$ 4,919	$ 7,839		
Admin. Support	$ 13,340	$ 5114	$ 8,196		
Mentor					
Salaries	$ 569,891	$ 219,740	$ 350,151		
Subtotal Personnel	**$ 623,084**	**$ 240,250**	**$ 382,834**		
Indirect Costs & Services Provided by District:	$ 51,170	$ 19,730	$ 31,440		
Facilities:					
Occupancy					
Storage					
Payroll & Accounting Support					
Electrical & Heating					
Custodial					
Insurance					
Parking					
Security					
Equipment & Materials:					
Office Furnishings					
Computers					
Computing Support/Services					
Internet Access					
Equipment					
Paper					
Telephone/FAX					
Books					
Other Materials					
Subtotal Indirect Costs	**$ 51,170**	**$ 19,730**	**$ 31,440**		
Program Inputs:					
Meeting Facility Rental	$ 811	$ 313	$ 498		
Academics/FAS Trainings	$ 5,677	$ 2,189	$ 3,488		
Substitute Teacher		$ 11,900	$ 4,588		$ 7,312
NTP Teacher Padfolios	$ 9,520	$ 3,671	$ 5,849		
NTP Mentor Padfolios	$ 992	$ 382	$ 609		
Formative Assessment System					
Materials	$ 1,488	$ 574	$ 914		
Copying/Printing	$ 714	$ 275	$ 439		
Supplies	$ 77	$ 30	$ 48		
Mileage Reimbursement	$ 4,403	$ 1,698	$ 2,705		
Subtotal Program Inputs	**$ 35,581**	**$ 13,719**	**$ 21,862**		
Client Inputs:					
New Teacher Personnel Time	$ 57,834				$ 57,834
Principal Coordination Time	$ 18,347				$ 18,347
Subtotal Client Inputs	**$ 76,181**	**$ -**	**$ -**	**$ -**	**$ 76,181**
Total Ingredients Cost	**$ 786,016**	**$ 273,700**	**$ 436,135**	**$**	**$ 76,181**
Per Teacher Costs	**$ 6,605**	**$ 2,300**	**$ 3,665**	**$ -**	**$ 640**

Threats to Internal Validity

According to Campbell and Stanley (1966), threats to internal validity may include non-equivalence, attrition, history, maturation, testing instrumentation, and regression to the mean. For the purposes of this article we will address the only relevant issue, that of non-equivalence.

The issue of non-equivalence raises concern with the comparison of groups. In order to attribute causality at any level of effectiveness, there must be some assurances that the groups being compared are or were equivalent at the beginning of the intervention. In the present design, the two groups of teachers (those with less than two years of experience and those with from 3 to 12 years of experience) are different a priori. An experimental design that randomly selects among all teachers with less than two years of experience for assignment to one of two groups, an induction treatment group and a control group, would be preferable. Absent that possibility, we exploit the differences in experience to construct a method to estimate the program's impact. We argue that the inherent bias works in favor of the more experienced teacher group and against the novice teacher group. Thus we avoid a potential Type 2 error (a mistake that concludes the program is effective when, in fact, it is ineffective), but become vulnerable to a Type 1 error (suggesting a program is not effective when it really is). Consequently, a finding of no difference on program outcomes suggests potential program effects (while allowing no claims of causality).

A second problem of non-equivalency exists relative to the mid-career comparison group (teachers with from 3 to 12 years of experience). Given that the NTP has existed more or less in its present form for some time, some of the mid-career teachers would have started teaching in that district and received the NTP induction support, while others would not. To address this problem, we include only those mid-career teachers who had not previously participated in the NTP program, as determined from the program archives.

Non-equivalency must be addressed also with regard to classroom composition. It is widely reported that classroom assignments tend to favor the more senior teachers (e.g., Finley, 1984). This was evident in the present study looking at class composition in two different ways. Using previous achievement as a measure, we found classrooms assigned to non-participating mid-career teachers started 2.7 points higher (37.1 to 33.4 Normal Curve Equivalents). Looking at the proportion of English Language Learners (ELL) per classroom, we determined that classrooms of new teachers were more densely populated by ELLs (77% to 67%). An analysis of variance on pre-reading achievement ($F = 5.428$, d.f. = 1, $p = .02$) and ELL assignment ($F = 6.716$, d.f. = 1, $p = .01$) demonstrated significant differences between teacher groups. This raises the possibility that estimates of program impact may be biased by these differences, but suggests again that the bias is in favor of the comparison group rather than the new teachers

Analysis of Variance of New Teacher Effectiveness

The counterfactual question associated with new teacher effectiveness, expressed in terms of student achievement gains is: How effective would new teachers be in the absence of the induction program? Because the program reaches all new teachers, we do not have an available nonsupported group of new teachers for comparison.

Alternatively, we can compare the effectiveness of the new teachers with that of more experienced teachers in the district, by looking at their respective student achievement gains. However, to do this we must assume that, absent the program, the achievement gains of classrooms taught by new teachers would be, a priori, significantly less than their mid-career or veteran teaching peers. While not an ideal condition for evaluating a program's effectiveness, this assumption is necessary because the saturation of the program over its lifetime eliminated any possibility of a zero-induction condition for new teachers for establishing a true control group.

Even so, there are limits to the controls we are able to create. The use of achievement gain scores aggregated to create value-added measures for teachers solves the problem of distributing teachers, but the scores essentially function as a onetime, post-test when the unit of analysis is the classroom. Any previous gain score for that same group of students in the current classroom assignment would reflect the effects of various teachers, since students do not move in unison from one classroom to the next. In other words, we can say something meaningful about teachers' value-added contributions when outcomes are clearly associated with only one teacher, but are less confident about such measures when they are associated with more than one teacher. As a result, we are required to interpret the value-added measures of teacher level data as one-time, post-test outcomes.

Teacher value-added scores were constructed by aggregating the difference between the current and previous year's SAT9 student achievement test outcomes into gains for individual students by classroom in a typical pre-post fashion. Aggregated classroom gains were standardized relative to the overall mean and standard deviation of the sample. The standardization of classroom gains effectively creates z-scores for each teacher, allowing us to distribute the entire population of teachers in terms of effectiveness. We created this measure as an alternative to other possible proxies of effectiveness such as years of service, course units accumulated, or the amount of professional development received. We felt that the value-added measure provided more variability than the others and would prove superior as a measure in both teacher and student-level analysis. Once constructed, the value-added measures serve to describe the distribution of teacher effectiveness and to situate new teacher productivity. Moreover, they can be marshaled at the student-level of analysis as controls for analyzing change in student achievement outcomes and as predictors of future outcomes.

The year 2002 marked the final administration of the SAT9 test in California, making it a suitable cutoff point. Since the NTP was providing its 12th year of service in the district, we concluded that the comparison group needed to include data associated with teachers with 12 or fewer years of experience up to 2002. The student achievement data subset could be organized into three groups: classrooms associated with, 1) teachers in year one or year two, receiving new teacher support through the full-release mentor induction model; 2) teachers in years 3 through 12 who previously received new teacher support through the same full-release mentor induction model as novices; and 3) teachers in years 3 through 12 who had not participated in the NTP full-release mentor induction model as novices. In those instances where teachers spanned more than one group, we privileged new teachers as a group and selected out any data pertaining to their classrooms in years three, four, or five to preserve mutual exclusiveness. While the potential for comparisons across all groups remained, we were most interested in comparisons that isolated the impact of new teachers. This was done best by comparing classrooms of new teachers (all of whom were participating in the induction program) with mid-career teachers (who had not previously participated in the induction program) in an analysis of variance.

The induction program under study imposes selection criteria on the teacher population to form groups for the analysis of variance. Without exception, all teachers in the first or second year of their practice are assigned to participate in the district induction program, and all teachers with three or more years of experience are not. This allows us to answer the first two research questions posed: How effective are new teachers as a group?, and How are new teacher classrooms distributed among the most effective teachers?

Regression Analysis of Predictors of Student Achievement

The best means of distinguishing among predictors of student achievement was to analyze test scores at the student level. Because student test data spanned a five-year period, we were able to establish four sets of pre- and post-test combinations. This allowed us to employ a comparative change design to evaluate a battery of predictors, of which new teacher status was one.

The use of regression analysis allowed us to isolate the effects of each variable and to assess its contribution to the model's explanatory power. Four models were tested: 1) a saturated model with no teacher information; 2) a saturated model with teacher information limited to years of service; 3) a saturated model with teacher information limited to participation in the induction program; 4) a saturated model with teacher information limited to an effectiveness z-score for the classroom, constructed from value-added measures. The saturated model included an intercept, student pre-score, class pre-score, percent of ELL students in the classroom, and test-year mobility. Our aim in this particular part of the analysis is to identify the teacher status variable with the most explanatory power and to draw out the implications for the other variables in the model.

Comparative Change

The counterfactual question, associated with teacher attrition, may be posed as follows: What would the attrition rate of new teachers be in the absence of the induction program? Ideally, in order to address this question, either we would need to know something about past attrition rates, or we could compare the target group with a comparison group that does not receive the intervention. However, because the program had been in existence for many years, and because the program serves all new teachers in the district, neither of these options was possible. The best alternative available was to impose a form of elementary quasi-experimental design known as the comparative post-test. We combined district and state attrition data, extrapolating where necessary, to construct a counterfactual comparison. Because the district induction program is extremely comprehensive and state induction programs typically are less so, we hypothesized the comparison would still yield meaningful differences that could be valued monetarily. If the difference between the state and district attrition rates favor the district, it can be valued and associated with the program as a benefit. The counterfactual in this instance is represented by the state attrition rate. As seen later in Table 6, the comparative change approach is applied to three questions on the benefits side of the ledger related to attrition differences between the state and the induction district under the heading "Savings from Induction".

Results

How effective are new teachers as a group?

This benefit is estimated by measuring teacher effectiveness in terms of the gains their students make in annual achievement test scores as a class, representing the value added by their teacher. We collected reading achievement data over a four-year period, measuring the gains obtained by classes taught by all teachers in the district's elementary schools. We aggregated the reading gain scores for all students of new teachers while they were in the program and compared them with the aggregated scores of the students of more experienced teachers. While there were the aforementioned significant differences in pre- and post-achievement rates related to assignment, we found that the classes taught by the new teachers in the comprehensive mentoring program realized reading gains that were equivalent to the gains of classes taught by more experienced teachers despite being assigned to classrooms that had lower initial achievement and higher representation of ELLs.

Table 2 summarizes the value-added comparisons, the percent at or above the district mean score, and the percent of teachers one standard deviation above the mean. According to the value-added measure, new teachers are separated from the non-induction veteran teachers by about three-tenths of a percentage point. This difference is not significant, suggesting equivalence between the two groups. When classrooms were analyzed to determine the proportion of classrooms meeting or approaching the district mean, and the proportion exceeding the district mean, new teachers again compared favorably to more experienced groups.

How are New Teachers Distributed Among the Most Effective Classrooms?

We can also compare the rate at which new and experienced teachers are represented in highly effective classrooms one standard deviation or more (10+ NCE points) above the district mean. About 7% of such classrooms taught by new teachers reach this level compared to 10% for no-induction veterans (Table 2). Thus new teachers look equivalent to veterans at all points across the performance spectrum, reinforcing the notion of equivalency among teacher status groups.

How do New Teacher Attrition Rates Change as a Result of Instituting a Districtwide Induction Program for New Teachers?

Compared to state statistics the retention rates for teachers of the induction program are higher. From two studies of retention rates of beginning teachers in the comprehensive mentoring program, it was determined that 88% were still teaching after six years (Strong & St. John, 2001). Averaged across years this represents an attrition rate of 2% per year. Comparison data for the state of California published by the California Council of Teacher Credentialing (CCTC, 2002b) showed an attrition rate of 16% after four years, extrapolated to 24% over six years, representing an annual attrition rate of 4%, or double that of the graduates of the program under study.

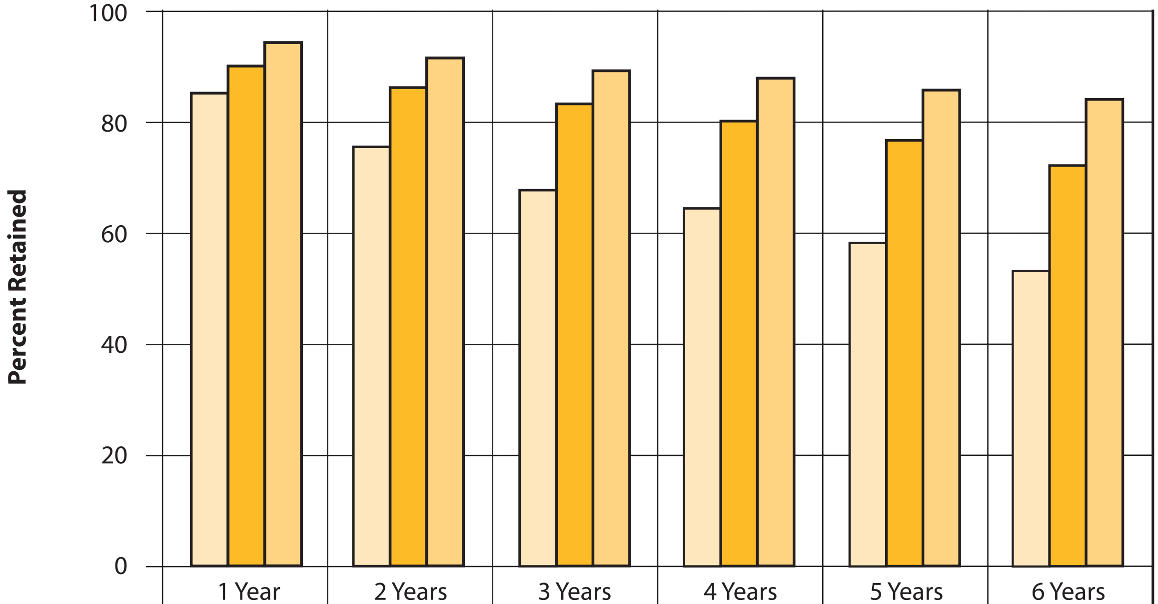
Figure 3 represents the overlapping data on retention with necessary extrapolations for comparison. The retention data for the induction program represent a onetime figure for attrition six years after graduating from the program. The retention data for the state and nation on the other hand were collected yearly for four years starting in 1996. In order to compare these data sets it was necessary to extrapolate in both directions, two years back for the induction program, and two years forward for the state and national figures. The difference after four, five and six years was a difference of 8%, 10%, and 12%. For purposes of valuing benefits we chose the most conservative difference of 8% over four years.

We chose to use the state rate of attrition as the logical counterfactual because the state of California, through the BTSA program, mandates access to a state-approved induction program for every new teacher in the first two years of practice. While these programs vary widely throughout the state in their organization and resource expenditures, they nevertheless represent in the aggregate a figure that is far removed from the zero condition of *no induction* and somewhere less than the comprehensive model described here.

Table 2: Comparison of Student Achievement Test Score Statistics by Teacher Career Status

	Career Status	
Test Score Statistics	**New Teachers With Induction Program**	**Mid-career Teacher No Induction Program**
Average SAT9 Gain Score (NCEs)	2.04	2.34
N	2,565	2,344
s. d.	10.0	10.8
Beat the District Mean by 1 s. d.	6.7%	10.0%
Approaching Average Growth or Better	82%	77%

Figure 3: Teacher Retention Rates Over Six Years (1996-2001): Comparing the Induction District with California and National Figures



	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years
Nation*	89	79	71	76	61	56
California*	94	90	87	84	80	76
Induction District**	98	96	94	92	90	88

Years

*Extrapolated Years 5-6; ** Extrapolated Years 1-5

To rule out the possibility that our focal district was retaining its teachers by offering higher salaries or higher achieving classrooms, we compared the salaries and student achievement of neighboring unified school districts. In each case, salaries and achievement were higher in the neighboring districts.

Table 3 provides the district comparison for lowest salary offered and their standing relative to the academic performance index. Districts are ordered by proximity to the focal district with *District A* being closest and *District D* most distant. The data in this table suggest that, if anything, the focal district should have higher attrition rates.

What are the Best Predictors of Student Achievement in a District Supporting a Comprehensive Induction Program?

A test of the four different models of student achievement using different teacher background information measures yielded significant results. Table 4 displays the estimated effects of various predictors on student reading achievement. Immediately apparent is the difference in contribution of the three different indicators of teacher impact.

Both *teacher years of experience* in model 2 and *participation in the induction program* in model 3 contribute little in terms of the size of the coefficients or explained variance. Indeed the error terms are as large as the coefficients in both cases. However, the effectiveness scores

Table 3: Proximal District Comparison of Salaries and Student Achievement in 2002

	Lowest Offered Salary	Academic Performance Index
Focal District	**$27,747**	**611**
District A	$37,287	656
District B	$35,687	683
District C	$33,641	828
District D	$46,704	872
Statewide Average	$34,186	n/a

Table 4: Estimated Effects of Student, Classroom, and Teacher Characteristics on SAT9 Reading Achievement

	Reading Achievement Model 1	Reading Achievement Model 2	Reading Achievement Model 3	Reading Achievement Model 4
Constant	18.58 (.926)***	20.333 1.014)***	18.840 (.946)***	13.043 (.885)***
Pre-Score	.748 (.006)***	.733 (.007)***	.746 (.006)***	.753 (.006)***
Teacher Years of Experience		- .021 (.013)		
NTP Induction Dummy			- .105 (.205)	
Teacher Z-Score				10.205 (.251)***
Class Pre-Score	- .020 (.016)	- .028 (.017)	- .022 (.016)	.086*** (.015)
Class ELL Percentage	- 8.709 (.650)***	- 9.770 (.705)***	- 8.874 (.661)***	- 5.546 (.617)***
Test Year Mobility	- 1.539 (.370)**	-1.786 (.404)***	- 1.554 (.3374)***	- 1.201 (.347)***
Observations	12,150	10,831	11,863	12,134
R-Squared	.755	.745	.752	.784
F-Statistic	9354.792***	6333.971***	7197.318***	8828.479***

constructed from value-added measures of achievement gains (z-scores) in model 4 contribute significantly. For every unit increase of teacher ability (one standard deviation), there is a corresponding increase in student test scores of 10.2 points, which tests significant ($p > .000$). This finding is important because it suggests that years of service or participation in a particular program are not good measures of teacher differences or ability when compared to value-added measures that align closely with student outcomes. Moreover, after introduction of the value-added measure, the intercept shifts downward, the class pre-score coefficient becomes positive and significant, and the class ELL coefficient decreases somewhat to accommodate the effect of better teacher information. Model 4 explains 78% of the total variance and every predictor contributes significantly. Relative to the other teacher characteristic variables, the teacher value-added measure accounts for 17% of the total explained variance in model 4, while the other two variables account for less than 1% in their respective models.

Benefits

Benefits are monetized and distributed across two basic categories: returns on district investments to training and the lowered social costs of losing new teachers to the teaching profession. Lowered social costs of losing new teachers establishes values for the proportion of non-program new teachers who would leave, using the state retention rate as the counterfactual. Table 5 provides the full list of benefits and streams for both categories and a few others that are assumed to accrue over time but are not specified monetarily.

Savings on Credential Investment

A student obtaining a credential through a state university teacher training program invested about $18,000 in tuition, expenses and forwent wages over 18 months. Factored by the differential in state and district retention rates the investment returns about $733 per year when distributed among all the teachers in the program. Over five years, the resulting figure of $3,394 represents the

Table 5: Marginal Benefits of Participating in Comprehensive New Teacher Induction

	State	District	New Teachers	Students
Lowered Social Costs of Losing BTs to the Teaching Profession				
BTs [Decrease in loss of $ invested in credentialing program per teacher if they leave profession distributed across 171 BTs]			$ 3,394	
Districts [Save time and $ off recruitment, orientation & administration - Decrease in per teacher costs due to high teacher turnover -] 4.0% Improvement Per Year		$ 3,736		
Districts [Decrease in $ invested and lost to induction training if BTs leave that district]	$ 762	$ 479		
Returns on District Investments to Training				
BTs [Increase in teaching skills/effectiveness valued at the rate of a midcareer 4th year teacher using scores on 9,842 students]	$6,318	$3,965		
BTs [Savings on tuition & private time invested in obtaining CLEAR credential without the induction program]			$ 54	
Student Academic Returns From Assignment to Highly Effective Teacher [Increased satisfaction with schooling, higher attendance, access to AP courses, higher probability of post-secondary schooling, valued at the same rate for "reduced class size" program which is argued to raise achievement as well. 14% of BT classrooms rated highly effective. No sensitivity measure used, full value of class size reduction investment]				$ 1,926
Principal or Site Administrator Time Savings Evaluating New Teacher Progress		$ 908		
Student Retention [Decrease in the K-12 dropout rate valued at some unknown rate]				+
Student Salaries [Increase in projected wage earnings from staying in school projected over time]				+
Improve Special Populations Practice [Increase ability to address the needs of special populations students, i.e. English Language Learners, etc.]	+	+		
Returns on a Culture of Professional Development				
Mentor Careers [Career ladder extended, at least 3 years]		+		
Mentor Job Satisfaction [Higher job satisfaction] @ 90%		+		
BTs Establish a network of colleagues and professionals			+	
Districts [Augment selectiveness over future teacher applicant pools & public relations return on the reputation for maintaining a stable, well trained teaching population]		+		
Subtotal Benefits	$ 7,080	$ 9,088	$ 3,448	$ 1,926
Total Benefits	**$ 21,542**			

marginal return on investment per teacher that is saved by remaining in the profession. This return extends out as long as teachers continue teaching, diminishing over time when discounted for net present value. Credential investment savings accrue to the new teacher rather than the district.

Savings on Reduced Attrition[1]

The difference between state and district retention rates can be translated into a monetary savings, realized at almost $807 per teacher per year (assuming that the replacement cost of a teacher is about 50% of a new teacher's salary) for a total of $3,736 per teacher after five years that accrue to the district.

Of relevance here is a report by Fuller (2000) who examined teacher turnover costs in Texas. He notes that turnover costs vary according to the experience of the teacher leaving, the school district in question, and the rate of turnover in a district. Some estimates put this cost as high as 150% of a leaver's salary, while a more conservative number could be as low as 15%[2]. For the purposes of this analysis we assigned turnover costs at a moderate estimate of 50% of a new teacher's salary.

Increased Teacher Effectiveness

Effectiveness outcomes of new teachers and non-inducted, mid-career teachers revealed no significant differences. When the outcomes of new teachers were compared to the nearest cohorts in experience (third- and fourth-year teachers), they surpassed third-year and were very similar to fourth-year values. This being so, we were able to assign a monetary value to the benefit of increased teacher effectiveness by assessing the difference between the salaries of a first-, second-, third-, and a fourth-year teacher. In years four and five of our analysis, this factor, therefore, produced no positive return. For first-year teachers the benefit amounted to $5,567; for second-year teachers the amount was $3,184, and for third-year teachers $1,531 (see Table 6).

Summary of Benefits

A summary of all monetized costs and benefits is portrayed in Table 6. Subtraction of per-teacher costs of about $13,000 from the benefits of about $21,500 shows each investment in a new teacher yields returns a little under $8,600 after five years. The implication from Fuller's (2000) study on the cost of turnover was that reducing teacher turnover represented the most important saving earned by a successful new teacher support program such as the Texas Beginning Educator Support System (TxBESS). The present study suggests that increasing teacher effectiveness provides far greater benefits (47%) than does reducing teacher attrition costs (17%). Normally, one might reasonably expect beginning teachers to lag behind their peers in effectiveness, but, in this population, beginners resembled fourth-year teachers, thus yielding a substantial return when expressed in salary differences.

When each constituency is taken in to account, the returns on time and program resources expended show that all four groups —students, new teachers, districts, and the state —all benefit from the investment in comprehensive induction. Students, who invest not a dollar, proportionally benefit the most, followed by new teachers who earn a return of $3.61 per dollar, and the district at $1.88 per dollar. Even the state recoups 98 cents on the dollar from its original investment. Society sees a return after five years of 1.66 for every dollar invested.

Conclusions and Implications

Most discussions of induction benefits and costs focus on the savings from reduced turnover to justify program investments (see Fuller, 2000). By measuring the full range of benefit streams accruing to induction, we were able to demonstrate that induction returns extend far beyond mere retention questions. The influence on new teacher practice is by far the most important benefit and potentially extends farther if we consider the benefits to children assigned to effective teachers over the course of their K-12 careers (see Sanders & Rivers, 1996). Savings from new teacher attrition amount to only 17% of the total benefits the program yields.

While we valued as many theoretical effects from the program as possible, we could not include those that accrue far into the future. For example, assignment benefits were limited to two years, but properly analyzed could extend out to include valuations on increased access to colleges and universities, or on increased earnings by the time the students are ready to join the work force. Another item not valued in this design is the benefit represented by a fully trained mentor returning to the classroom. It is highly likely that the mentoring experience adds value

[1] We use attrition (i.e. leaving the profession) as opposed to turnover (i.e. moving schools or districts) to represent the loss to society.

[2] The range of estimates is probably this broad because many of the studies were weighted to account for lost human capital in the form of lost effectiveness or ability in the trade-off between replacing more senior teachers with a more novice ones. Because we measure teacher effectiveness directly and can account for it, our estimate of the real cost of teacher attrition leans toward the more conservative figure of 50%.

Table 6: Net Present Value of Induction Returns Over Five Years Calculated at a 4% Discount Rate and Attrition Costs Estimated at 50% of a New Teacher's Salary

NPV of Returns over 5 years	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Savings* From Induction						
BT Earnings on Credential Investment/BT	$733.00	$704.81	$677.70	$651.63	$626.57	$3,393.71
Attrition Savings/BT	$807.00	$775.96	$746.12	$717.42	$689.83	$3,736.33
Savings on Investment in Induction Training /BT	$268.00	$257.69	$247.78	$238.25	$229.09	$1,240.81
Returns on Training Investment						
BT Effectiveness Returns/BT	$5,567.00	$3,184.62	$1,531.07	$0.00	$0.00	$10,282.68
Savings on CLEAR Credential/BT			$19.00	$18.27	$16.89	$54.16
Student Academic Returns/ BT	$982.00	$944.23	$0.00	$0.00	$0.00	$1,926.23
Principal or Site Administrator Time Savings	$463.00	$445.19				$908.19
Total Benefits	**$8,820.00**	**$6,312.50**	**$3,221.66**	**$1,625.57**	**$1,562.38**	**$21,542.11**
NPV of Costs over 2 years						
Program Costs						
Personnel Costs	$5,236.00	$5,034.62				$10,270.62
Program Costs	$299.00	$287.50				$586.50
Facilities & Equipment	$430.00	$413.46				$843.46
Client Inputs						
BT Private Time/BT	$486.00	$467.31				$953.31
Principal Coordination Time	$154.00	$148.08				$302.08
Total Costs	**$6,605.00**	**$6,350.96**				**$12,955.96**
Total NPV	**$2,215.00**	**-$38.46**	**$3,221.66**	**$1,625.57**	**$1,562.38**	**$8,586.15**

* Savings Value District Rates to State Rates of New Teacher Attrition Using 4% Differential

Table 7: Cost-Benefit Summary: Marginal Returns to a District Induction Program by Constituency

Constituency	Costs	Benefits	Marginal Return on $1
Student	$0	$1,926	∞
New Teacher	$953	$3,448	$3.61
District	$4,813	$9,088	$1.88
State	$7,189	$7,080	$ .98
Total to Society	$12,955	$21,542	$1.66

to the teaching skills and raises the pedagogical level of the veteran teacher. Nonetheless, we captured what we believe is the most important impact of new teacher induction —the change in classroom practice and its effect on students.

From an administrative perspective, the program is a clear winner. Assuming the costs of hiring a replacement represent 50% of a new teacher's salary, an investment in an intensive model of new teacher induction in a given district pays $1.66 for every $1 spent. From a public policy perspective, it may be argued that the program would have been considered a winner had it simply broken even. That is to say, public policy does not assume a profit margin on public spending in order to make the investment in the first place.

While mentoring programs of support for beginning teachers have become more visible during the past ten years, no rigorous analysis, to our knowledge, has been performed to assess the potential return on investment for such programs. The analysis described here provides educational decision makers, either at school, district, or policy levels, with information that may guide them in how to spend education dollars.

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