
# Counting The Cost

## A Commitment to Educational Equity that Yields Returns

**Technical Report**

NEW TEACHER CENTER

OCTOBER 2019

Teacher Induction:

# Measuring the Return on Investment Technical Report

## SUMMARY OF FINDINGS: INVESTMENTS IN NEW TEACHER SUPPORT YIELD RETURNS

Educators have long cherished the idea that what a student learns in school will benefit them later in life. From 2013 to 2017, the New Teacher Center (NTC) received a federal grant to provide high-intensity mentor support to new teachers in a large urban school district. NTC partnered with Metis Associates to compare the grant spending to the estimated monetary value of the observed effects of the program on student performance and teacher attrition.[1] Metis developed the models described in this report and found that:

- Each dollar invested per student by the district realized a 141-fold benefit over a 30-year career, on average, resulting in higher tax levies to support the district, and
- Each dollar invested in NTC's teacher induction resulted in a 22 cent return the following year due to reduced teacher attrition.
- Each dollar invested would see a $2.43 return to city/state coffers over the same time period as above.

These findings should also be of particular interest to policymakers because of the inequitable distribution of new teachers within school districts in the United States. For example, we estimate that in the school district we studied, white students make up 10.3% of the students not served by new teachers in a given year and only 8.8% of the students with new teachers.

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[1] Cost estimates were calculated in two different ways resulting in different returns in proportion to costs. More information about this will be provided later in this report.

# INTRODUCTION

New Teacher Center is a national non-profit organization dedicated to improving student learning by guiding a new generation of educators. Founded by teachers in 1998, NTC works with school districts, state policymakers, and educators across the country to increase the effectiveness of teachers and school leaders at all levels. NTC knows districts across the country invest significantly in professional learning for teachers, much of which does not meet their needs nor produce the impact intended. Therefore, NTC has a keen interest in testing the hypothesis that they are a partner who can offer districts a return on their investments in meaningful and measurable ways.

In 2012, the US Department of Education awarded NTC a four-year Investing in Innovation (i3) grant to provide high-intensity mentor support to new teachers in three underfunded high-need districts. The evaluation of the i3 validation grant, conducted by SRI Education and reported in 2017, showed that the program positively affected student scores on standardized tests and, to some extent, teacher retention, leading NTC to wonder if their model could offer a positive return on investment for the school districts with which they work.

This report presents a Return on Investment (ROI) study conducted by Metis Associates on behalf of NTC. To estimate the return on investment, we used both empirical data from the SRI study (e.g., observed differences in student test scores between treatment and control groups) and assumptions drawn from a review of relevant literature (e.g., the cost to schools/districts of replacing a teacher who leaves their position).

The body of this report has six sections. In the first section, we will discuss the logic that we relied on to design our models. This section will explain who is expected to make the investment, who is expected to reap the returns, and how we believe the investment works to get us to those returns. The second section of the report describes the steps that we took to quantify the actual investments in the program through the grant at the per-teacher and per-student levels. The next three sections describe the steps we took to model and quantify the returns on the investment. Section three discusses how we were able to model student increased earnings in the future based on the observed improvement in their test scores. Section four discusses how we calculated possible district savings in the short term due to reductions in teacher turnover. Section five extrapolates from the student earnings in section three to estimate how much future tax levies might increase as a result of an investment in new teacher induction. Section six discusses the implications of these findings for racial equity. Following these six parts, we offer concluding remarks, including thoughts about where future researchers might want to add to these findings and a list of the references we consulted in our work.

## 1. THE LOGIC OF RETURN ON INVESTMENT

Return on investment (ROI) is the percentage increase or decrease in an investment over a set period. If you are investing in an asset, the ROI is calculated by taking the difference between current or expected value and original value, and dividing by the initial value.

For example, suppose you invest in an asset by purchasing it for $200 and then sell it for $300. The equation for this ROI would be the following:

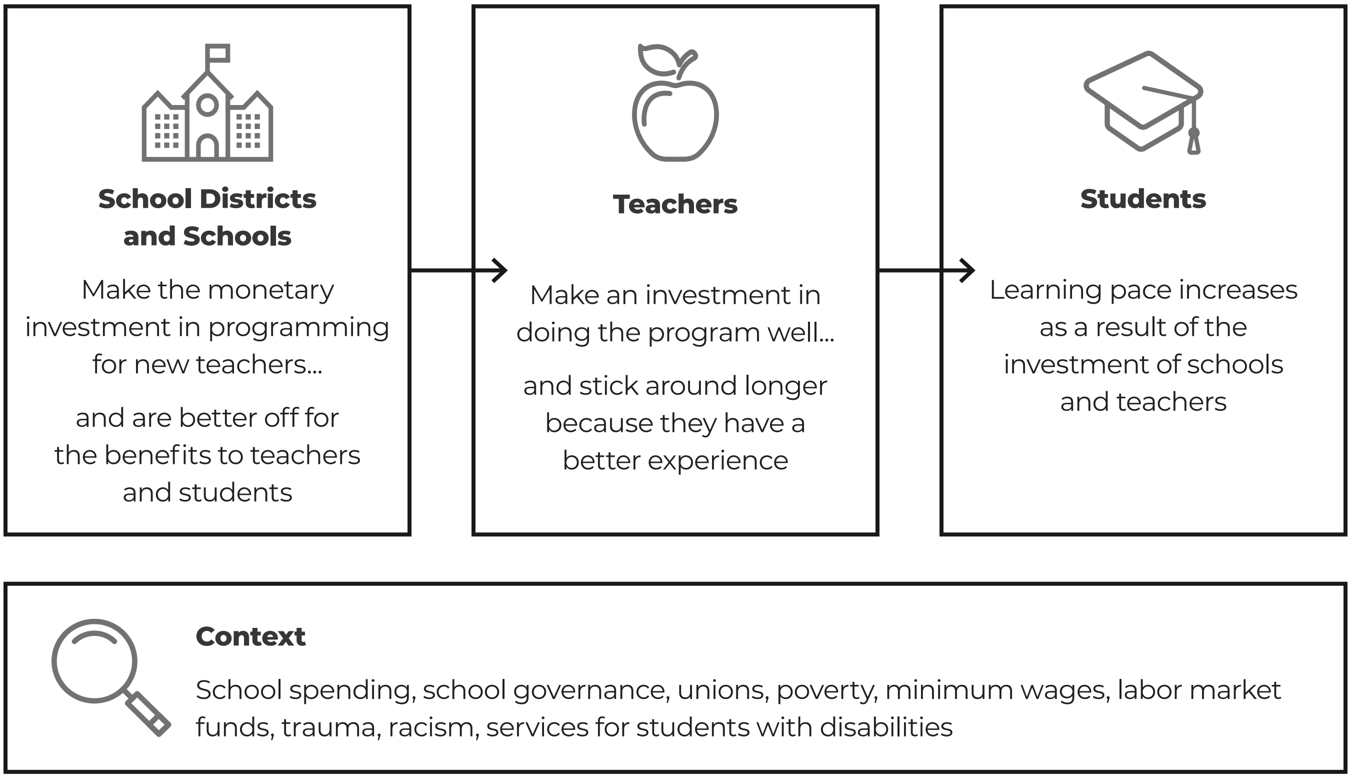
**($300 - $200) ÷ $200 = 0.5 or 50%**

This calculation works for any period, but one must discern between evaluating shorter-term vs. longer-term investment returns with ROI. An ROI of 80% sounds impressive for a five-year investment but less impressive for a 35-year investment. A return of 22% over five years is less impressive than a 22% return within a single year. For context, since 1964 the well-known investor Warren Buffet's holding company, Berkshire Hathaway, has produced, on average single-year returns of 20.9%.[2]

The logic behind the returns on investment in this report, calculate the returns, calculate the investment, and then relate two, are similar to the way you would think about investing in an asset, except that the investment here is not an investment in an asset. The investment is made by a school district in programming, and they do not have to cash out to see the benefits accrue. However, by that same token, the returns do not flow directly into their bank account. Some of the returns go to students in the form of increased career earnings. Some of the returns go to districts in the way of reduced future expenditures related to teacher turnover, and some of the returns may eventually flow back to school districts as the increased student earnings produce increased tax levies. To investigate how the returns on teacher induction relate to the required investments, we organized our model and our findings around three constituent groups: districts, schools, and students (see Figure 1).

[2] Frankel, Matthew. Here's How Much $10,000 Invested in Berkshire Hathaway Stock in 1964 Is Worth Now. July 24, 2017. https://www.fool.com/investing/2017/07/24/heres-how-much-10000-invested-in-berkshire-hathawa.aspx

Figure 1: ROI teacher induction logic: Who invests and who draws returns?




At its most essential, the NTC program provides intensive support to new teachers to improve their effectiveness and increase their retention, leading to higher student achievement. SRI notes, "Several elements distinguished the NTC induction model from traditional district mentoring programs. The teacher to mentor ratio was intentionally low to enable mentors to work with new teachers frequently, intensively during each meeting, and consistently during the school year. The induction model encompassed the first two years in the classroom when novices need to rapidly master classroom management and pedagogical skills and build the foundation for a sustainable teaching career. It is at this time that they are also at high risk of leaving the profession, which sustained induction support is intended to mitigate."

The return on investment logic model (presented at a high-level in Figure 1, and then with more detail in Table 1) specifies the investments and returns that framed our analysis plan.

It is important to note that because empirical data reflect the context in which they were collected, there are limits to any inferences drawn about how ROI might play out beyond the years and locales studied. An NTC program model under consideration by policymakers may be different from the program model examined. This model was funded by a federal grant that required that NTC staff devote greater time and attention to assure model fidelity and appropriate documentation than might otherwise be possible due to resource limitations. Additionally, while all NTC programs aspire to be distinct from traditional district mentoring programs, as described above, there are variations in implementation. The study model allowed mentors to be mentors full time, whereas in some

NTC programs they are only part-time mentors and still have teaching responsibilities. There are also variations in the scope of the induction program within the district, whether mentors are based at the district or schools, and the level of involvement of principals, among others. Because the model is always evolving, we cannot say anything about the outcomes in a more standard model. In addition to the variation in the model, there will also be variation in the context in which the model is implemented (e.g., class sizes and district per-pupil spending). Student race, in particular, strongly correlates with future earnings due to racism.

Table 1 presents the inputs and outputs that relate to program ROI, organized around the three constituent groups introduced above. Investments are made primarily by school districts and their constituent schools. The investment made by teachers in doing the program well is noted, but not quantified in our analyses. Returns may accrue to LEAs/schools, teachers, and, notably, students.

School districts and schools make the monetary investment in programming for new teachers. It is especially important to quantify their investment beyond what would normally be spent on teacher induction absent the program. Following the school row across to outputs, we expect that the program will have an effect on the composition of the teacher population and that this will have an effect on future expenditures by the districts. If teachers remain longer in a district, the gross amount spent on teacher salaries may increase, but there may also be savings associated with recruitment expenditures.

Although our ROI analysis focused on the most tangible investments by districts and returns to students and schools/districts, the implication is that these inputs and outputs are related through the activities of teachers; therefore, it is also reasonable to think that teachers have their own investments and returns because of program participation. Table 1 describes how we imagine the role of teachers in the program logic, even though measuring the value of teacher investments and returns were outside the scope of this report. Teachers invest in doing the program well. They are also compensated for the time they take to do the program, so it may be considered a wash in the overall analysis. Teachers who stick with teaching because of their participation may get a tangible benefit of increased earnings. We would hope that they also become more effective, but SRI was not able to demonstrate that effect.

Students do not have to make any investment to potentially reap the rewards of new teacher induction, but the SRI evaluation demonstrates that their learning pace increases because of the investments of schools and teachers. By pulling in other research, we will estimate the tangible increase this additional learning may have on their future earnings.

That is the essential logic of the ROI, but the context in which the investments are made may have a significant impact on what kinds of returns come out. In our analyses, we were able to take into account the race and gender of the specific population under consideration to some extent. In addition, after considering the potential impact of the contextual factors enumerated in the right-most column of Table 1, we concluded that it would not be possible to combine the empirical data from different districts in the study, and instead the ROI study focused exclusively on the large urban school district.

**Table 1: Inputs, outputs, and context by constituency groups**

| WHO | INVESTMENTS | RETURNS | VALUE ASSIGNED | CONTEXTUAL FACTORS |
|---|---|---|---|---|
| **Schools / Districts** | Grant expenditures to district divided by the number of teachers receiving services and then spread out among the schools based on the teachers in the study.<br><br>Grant expenditures on project overhead excluding evaluation also spread out among schools.<br><br>Comparisons to other district professional development expenditures and teacher induction practices. | Change in teacher salaries<br><br>Change in recruitment expenditures due to decreased teacher turnover (estimate based on the literature review and empirical changes in teacher retention)<br><br>Change in culture (Program Quality Survey)<br><br>Future revenue from tax levy | For future exploration<br><br>Tangible<br><br>For future exploration<br><br>Tangible | District per-pupil spending<br><br>Cost compared with comparable programs<br><br>Scale of program in district<br><br>School closures, openings<br><br>School control status |
| **New Teachers** | Participation in mentoring and other program activities (time spent).<br><br>Compared to information from district about teacher induction. | Change in salary earnings<br><br>Change in effectiveness (SRI)<br><br>Change in satisfaction (Program Quality Survey)<br><br>Change in job-leaving (SRI) | Not to be assigned<br><br>Not to be assigned<br><br>For future exploration<br><br>Tangible | Teacher job market factors, including mass layoffs<br><br>Principal turnover<br><br>Compensation context |
| **Students** | N/A | Change in learning pace (SRI)<br><br>Change in HS completion<br><br>Change in future earnings by racial, socio-economic, and gender subgroups. | Impact on future earnings<br><br>Assigned value implied by the learning-pace-earnings relationship<br><br>Tangible | Poverty & trauma<br><br>School choice<br><br>Class size<br><br>Instructional supports (e.g., special education) |

## 2. HOW WE QUANTIFIED THE LEVEL OF INVESTMENT

Actual program costs were provided for treatment schools in the study districts as part of the federal grant reporting process. To estimate the cost per student, we excluded some grant-costs that were not related to the program, pro-rated the costs by teacher by year, and compared this to an estimated per-teacher cost for traditional new-teacher support within the control schools. The program costs included program administration and management, tracking software, and added salaries to hire mentors where district teachers were not available to fill the role. We looked at empirical grant spending because these were costs above what a district would typically do, but we also assumed that new teachers in the control schools were getting at least something extra too, given the number of programs available to schools in a large urban setting. We did ask the school district if they were able to describe these other costs, but doing so would have been a considerable undertaking given the wide variety of programs and funding sources that would contribute to teacher professional development.

### OUTRIGHT EXCLUSIONS

To calculate the size of the investment in the program, we began by excluding any spending from the grant that was not actually funding for the program under consideration. These exclusions fell into three categories: evaluation costs, costs in years after the program was implemented, and costs for municipalities that received grant funding but were not included in the ROI study.

First, we excluded the marked contractual spending that went to an **outside evaluator** (SRI Education) to perform the randomized control trial that established the student test score gains. Although it is certainly recommended to budget time and resources for program evaluation, it is not necessary to achieve the returns of the program.

Second, while the grant spending ran from 2013 to 2018, the program was only implemented from the 2013-14 to the 2015-16 school year, so we excluded the spending in **2017 and 2018** as being not directly relevant to the program outcomes. These first two, simple exclusions left us with 11.7 million dollars in grant spending.

A complication in cost computations resulted from the fact that grant spending went to three **different municipalities**. One municipality was urban, one was suburban, and one was rural. The rural municipality was not included in the SRI study. We limited our analysis to the urban school district, so we, therefore, needed to estimate how much of the spending went to each district to extract only the spending that would be relevant to our outcomes. We started by immediately excluding the $2.6 million that was earmarked in the budget for the rural county. Of the remaining amounts, $2 million went to the urban county, $4.4 million went to the suburban county, and another $2.6 million was not clearly attributable to one county or another. We then arrayed all of the spending across the districts and years by pro-rating the $2.6 million by the number of teachers in each district in each cohort and pro-rating the amount of spending in the urban district across the cohorts based on the number of teachers in each cohort. This process gave us a value for per-teacher spending in each year and cohort.

## HANDLING GRANT EXPENDITURES FOR MENTOR SALARIES

In designing the methodology for calculating per-student and per-teacher costs, there were two schools of thought about whether or not to include the cost of hiring mentors in the urban district. On the one hand, across the communities that have invested in NTC's new teacher induction support, it is very unusual for districts to need to hire new staff to be mentors. On the other hand, to exclude a cost empirically that went to pay for the program as part of the federal grant, seemed like a violation of the cost-calculation methodology. The solution was to flag the individuals who were paid directly by the grant as mentors and run separate analyses, one set of figures including mentors and one set of figures excluding mentors.

**Table 2: Costs by year, including & excluding hiring mentors**

| | COHORT | 2013 | 2014 | 2015 | 2016 | TOTAL | TEACHERS | COST PER TEACHER |
|---|---|---|---|---|---|---|---|---|
| **Including Mentors** | **1** | $15,672 | $788,308 | $468,561 | $0 | **$1,272,541** | **68** | **$18,714** |
| | **2** | $18,668 | $0 | $558,139 | $823,856 | **$1,400,663** | **81** | **$17,292** |
| **Excluding Mentors** | **1** | $15,672 | $433,515 | $177,956 | $0 | **$627,143** | **68** | **$9,223** |
| | **2** | $18,668 | $0 | $211,977 | $261,527 | **$492,172** | **81** | **$6,076** |

## COSTS PER STUDENT AND PER TEACHER

The next step was to spread our costs per teacher out across all of the treatment schools. We also added in $9,000 per student to all schools, as an approximation for per-student spending (because student test score gains are more appropriately attributed to all student spending, not just this one program). We assigned $1,000 per teacher to control schools, as we were not able to obtain information about spending on teacher development in the absence of NTC support. After arraying all of the costs across the control and treatment schools, we took an average of the total number of students in each of the control and treatment groups to arrive at per-student costs. (It should be noted that the number of students and the number of teachers here are the total numbers in the program, which may be different from the number included in the study since data were not available for every student and teacher.)

**Table 3: Costs by student, including non-program costs**

| | TREATMENT | TREATMENT | CONTROL | DIFFERENCE |
|---|---|---|---|---|
| | Schools | 32 | 37 | |
| | Teachers | 50 | 56 | |
| | Students | 2,476 | 2,323 | |
| **Including Mentors** | Total Cost | $24,038,341 | $20,963,000 | |
| | Cost per Student | $9,706 | $9,024 | **$682** |
| **Excluding Mentors** | Total Cost | $23,011,620 | $20,963,000 | |
| | Cost per Student | $9,294 | $9,024 | **$270** |

## 3. HOW WE QUANTIFIED THE BENEFITS TO STUDENTS

The SRI study showed that induction support for teachers resulted in positive impacts on **student test scores** in mathematics.[3] Students in grades four to eight of teachers who participated in the NTC induction program scored significantly higher on average than students of control teachers (0.15 SDs, $p < 0.01$) on standardized tests. The observed effect is equivalent to approximately two and a half to four and a half additional months of learning depending on the student's grade level. This section of the report will describe how we consulted other return on investment studies to develop a model for predicting future student earnings based on their test performance, and the steps we took to calculate returns in the form of student earnings.

To determine an appropriate basis for assigning a monetary value to student achievement gains, a thorough review of the literature led us to an approach to ROI modeling similar to our intended application conducted by the Washington State Institute for Public Policy (WSIPP). The WSIPPP approach provided the technical framework needed to establish a relationship between gains in student test scores and labor market earnings. In addition, the WSIPP approach had been successfully applied to a cost-benefit analysis of a teacher induction program.[4] The WSIPP model used two relevant outcomes to our ROI study to which they assigned monetary value: high school graduation and standardized student test scores. WSIPP conducted an extensive meta-analysis

[3] While the SRI study revealed positive impacts on student test scores in math and English Language Arts, we focus on math scores because math scores are more predictive of future academic success. See Duncan, J., Dowsett, C.J., Claessens, A., Magnuson, K., Huston, A.C., Klebanov, P., Pagani, L.S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. Developmental Psychology, 43(6), 1428-1446 and/or Adelman, C. (1999). Answers in the toolbox: Academic intensity, attendance patterns, and Bachelor's Degree attainment. US Department of Education, Jessup, MD.

[4] Teacher professional development: Beginning Educator Support Team (BEST) program in FY 2013. Induction/mentoring Benefit-cost estimates updated December 2017.

to estimate the likelihood of graduation based on test scores using scores from the 10th grade while controlling for 8th-grade scores and other student characteristics. Regression models were conducted to estimate the relationship between gains in student test scores and market earnings to determine how a one standard deviation gain in test scores related to a percentage increase in labor earnings based on high school graduation.

To develop parameters in their model relating gains in standardized test scores to labor market earnings, WSIPP referred to a study conducted by Hall and Farkas[5] wherein the authors estimated the relationship between cognitive ability (measured with standardized test scores) and non-cognitive skills on wages. WSIPP's description of how they used the analysis results from Hall and Farkas to develop parameters in their model resonated with our purposes, so we decided to use it as the basis for **projecting student earnings** in our model.

In their study, Hall and Farkas argued that attitudinal/behavioral traits would be more important in determining starting wages while cognitive skills would have a greater effect on wage growth over time. To test their hypotheses, they developed a series of growth curve models that contained intercept and slope estimates for each factor to estimate their association with wage trajectories. The authors also expanded their models to include educational attainment and high school GPA. As the SRI study focused on students in elementary and middle school, we opted to follow the simpler models based on cognitive and non-cognitive abilities. Further, we did not use the non-cognitive abilities portions of the model, as the SRI study did not measure non-cognitive abilities.[6]

Using data from the National Longitudinal Survey of Youth, Hall and Farkas provided estimates of the proportion of future starting wages and wage growth for three racial/ethnic subgroups (white, black, Latinx) separately for males and females. We weighted these estimates by the proportion of students in these subgroups from SRI's student test score analysis to develop starting salary and wage gain estimates relevant to our student participants . We then used observed differences between pre- and post-scores for treatment and control students to determine average wage gains based on cognitive ability (Table 4).

[5] Hall, M. & Farkas, G. 2011. Adolescent cognitive skills, attitudinal/behavioral traits and career wages. Social Forces, 89(4), 1261–1285.
[6] Standardized test scores may not be an appropriate proxy for cognitive ability. Also note that the standardized examinations from the SRI study were not the same as those utilized by Hall and Farkas.
[7] Note that we reapportioned the black, white, and Latinx student population from the district to 100%.

Table 4: Data used to construct the student benefit model

| | CONTROL | TREATMENT | |
|---|---|---|---|
| **1. EMPIRICAL DATA FROM SRI STUDY AND GRANT SPENDING** | | | |
| **a. N Schools** | **29** | **32** | The number of schools and students that had math teachers in the SRI study |
| **b. N Students** | **1,595** | **1,584** | |
| **c. Cost per Student** | **$9,024** | **$9,706** | District cost per pupil for treatments & controls. Although the costs accrued over the years 2013-16, we are simplifying here and assuming all costs were in 2016. |
| **d. Average Gain (z)** | **-0.0567** | **0.0178** | The difference between pre and post-achievement, derived from SRI data. |
| **2. MODEL-SUPPORTING DATA FROM THE LITERATURE** | | | |
| **a. Average Starting Hourly Wage** | **$6.5517** | **$6.6154** | Empirical data from Hall & Farkas, weighted by the proportions of students of different races and genders in the SRI study. |
| **b. Portion of Starting Wage Based on Cognitive Ability** | **$0.1961** | **$0.1786** | |
| **c. Annual Change in Wage Based on Cognitive Ability** | **$0.0306** | **$0.0306** | |
| **c. Base unit salary[8]** | **$52,007** | **$52,007** | Estimate is similar in scale to current population survey. Figure provided by disaggregated by location and by years in the workforce (1). Used as a proxy for 2016 salaries. |
| **3. ESTIMATES DERIVED FROM PLUGGING EMPIRICAL DATA INTO THE MODEL** | | | |
| **a. Average Wage Gain** | **-$0.0024** | **$0.0091** | Difference in starting wages due to implied differences in cognitive ability based on student achievement gains, represented as a proportion of Hall & Farkas' average starting wages (2a). |
| **b. Average Annual Wage Gain** | **-$0.0022** | **$0.0001** | Difference in the trajectory of wage increases due to implied differences in cognitive ability based on student achievement gains, shown as a proportion of the starting wage in (2a). |

[8] Derived from PayScale.com, a for-profit service that gathers and reports salary data for locales across the United States. Estimate was retrieved in mid-December 2018.

Once starting salaries were adjusted based on the implied differences in cognitive ability (Table 4; 3a), average salary estimates were derived for treatment and controls for every year in a 30-year cycle by multiplying salary by the expected average annual wage gain based on cognitive ability (Table 4; 3b). To ensure that future earnings were expressed in present-day value, a 4% discount rate was applied to each calculation.[9]

Table 5 shows two different sets estimates for program returns relative to investment based on two different estimates of program costs, one that included costs of teacher mentors and one that did not (see the discussion above about the investment in mentors). We determined that the estimated economic benefits per student in the treatment group for the large urban school district are $55 when teacher mentors are included in the costs and $141 when they are not for each dollar of investment across a career span of 30 years.

**Table 5: Summary of costs and benefits per student**

| | | |
|---|---|---|
| **Program cost (incl. mentors)** | **$682** | The present value of costs is just the value of the costs (see program investment above). |
| **Program cost (excl. mentors)** | **$270** | |
| **Student career earnings** | **$38,332** | The present value of the returns is greater the more years we project. This is the average difference in projected earnings between treatment and control students after 30 years of employment. |
| **Net** | **$37,650** | The net present value is the difference between returns and costs for a given time horizon. In other words, the returns minus the costs. |
| **Return on the dollar (incl. mentors)** | **$55** | The return per $1 is the ratio of the returns to costs for a given time horizon, calculated as the net present value divided by program costs. |
| **Return on the dollar (excl. mentors)** | **$141** | |

## 4. HOW WE QUANTIFIED THE SHORT TERM BENEFITS TO DISTRICTS

In the first cohort of teachers for the ROI study district, **teacher retention** rates from year one to year two were 11 percentage points higher in the treatment group than the comparison group (67% for control teachers and 78% retained for treatment teachers). For calculating return on investment, we used this observed effect, surmising that the mentorship support teachers received likely contributed to their decision to stay. We did not consider the findings from a second cohort of teachers because looming district-wide layoffs dramatically distorted trends in the teacher job market.

[9] Discounting is a common procedure in cost-benefit analyses. For more information, see Levin, H.M, McEwan, P.J, Belfield, C., Bowden, A.B., & Shand, R. (2018). Economic evaluation in education (3rd ed). Los Angeles, CA: Sage Publishing.

A review of the literature on teacher turnover cost found that hiring a new teacher in the study district costs $17,872 per each teacher that needs to be replaced.[10] The program per teacher cost estimated at $9,223 for the first cohort (excluding mentor costs; see Table 2.) Therefore, for every 100 teachers included in the program, one could expect to spend $922,300, and save $200,166 the following year due to increased teacher retention ($200,166 = $17,872 * 100 * 11.2%). This finding implies that a district has the potential of achieving a 21.7% return on the investment in NTC ($200,166 / $922,300).[11]

## COSTS OF TEACHER TURNOVER

Recognizing that one source of the potential return of NTC programming would likely be a decrease in costs associated with replacing teachers because of improvement in teacher retention rates; we conducted a literature review of teacher turnover costs to inform the above estimate of a 22% return. We learned the costs of recruiting, hiring, and training replacement teachers are substantial.

One consistent theme across the literature is that costs associated with teacher turnover are not easy to identify in budget line items but are embedded in multiple line items within the budgets of different district offices and schools. Some costs of turnover, especially those occurring at the school level, may need to include estimates of administrator and teacher time spent to fill vacancies or develop new teachers. Because these investments of time are not often recorded, they are particularly difficult to obtain. Even when time and materials investments are recorded, the data are frequently unavailable or incomplete, requiring researchers to make assumptions.

The review also pointed to the fact that the largest share of turnover costs is typically attributable to efforts to train and orient the teachers recruited and hired to replace the departing teachers, which is the very item that likely costs more for districts and schools that invest in NTC. Orientation, new teacher support and professional development costs typically outweigh the sum of costs across the separation, recruitment and hiring components, comprising from 50-65% of the total cost of teacher turnover.

Since the literature-informed estimates for the study districts were dated, we attempted to acquire updated information from district personnel. Although we requested assistance through contacts provided by NTC, we did not get enough detailed information to replicate the estimates. However, district staff were able to confirm that the findings of a study that documented the cost of teacher turnover in their very district in 2007 were reasonable on their face even though updated information was unavailable. That is how we arrived at the per-teacher cost assumption of $17,872.

## COSTS OF TEACHER PROFESSIONAL DEVELOPMENT

We regarded it as critical to the study to collect and use information from districts on their teacher induction practices and professional development expenditures. Presumably, a significant share of the treatment group's professional development costs would be attributable to the above NTC program costs. However, we expected that control group teachers would be consuming other forms of new teacher support whose costs ideally would be represented in the ROI analysis. Therefore, we conducted a professional development review of the literature to gather information on district

[10] Barnes, G., Crowe, E., & Schaefer, B. (2007). The cost of teacher turnover in five school districts: A pilot study. National Commission on Teaching and America's Future (NCTAF), Arlington, VA.
[11] Alternatively, if we include mentor costs, the per-teacher cost is $18,714, and the return is 11%.

teacher development programs. This information was intended to inform our planned interviews with appropriate district staff. The review also revealed studies that provided results of efforts to acquire data on the costs of professional development as well as approaches to estimating professional development costs.

One research study we reviewed found that expenditures ranged from $8.6 to $19.5 million, or 2.2 to 3.7 percent of operating expenditures, in the four districts studied. Consortium for Policy Research in Education (CPRE) researchers analyzed how much money was spent on which professional development activities at both the district and school level. This study cited research that found responsibility for professional development spending and services was often spread across numerous district departments and budgets and scattered over a variety of funds and funding streams. It noted that district administrators were unaware of the total amount spent on professional development. In one district, the reported budget for professional development was only $460,000. Following analysis by a researcher that devoted resources to thorough data collection, it was found that the district spent $8.9 million. Various studies agreed that spending for professional development typically exceeded common expectations. Most estimates of school district spending on professional development ranged from one to four percent of a district's total budget.

Another factor evident from studies of district professional development spending was that resources are cobbled together from a wide range of funding sources. The mix also appeared to vary by district or state. For example, one study found that revenues for professional development activities were nearly evenly split between state and local sources, 45.9 percent versus 47.8 percent respectively, with federal sources comprising the remaining 5.7 percent. Alternatively, another study found that federal sources played a much more significant role in Boston and New York. In Boston, federal sources comprised 32 percent of professional development spending while local sources provided 45 percent. The remaining 23 percent was comprised of state and private sources. In one of New York's districts, federal funding, primarily Title I, provided fully 68 percent of the resources dedicated to professional development.

Another research project, focused upon three large, geographically diverse school districts and one midsize charter network, expanded the more traditional definition of professional development to professional growth and support in order to include any use of people, time and money that targets improvement of teaching. This study concluded that districts spent an average of $18,000 on development for each teacher per year.

## 5. HOW WE QUANTIFIED THE LONG TERM BENEFITS TO DISTRICTS

If students earn more throughout their careers due to participation in the program, then we can expect them to pay more in taxes to the city and state governments who fund the education that prepares students for productive careers. Students might pay more in income taxes, property taxes, and sales taxes. We will estimate the returns to state coffers through sales taxes because people at all income levels pay sales tax.

For example, if an average student earns approximately $1,000 more in 2042 for having participated in the program, we estimate that 23% of their marginal income is likely to be spent on taxable items (based on empirical estimates of the ratio of the implicit sales tax base to state personal income in Illinois from the Tax Foundation),[12] which is adding $230 to the tax base. However, empirical research that followed the cohort of young people born in Chicago from 1978 to 1983 to when they were 32 years old suggest that 27% of youth leave the metro area,[13] so we would reduce that $230 to $168 for the average participating student. If tax rates in the future are similar to tax rates today then that $168/student in 2042 would be subject to the following taxes:

- 6.25% Illinois state sales tax;
- 1.75% Cook County sales tax;
- 1.25% Chicago tax; and
- 1.00% Special tax.

Because these sum to 10.25%, for every $1,000 of increased earnings, we would see an increase of $17.21 in sales tax revenue.[14]

Since we have estimated that for the intervention with math teachers, every $1 invested would see $141 in returns over 30 years of a student's career (using the cost estimates that exclude mentor costs), we can further estimate that every $1 invested would see $2.43 return to state coffers over that same time period [($17.21 * $141) / $1,000]. Likewise, if we use the cost estimates that include mentor costs, then we would assume that every $1 invested would see $55 in returns over the 30 years of students' careers and that every $1 would see a 95 cent return to state coffers over that same time period.

## 6. THE IMPLICATIONS FOR RACIAL EQUITY

Black and Latinx students are more likely than their White counterparts to have new teachers. The U.S. Department of Education Office for Civil Rights found that nationwide, Black students were about four times as likely and Latinx students three times as likely as White students to attend a school where more than 20% of the faculty were first-year teachers.[15] Therefore, if districts nationwide made targeted investments in new teacher induction in areas with high concentrations of new teachers, this would promote equity by disproportionately directing resources toward students who have been structurally denied resources through the inequitable distribution of teachers. The overall return on investment would be lower than if the investment went into the teachers of predominantly white students because racism will likely still negatively impact the earnings of students of color. However, our findings

[12] Kaeding, N. (2017). Sales tax base broadening: Right sizing a sales tax. Fiscal Fact 563, Tax Foundation, Washington, DC. Retrieved from https://taxfoundation.org/sales-tax-base-broadening/

[13] Chetty, R., Friedman, J., Hendren, N., Jones, M.R., & Porter, S.R. (2018). Opportunity Atlas. Opportunity Insights, Cambridge, MA. Retrieved from https://opportunityinsights.org/paper/the-opportunity-atlas/

[14] It should be noted that while the research of Hall and Farkas supports the idea that increased cognitive ability could lead to increased future earnings for individuals, this analysis relies on the related but separate idea that increased cognitive ability in a municipality could lead to an increase in gross metropolitan product for that population.

[15] U.S. Department of Education Office for Civil Rights. (2014). CRDC data snapshot: Teacher equity. Retrieved from https://www2.ed.gov/about/offices/list/ocr/docs/crdc-teacher-equity-snapshot.pdf

suggest that the transfer of resources would be tangible to the students whose teachers participate in the induction because the demographics of the students in these high-concentration-of-new-teacher schools are likely to be very similar to the demographics of the students in the validation study. Within the large urban district that the study was conducted, we estimate that Black and Latinx students are twice as likely to attend a school with a high concentration of novice teachers.[16] Therefore, adopting a policy of new teacher induction could even address within-district racial opportunity gaps. A district wanting to employ this strategy should model the impact at the student-level.

## CONCLUSIONS

The New Teacher Center regards its return on investment estimate as a "first approximation." The model was kept simple with a focus on the two most scrutinized program benefits: student testing achievements and teacher turnover.

These monetary returns to a district's investment are further enhanced by the intangible benefit of having an educational system where the newest teachers are supported and nurtured. These results, built on earlier findings about the empirical benefits of new teacher induction, suggest that the New Teacher Center model is worthy of the investment of schools and school districts.

We hope that future research will build on the findings presented here in a few key areas:

- By more deeply exploring the impacts of teacher induction on the career trajectories and earnings of the teachers who participate;
- By replicating our student-level analysis, which was done at the school level (with pro-rating for student race/gender composition) using student-level data files;
- By quantifying further the changes and the value of the changes in school culture and teacher satisfaction, without which, the returns shown here would probably not be possible;
- In addition, by extending these results to other contexts and in other instances of implementation, possibly with some variation in the mentorship model.

[16] CWe used publicly available teacher salary data from the district and estimated the number of novice teachers by selecting the teachers with the lowest salary; then cross-walked the data with racial demographics by school. Novice teachers were defined as those with an FTE salary of $55,000 or less (17% of teachers) and a high concentration was considered to be more than 27% of teachers in a school (14% of schools).

# REFERENCES CONSULTED

## SRI EDUCATION REPORTS


- Findings Brief, Evaluation of New Teacher Center's i3 Validation Grant Impact of the New Teacher Center's New Teacher Induction Model on Teachers and Students , Rebecca Schmidt, Viki Young, Lauren Cassidy, Haiwen Wang, & Katrina Laguarda, June 2017.
- A Comprehensive Model of Teacher Induction: Implementation and Impact on Teachers and Students, Evaluation of the New Teacher Center's i3 Validation Grant, Final Report Prepared by: SRI Education, Viki M. Young, Rebecca Schmidt, Haiwen Wang, Lauren Cassidy, Katrina Laguarda, December 2017.
- Evaluation of New Teacher Center's i3 Validation Grant, Methods Appendix to Findings Brief, June 22, 2017.


In addition, NTC shared the following SRI reports in early June:


- NTC i3 Validation Study
- Spring 2016 Survey Results
- 2014-15 Achievement and Retention Results – Preliminary
- Cohort 1 and 2 Observation Results
- Annual Reports (March 2014, March 2015, March 2016, March 2017)
- Evaluation of the New Teacher Center's i3 Validation Grant Combined Survey Results (Memo)


## TEACHER PROFESSIONAL DEVELOPMENT COST DATA

As noted above in the Findings Summary, we conducted an extensive literature review to inform our understanding of costs of professional development. The studies below informed the literary review:


- An Analysis of Professional Development Spending in Four Districts Using a New Cost Framework, Consortium for Policy Research in Education, University of Wisconsin-Madison, 2002.
- New Teacher Project (TNTP) The Mirage: Confronting the Hard Truth about Our Quest for Teacher Development, August 2015.
- Professional Growth & Support Spending Calculator, Quantify Your Investment in Teacher Effectiveness, Education Resource Strategies, May 2013.


We also catalogued publicly available information on BCPS and CPS Teacher Induction and professional development programs, policies and procedures.

## STUDIES WITH RELEVANT VALUATION APPROACHES

To determine ways of assigning monetary value to increased effectiveness of teachers, we reviewed the following:


- Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood By Raj Chetty, John N. Friedman, and Jonah E. Rockoff.
- Benefit- Cost Technical Documentation, Washington State Institute for Public Policy Benefit Cost Model Technical Documentation, December 2017.

- Benefit-Cost Analysis of Accelerated Study in Associate Programs (ASAP) of the City University of New York (CUNY), Henry M. Levin and Emma Garcia, May 2013.
- 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 and Michael Strong, 2007 Educational Research Service.
- The Economic Costs of Educational Inequality in Developing Countries Carina Omoeva, Wael Moussa, and Charles Gale, June 27, 2016.

As highlighted above, our ROI analysis relied on the types of computational procedures deployed by WSIPP to assign monetary value to outcomes. WSIPP's benefit-cost model included a number of education-related parameters used to compute estimates of the benefits of K-12 education outcomes (i.e., standardized test scores, high school graduation, and years of education).

## TEACHER TURNOVER COST STUDIES

As noted in the Findings Summary, we conducted a literature review to inform our understanding of costs of teacher turnover. The studies below informed the literary review:

- Barnes, G., E. Crowe, and B. Schaefer. 2007. The Cost of Teacher Turnover in Five School Districts: A Pilot Study , National Commission on Teaching and America's Future (NCTAF).
- Milanowski, A. T., and A. R. Odden. 2007. A new approach to the cost of teacher turnover (Working Paper No. 13). Seattle, WA: University of Washington.
- The cost of teacher turnover in Alaska, A study by the Center for Alaska Education Policy Research at the Institute of Social and Economic Research, Dayna Jean DeFeo, PhD Trang Tran, MPP, Diane Hirshberg, PhD Dale Cope, PhD Pam Cravez, JD, March 31, 2017.
- Watlington, E„ Shockley, R„ Guglielmino, P., & Felsher, R. (2010). The high cost of leaving: An analysis of the cost of teacher turnover. Journal of Education Finance, 36(1).
- Estimating Teacher Turnover Costs: A Case Study, Author(s): Abigail Jurist Levy, Lois Joy, Pamela Ellis, Erica Jablonski and Tzur M.Karelitz, Source: Journal of Education Finance, Vol. 38, No. 2 (FALL 2012), pp. 102-129.
- A Comprehensive Model for Estimating the Financial Impact of Teacher Turnover Author(s): Edwyna Synar and Jeffrey Maiden, Source: Journal of Education Finance, Vol. 38, No. 2 (FALL 2012), pp. 130-144.

## TEACHER RETENTION AND EFFECTIVENESS ANALYSIS

To further our understanding of factors of influence regarding teacher retention and its impact on teacher effectiveness, the following studies have been reviewed:

- Does Teaching Experience Increase Teacher Effectiveness? A Review of the Research. Learning Policy Institute, Tara Kini, Anne Podolsky, June 2016.
- Rethinking Teacher Turnover in Texas: Longitudinal Measures of Instability in Schools by Jennifer Jellison Holme, Huriya Jabbar, Emily Germain, & John Dinning, 2017.

- The Schools Teachers Leave: Teacher Mobility in Chicago Public Schools, University of Chicago Consortium on School Research, June 2009.
- Why Public Schools Lose Teachers. Eric A. Hanushek, John F. Kain, Steven G. Rivkin, 2004.

## LINKS BETWEEN MIDDLE SCHOOL AND HIGH SCHOOL ACHIEVEMENT/GRADUATION

To establish links between middle school academic achievement and future academic achievement, we reviewed the following studies: teacher effectiveness, the following studies have been reviewed:

- Allensworth, E.M., Gwynne, J.A., Moore, P., & de la Torre, M. (November 2014). Middle grade indicators of readiness in Chicago Public Schools.
- Balfanz, R. (June 2009). Putting middle grade students on the graduation path (Policy brief).
- Balfanz, R., Herzog, L., & Mac Iver, D. (2007). Preventing student disengagement and keeping students on the graduation path in urban middle-grades schools: Early identification and effective interventions. Educational Psychologist, 42(4), 223–235.
- Hanover Research (June 2014). Critical academic indicators.
- Hein, V., Smerdon, B., & Sambolt, M. (November 2013). Predictors of postsecondary success.
- Kieffer, M.J., Marinell, W.H., & Stephenson, N.S. (June 2011). The middle grades student transitions study: Navigating the middle grades and preparing students for high school graduation (Working brief).
- Silver, D., Saunders, M., & Zarate, E. (June 2008). What factors predict high school graduation in the Los Angeles Unified School District (California Dropout Research Report #14).

## TEACHER/EMPLOYEE POSITION DATA

- CPI Position files, including Pos #, Dept ID, Department, FTE, ClsIndc, Annual Salary FTE, Annual Salary, Annual Benefit Cost, JobCode, Job Title, Name.
- ISBE Position files for CPI teachers, including School Year, ID Number, Position Code, Position, Name, Gender, Race/Ethnicity, Grade Level, Full Time Equivalent, Position Timeframe, Position Timeframe Description, Salary Funding Source, Salary Funding Source Description, Salary, Sick Days, Vacation Days, Bonus.

## FINANCIAL/BUDGET INFORMATION

- School District Expenditures Per Pupil, National Center for Education Statistics – CPI and BCPS, including Instruction Expenditures Per Pupil
- School District Revenues Per Pupil, National Center for Education Statistics – CPI and BCPS, including by federal, state and local share of revenues.

- Florida Department of Education, The Office of Funding and Financial Reporting (OFFR), School District Summary Budgets, School District Annual Financial Reports (AFR), Expenditures Per Full-Time Equivalent (FTE) Student 2016-17, 2015-1, 2014-15, 2013-14. http://www.fldoe.org/finance/fl-edu-finance-program-fefp/index.stml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**SCHOOL-LEVEL REPORT CARD TYPE DATA**


- CPI School Quality Rating Policy (SQRP) Results and Accountability Status (All school files), 2017-2018, 2016-2017, 2015-2016, 2014-2015
- Illinois State Board of Education (ISBE) Report Card Data, 2017-2018, 2016-2017, 2015-2016, 2014-2015, 2013-2014, 2012-2013, 2011-2012; https://www.isbe.net/pages/illinois-state-report-card-data.aspx


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**SCHOOL-LEVEL CLIMATE/PARENT SURVEY DATA**


- CPI My School Parent/Guardian Survey, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016
- Chetty, R., Friedman, J., Hendren, N., Jones, M.R., & Porter, S.R. (2018). Opportunity Atlas. Opportunity Insights, Cambridge, MA. Retrieved from https://opportunityinsights.org/paper/the-opportunity-atlas/
- U.S. Department of Education Office for Civil Rights. (2014). CRDC data snapshot: Teacher equity. Retrieved from https://www2.ed.gov/about/offices/list/ocr/docs/crdc-teacher-equity-snapshot.pdf

## ABOUT NEW TEACHER CENTER (NTC)

New Teacher Center (NTC) is a national non-profit organization committed to disrupting the predictability of educational inequities for systemically underserved students to ensure every student, from preschool through high school, receives an excellent and equitable education that empowers them to reach their full potential in classrooms, communities, and beyond.

Founded by teachers in 1998, NTC works with systems to drive student learning, increase educator effectiveness, and build leadership capacity. We do this by providing PreK-12 educators with evidence-based skills and supports needed to create optimal learning environments that accelerate students' academic and social-emotional success, specifically focusing on the whole-child. NTC is improving the learning of over 1.8 million students and 25, 700 educators nationwide.

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