Following The Leaders:
An Analysis Of Graduate Effectiveness From Five Principal Preparation Programs

OCTOBER 2016

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American Institutes for Research was contracted to support the George W. Bush Institute's research on education leadership.

Acknowledgments

This report was made possible by the project teams from the George W. Bush Institute and American Institutes for Research. The project teams would like to thank the Technical Advisory Group, which provided input on the study's methodology and direction.

In addition, we are grateful for the continued generous support of the AT&T Foundation, the Bass Foundation, the CME Group Foundation, the Rainwater Charitable Foundation, the Sid W. Richardson Foundation, The Morris Foundation, and The Prudential Foundation.

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Executive Summary

When an effective principal is at the helm of a school, students benefit (Branch, Hanushek, & Rivkin, 2012). Principals play a critical role in establishing a school's climate and culture and in selecting and developing teachers, among other roles. Indeed, school leadership is second only to direct classroom teaching among school-level influences on achievement (Hallinger & Heck, 1998; Leithwood, Louis, Anderson, & Wahlstrom, 2004). Although there may be little disagreement that good principals make a difference, what is less clear is how to systematically prepare good principals.

The George W. Bush Institute has made school principals a focus of its education reform initiative through the Alliance to Reform Education Leadership (AREL) program. The AREL program was launched by convening a network of 28 innovative principal preparation programs for 3 years to learn from the programs, help the programs learn from each other, and spotlight the work done by these programs. With this current study, the Bush Institute sought to go beyond sharing information about best practices in principal preparation and connect information about program graduates to student outcomes. **Specifically, this study evaluated the impact of five AREL Network programs on student achievement.** We also gathered information on graduates' perceptions of their programs. The five principal preparation programs were selected for inclusion in the study based on a set of criteria developed to reflect the best available theory and research on promising practices in principal preparation.

The study was designed to address the following research questions (RQs):

1. What are the characteristics of the selected preparation programs and the district-provided supports to program graduates?
2. What are the characteristics of schools in which program graduates were placed?
3. What effect do program graduates in their first placements as principals have on student achievement and other outcomes?[1,2]
   3a. How much variation is there in program graduates' effects on student achievement?
4. What effect do program graduates with varying levels of experience as principals have on student achievement?

Assessing the impact of principal preparation programs on student outcomes is not without its challenges. Some of the challenges are as follows: principals affect achievement indirectly, and it may take time for leadership to have a measurable effect on student learning; the single-year impact of principals' effects on student achievement may be relatively small (Clifford, Behrstock-Sherratt, & Fetters, 2012); the number of graduates from any single program that have been placed and retained as principals may be small; and there may be factors in the district or elsewhere that cannot be disentangled from the effects of preparation programs, such as additional supports that districts provide to new principals or even the culture of a district. These challenges and others are described in more detail in the report.

These challenges do not lessen the importance of tracking program completers after they graduate and gathering and rigorously analyzing data about their placement, retention, and their school and student outcomes, including achievement. They do, however, point to the need to consider multiple factors in determining the overall effectiveness of any single preparation program.

1 In one district (E), complete data to address RQ3 and RQ4 were unavailable. In this case, RQ3 was modified as described in the following sections, and RQ4 was omitted.

2 The original analysis plans included analysis of achievement, school climate, and graduation rate outcome data—where possible. Ultimately, however, usable school climate data were not consistently available in the districts we studied. In addition, most programs had no principals or very few principals assigned to high schools, and initial feasibility analysis of graduation rates suggested that we would not be able to detect effects on 4-year cohort graduation rates, so the analysis of graduation rates was dropped.

Key Findings

Districts and preparation programs lacked high-quality data on principal characteristics and placements. High-quality data about principal preparation, experience, and assignment were not readily available within the districts where program graduates were placed. For example, one district was unable to provide information on principal experience (in or outside the district). Other districts did not have data about principal preparation, so we relied on data from the preparation programs themselves about their graduates. Data that describe principals' participation in district professional learning, support, or other leadership initiatives (e.g., grant programs targeting leadership support, mentoring programs, and coaching) were typically not centrally collected or complete. In addition, consistent or accurate data about student outcomes other than achievement were not readily available, including data on school climate.

Selected program graduates had generally positive perceptions of program coursework and hands-on experiences, but they have mixed perceptions of district supports and ongoing supports from their programs. The results of 68 interviews conducted with principals who graduated from the five selected programs included generally positive feedback on key aspects of the programs, such as coursework, hands-on experiences, and the rigor of selection into the programs. For example, approximately three fourths of the respondents found their coursework to be supportive of their practice in the principal role to "a great extent." However, graduates described variety in the supports received once they were placed and in their perceptions of the supports. They had mixed views on the usefulness of district supports, with some respondents noting very minimal or ineffective district support, and others praising extensive support from the district. The majority of respondents across three programs found the support they received from programs (e.g., coaching) to be "greatly beneficial" to their practice in the principal role, whereas some other respondents described the coaching support they received as only "somewhat beneficial."

We found little consistent evidence that student achievement in schools led by program graduates is better (or worse) than student achievement in similar schools led by graduates of other programs. Using two different analytic approaches (one that focused on principals newly placed during the time period of the study and one that included all principals from the selected programs serving as principals in schools during the same period), we found little consistent evidence that graduates from any program were more or less effective at fostering student achievement than principals from other programs. It is important to note that this finding does not indicate that these programs are not effective. It does mean that within the time period that we studied, we were unable to identify average effects of the programs on student achievement.

Significant variation occurred in effectiveness among principals from selected and other programs. Although we observed little consistent evidence about average program effects, we observed significant variation in effectiveness among inexperienced principals—from both selected and other programs. In some schools led by one of the selected program graduates, academic performance was well above the average for new principals, but in other schools, it was well below the average.

Taken together, these findings suggest that focusing on how to reduce variation in the performance of graduates through training, selection, or other means or how to systematize or better tailor supports may be the keys to success in preparing effective school leaders.

Introduction

When an effective principal is at the helm of a school, students benefit—by one estimate, students can gain as much as 7 months of additional learning in one school year (Branch, Hanushek, & Rivkin, 2012). Principals play a critical role in establishing a school's climate and culture and in selecting and developing teachers, among other roles. Indeed, school leadership is second only to direct classroom teaching among school-level influences on achievement (Hallinger & Heck, 1998; Leithwood, Louis, Anderson, & Wahlstrom, 2004).

Although there may be little disagreement that good principals make a difference, what is less clear is how to systematically prepare good principals. States typically require principals to complete a preparation program to obtain an administrative certification, although the criteria for the design of these preparation programs vary. Historically, universities have provided principal preparation programs, as is true with teacher preparation, and 48 states require principal candidates to obtain a graduate degree in education or another field to be certified (26 states require a graduate degree in education). Across the United States, as many as 700 principal preparation programs are preparing and certifying principals to lead our nation's schools (Anderson & Reynolds, 2015; Wallace Foundation, 2016). All states allow nonprofit or alternative programs to prepare principals, and 35 state laws or rules specify that nontraditional programs are required to meet the same program quality criteria that other, traditional programs must meet (Wallace Foundation, 2016).

Current approaches employed by university-based principal preparation programs, which continue to train the majority of future principals, often are not viewed as being sufficient to prepare principals to lead schools. For example, Darling-Hammond, LaPointe, Meyerson, Orr, and Cohen (2007) noted that educators in a variety of roles, including principals themselves, reported that universities generally offer principal preparation programs that are "out of touch with the real-world complexities and demands of school leadership" (p. 5), have a low bar for admissions, have programming that is based on outdated research, have curricula that are not aligned to current research-based standards, and lack meaningful experiential learning. In another study, 69% of the principals and 80% of the superintendents reported that typical leadership programs are not aligned to the realities of current districts (Farkas, Johnson, Duffett, & Foleno, 2001).

Study Background

The George W. Bush Institute has made school principals a focus of its education reform initiative through the Alliance to Reform Education Leadership (AREL) program. Rooted in President and Mrs. Bush's belief that "excellent schools must first have excellent leaders," the AREL program was developed to improve the way U.S. principals are prepared and supported. The AREL program was launched by convening a network of 28 innovative principal preparation programs for 3 years to learn from the programs, help the programs learn from each other, and spotlight the work done by these programs.

Convening the AREL Network was a first step into understanding expert opinion on best practices in principal preparation. With the current study, the Bush Institute sought to go beyond sharing information about best practices in principal preparation and connect information about program graduates to student outcomes. **Specifically, this study evaluated the impact of five AREL Network programs on student achievement.** We also gathered information on graduates' perceptions of their programs.

Most discussion and research on the use of student test scores to assess educator preparation has focused on teacher preparation programs. With a few notable exceptions (e.g., Gates et al., 2014), few studies have analyzed the impact of principal preparation programs on student learning. This study aimed to extend our knowledge about program impact by evaluating multiple programs and implementing a rigorous methodology that could potentially serve as a model for future studies or improvement efforts.

Assessing the impact of principal preparation programs on student outcomes is not without its challenges. Some of the challenges are as follows: principals affect achievement indirectly, and it may take time for leadership to have a measurable effect on student learning; the single-year impact of principals' effects on student achievement may be relatively small (Clifford et al., 2012); the number of graduates from any single program that have been placed and retained as principals may be small; and there may be factors in the district or elsewhere that are difficult to disentangle from the effects of preparation programs, such as additional supports that districts provide to new principals or even the culture of a district. These challenges and others are described in more detail in the Methods section.

These challenges do not lessen the importance of tracking program completers after they graduate and gathering and rigorously analyzing data about their placement, retention, and their school and student outcomes, including achievement. They do, however, point to the need to consider multiple factors in determining the overall effectiveness of any single preparation program.

Study Overview

Five AREL Network principal preparation programs were selected for inclusion in the study based on a set of criteria developed to reflect the best available theory and research on promising practices in principal preparation. The study was designed to address the following RQs:

1. What are the characteristics of the selected preparation programs and the district-provided supports to program graduates?
2. What are the characteristics of schools in which program graduates were placed?
3. What effect do program graduates in their first placements as principals have on student achievement and other outcomes?[3,4]
   3a. How much variation is there in program graduates' effects on student achievement?
4. What effect do program graduates with varying levels of experience as principals have on student achievement?

We used multiple approaches to address these questions (Table 1). The Methods section provides more detail on the methods and data.

Table 1. Research Questions and Data Collection Methods

Research Question	Data Collection and Analysis
RQ1. What are the characteristics of the selected preparation programs and the district-provided supports to program graduates?	Interviews with key preparation program administrators, a sample of graduates from each program, and district staff responsible for principal recruitment and development in districts where graduates were placed. Review of program documentation.
RQ2. What are the characteristics of schools in which program graduates were placed?	Descriptive analysis of publicly available aggregate school-level demographic data for schools in the districts matched to data from selected programs about where their graduates served as principals. These data were then matched to placement data provided by the programs to identify where their graduates served as principals during the period of the study. Finally, we analyzed student test scores in reading/English language arts (ELA) and mathematics in Grades 3–8 and matched to data about where the programs placed their graduates.
RQ3. What effect do program graduates in their first placements as principals have on student achievement and other outcomes? 3a. How much variation is there in program graduates' effects on student achievement?	Quantitative analysis of student test scores in reading/ELA and mathematics in Grades 3–8 and matched to data about where selected programs placed their graduates (focus on first-time principals only).
RQ4. What effect do program graduates with varying levels of experience as principals have on student achievement?	Quantitative analysis of student test scores in reading/ELA and mathematics in Grades 3–8 and matched to data about where selected programs placed their graduates (includes all principals from the program serving in schools during the study period).

3 In one district (E), complete data to address RQ3 and RQ4 were unavailable. In this case, RQ3 was modified as described in the following sections, and RQ4 was omitted.

4 The original analysis plans included analysis of achievement, school climate, and graduation rate outcome data—where possible. Ultimately, however, usable school climate data were not consistently available in the districts we studied. In addition, most programs had no principals or very few principals assigned to high schools, and initial feasibility analysis of graduation rates suggested that we would not be able to detect effects on 4-year cohort graduation rates, so the analysis of graduation rates was dropped.

Organization of the Report

This remainder of this report is divided into the following major sections:

- **Key findings**
- **Methods**
- **Findings**
- **Discussion and implications**

Following an overview of the key findings, we describe all the methods, beginning with our approach to selecting and describing the programs and collecting interview data from program administrators and principals. We also give an overview of our quantitative analysis methods, with more detailed descriptions available in Appendix F. We close the quantitative methods section with an overview of the methodological challenges of this work.

Next, we give an overview of the findings about program characteristics and district supports (RQ1), including program descriptions and principal perception data. This section also provides descriptive statistics on each district where graduates were placed (RQ2) and follows with the findings on graduate performance for all five programs (RQ3 and RQ4).

The report closes with a discussion of the implications of our findings and suggestions for future research. The appendices include program selection criteria, the program documentation request, principal and program administrator interview protocols, additional principal perception findings, more detailed quantitative methods, and more detailed empirical findings.

Key Findings

Districts and preparation programs lacked high-quality data on principal characteristics and placements. High-quality data about principal preparation, experience, and assignment were not readily available within the districts. For example, one district was unable to provide information on principal experience (in or outside the district). Other districts did not have data about principal preparation, so we relied on data from the preparation programs themselves about their graduates. Data that describe principals' participation in district professional learning, support, or other leadership initiatives (e.g., grant programs targeting leadership support, mentoring programs, and coaching) were typically not centrally collected or complete. In addition, consistent or accurate data about student outcomes other than achievement were not readily available.

Selected program graduates had generally positive perceptions of program coursework and hands-on experiences, but they have mixed perceptions of district supports and ongoing supports from their programs. The results of 68 interviews conducted with principals who graduated from the five selected programs included generally positive feedback on key aspects of the programs, such as coursework, hands-on experiences, and rigor of selection into the programs. For example, approximately three fourths of the respondents found their coursework to be supportive of their practice in the principal role to "a great extent." However, graduates described variety in the supports received once they were placed and in their perceptions of the supports. They had mixed views on the usefulness of district supports, with some respondents noting very minimal or ineffective district support, and others praising extensive support from the district. The majority of respondents across three programs found the support they received from programs (e.g., coaching) to be "greatly beneficial" to their practice in the principal role, whereas some other respondents described the coaching support they received as only "somewhat beneficial."

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Significant variation occurred in effectiveness among principals from selected and other programs. Although we observed little consistent evidence about average program effects, we observed significant variation in effectiveness among inexperienced principals—from both selected and other programs. In some schools led by one of the selected program graduates, academic performance was well above the average for new principals, but in other schools, it was well below the average.

Taken together, these findings suggest that focusing on how to reduce variation in the performance of graduates through training, selection, or other means, or how to systematize or better tailor supports may be the keys to success in preparing effective school leaders.

5 Because of data limitations in one district, we focus here on findings from four of the five originally selected programs. The results for that district (District E) can be found in the section on quantitative results for District E.

Program Selection Process

To develop an initial pool of potential programs to be evaluated, we first looked at those participating in the AREL Network and then considered recommendations from experts in the field and professional associations, such as the University Council for Educational Administration (UCEA). We developed a set of criteria reflecting the best available theory and research on promising practices in principal preparation and then rated each program (see Appendix A). A review of the research on what experts consider promising principal preparation programs generally characterizes the features of these programs into several categories: alignment to research-based competencies, rigorous selection criteria, the inclusion of experiential learning, on-the-job support (mentoring, coaching, and professional development), and strong district-program partnerships (Darling-Hammond et al., 2007; George W. Bush Institute, 2014; Shelton, 2012). The selection criteria were as follows:

- **Program Alignment to Research-Based Competencies.** The program's structure and curriculum is organized according to a set of research-based standards and practices and displays alignment to these research-based competencies.
- **Experiential Learning**. The program has student learning experiences (including coursework and other learning experiences) that expose students to the problems of school leadership practice, with the intent to build practical and technical knowledge. Learning experiences are scaffolded, moving from classroom or online learning simulations to internship experiences where students lead all or a significant portion of a school's operations.
- **High-Quality, Rigorous Recruitment and Selection**. The program engages in vigorous recruitment of high-ability candidates with experience as expert, dynamic teachers and a commitment to instructional improvement.
- **Early Years on-the-Job Support**. The program includes intensive on-the-job support (i.e., induction) for program graduates who are principals, such as mentoring, coaching, or a peer network, for at least 1 year after graduation.
- **Partnerships for Excellence**. The program's administrative structure engages district personnel in coteaching classes, serving as sites for learning, providing feedback on graduate quality, or curriculum review and alignment.
- **Evidence of Effects**. The program seeks out evidence of effects on advancing leadership practice, school culture, or student learning that have been developed through rigorous study. The program also has established routines for collecting program effectiveness information and uses data to adjust programs.

In addition, we selected programs that placed most or all of their graduates in one district to facilitate data analysis. Ultimately, based on these criteria, of the 11 programs reviewed, five programs were selected for inclusion in the study. Complete documentation of our selection criteria is in Appendix A.

Program Document Review and Administrator Interviews

To learn more about the characteristics of the five selected programs, including how they align to the selection criteria, we requested documentation from the selected programs (Table 2) and conducted interviews with one or more program administrators from each program. These interviews produced a detailed description of each program, which was reviewed for accuracy by each program. The program documentation request and interview protocol are in Appendix B and Appendix C. A synthesis of the findings from the document review and interviews, including detailed examples from particular programs as they relate to each selection criterion, can be found in the results section.

Table 2. Types of Documentation Requested of the Programs

Program descriptions
Admission and graduation statistics
Placement data and statistics
Recruitment materials
Coursework descriptions and syllabi
Program standards and competencies
Documentation of program alignment to standards
Program planning documentation
Faculty information
Materials describing clinical residencies or internships
Descriptions of coaching or mentoring programs
Information documenting partnerships between programs and districts
Evaluation data or reports

Principal Interviews

To further explore RQ1 regarding program characteristics and better understand the types of supports provided to graduates of the selected programs, both by the program and the partner district, we interviewed a sample of principals who graduated from each selected program. The purpose of these principal interviews was fourfold:

- Learn more about the principals' background and experience in education.
- Determine if graduates' schools or districts were participating in any special initiatives.
- Understand the supports that principals received from the program, the district, and any other sources.
- Learn more about how the principal graduates have applied material learned in the program in their roles as school leaders.

These interviews were not intended to compare the experiences of principals trained by the selected programs with the experiences of principals trained by other programs; they were intended to provide only more detailed descriptive information on the practices of the selected programs. The complete interview protocol is in Appendix D.

Those interviewed were selected from a complete list of all graduates of each program obtained from the program itself and, when available, cross-checked by data provided by the partner district. This list included both principals who graduated from the program and currently serve as principals and graduates that served as principals in the district but then left their initial principal position.

Telephone interviews were conducted from October 2014 through May 2015 and were approximately 60–90 minutes in length. Researchers recorded and transcribed the interviews and then coded and analyzed the interview transcripts and notes using NVivo software.[6]

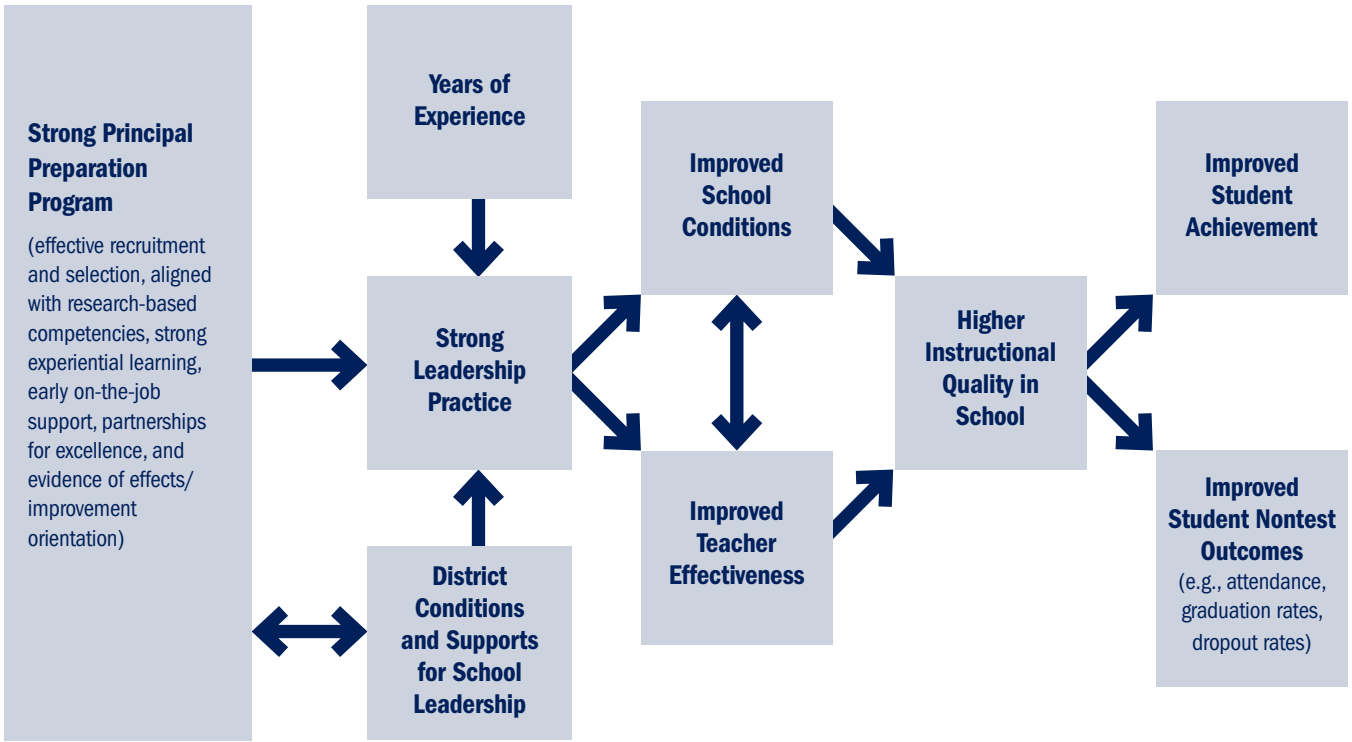
6 Interviews were recorded only when the respondent provided consent. In the event that a respondent did not want to be recorded, the analysis was based on the interviewer's notes.

Student Achievement Analysis

To address RQ3 and RQ4 regarding the effects of program graduates on student achievement and school climate (where data were available), we employed several different analytic strategies based on the available data and the specifics of the research questions. We describe each analytic approach in the following sections.

In each case, the program effect for RQ3 and RQ4 is a school-level factor. We assume that principals who are trained by strong preparation programs will emerge with good leadership practices (which will, in turn, be affected by the supports they receive from their programs or districts, as well as by their own leadership experience (Figure 1). We expect these practices to lead to school-level changes that ultimately result in school-level improvements in student achievement.

Figure 1. Logic Model for Principal Preparation Program Effects on Student Outcomes



Each of the five principal preparation programs mentioned earlier is unique, as are the districts with which the principal preparation programs partner. Therefore, our research design specifies a separate analysis for each program.

Based on within-school estimates of principal value-added effects, Grissom, Kalogrides, and Loeb (2015) estimate that a one standard deviation (SD) increase in principal effectiveness is associated with an increase in student achievement equivalent to between 0.058 and 0.084 SD of the test score distribution in mathematics and between 0.038 and 0.065 SD of the test score distribution in reading. These measures provide a benchmark by which to assess the relative effectiveness of principals trained by one of the programs of interest.

Estimating Effects of Newly Placed (Inexperienced) Principals From Selected Programs

Defining the Treatment

For RQ3, the treatment is being assigned a principal newly trained by one of the principal preparation programs of interest. The counterfactual—what would have happened in the absence of treatment—is what would have happened at that same school had a principal from one of the preparation programs of interest not been assigned to the school.

For RQ3a on variation in program graduates' effects on student achievement, the treatment is being assigned a principal newly trained by one of the principal preparation programs of interest, and the counterfactual is what would have happened at that same school if a principal from a different program had been assigned at the same time.

Our research design measures the difference between what actually happened at schools during years they were led by a principal from one of the programs of interest and what would have happened in the counterfactual. This difference in student outcomes at the school is interpreted as a causal effect of principals from the programs of interest on student outcomes. The theoretical framework for this design (the potential outcomes framework) derives from Rubin's (1974) causal model.

The following further clarify the treatment:

- Our analysis cannot disentangle the process by which individuals are selected (or self-select) into preparation programs. For example, some programs may be better at selecting individuals who become more effective principals (e.g., those with greater content knowledge or other relevant skills) than others. A program may then appear to be more effective because it selects highly qualified applicants, even though the program does little to improve the skills of those it prepares. However, the process by which the principal preparation program selects among its applicants may be viewed as an important component of the program. The goal of this project is to determine the effect of principals from the programs of interest. The project will not explain why those principals are more effective.
- In some schools in our study, a principal trained by one of the programs of interest is placed at a school, serves for a number of years, leaves the school, and is replaced by another principal from the same program. This creates a problem for our identification strategy: Should the first year the second principal leads the school be considered the first year the school is treated by an inexperienced principal from one of the programs of interest or a continuation of the leadership from the previous principal trained by one of the programs of interest? Because neither approach would provide a clean measure of the number of years the school had been led by an inexperienced principal from one of the programs of interest, we drop from our sample all observations where a school was led by a second principal from one of the programs of interest.
- The goal of this analysis is to evaluate the effectiveness of principals trained by one of the five selected programs. However, if many comparison-group principals also are trained by other high-quality programs that serve the district, we might not expect to find significant differences in effectiveness between principals from programs of interest and principals from other programs.

- In some cases, several years may pass between the time an individual completes one of the programs of interest and the time the individual first becomes a principal. We did not control for the number of years that pass between the time an individual completes a principal preparation program and the time the individual becomes a principal. Individuals who do not secure a principal position until several years after completing their principal preparation program might be different, on average, than individuals who secure a principal position shortly after completing a principal preparation program. For example, individuals who do not secure a position until several years after completing the program might have been less effective than principals who secured a position immediately for reasons that have nothing to do with the span of time between completing the program and securing a position. Therefore, controlling for the number of years that pass between the time an individual completes a preparation program and the time the individual secures a principal position could remove important variation in principal quality from our estimates of the relative effectiveness of the programs of interest. To the extent that the potential effect of the program of interest decays between the time the individual completes the program and the time the individual receives his or her first principal assignment, however, our estimates of the effect of the programs of interest on achievement at schools will be attenuated.

Analytic Approach

RQ3 asks about the effect of program graduates in their first placements as principals after being trained by the selected program. To evaluate the effect of being assigned a principal newly trained by one of the selected programs on outcomes at that school (compared with schools that were assigned an inexperienced principal not trained by one of the selected programs), we identified all schools in the participating districts that were assigned a principal who had no experience as a principal in that district prior to placement. Most districts were unable to provide information on principals' experience outside the district, so our analysis was able to identify only those principals with no experience within the selected program partner district. The implication of this fact is that although we refer to this analysis as addressing inexperienced principals, it is possible that some comparison group principals did have leadership experience outside the district, and we simply observed their first placements within the district.[7]

The analysis focused only on those schools that received an inexperienced principal during the 2011–12, 2012–13, 2013–14, or 2014–15 school years. It includes both treatment schools that received an inexperienced principal from one of the selected programs and comparison schools that received an inexperienced principal who did not attend one of the selected programs. We included only those schools for which outcome data were available every year from 2008–09 through 2014–15.

The gold standard for determining program impact in education research is the randomized experiment. Using this research design, principals would be randomly assigned to schools, and outcomes of students in schools led by principals from one of the selected programs would be compared with the outcomes of students in other schools. Because such a design is impractical in this case, we employed a quasi-experimental analytic strategy—a within-school comparative interrupted time series (CITS). CITS designs have been shown to produce results similar to those of other quasi-experimental designs (Somers, Zhu, Jacob, & Bloom, 2013) and randomized controlled trials (St. Clair, Cook, & Hallberg, 2014, 2016).

In our CITS design, student outcomes at each school were expected to continue along the same linear trend followed prior to the arrival of an inexperienced principal, along with any additional changes in student outcomes one might expect because of changes in the characteristics of students attending the school. The expectation that student outcomes will continue along their previous linear trend is the "time series" component of CITS.

7 It also is possible that both treatment and comparison group principals held school leadership positions, such as assistant principal or teacher leader, prior to becoming a principal.

The CITS analysis included schools that received an inexperienced principal from one of the selected programs as well as other schools that received inexperienced principals who were graduates of other programs (i.e., not the selected programs). Following the arrival of the new principals, changes in outcomes at schools that received an inexperienced principal from one of the selected programs were compared with changes in outcomes at schools that received other inexperienced principals. The estimated average change in outcomes following the arrival of inexperienced principals in schools is the "interrupted" component of CITS. Finally, the difference between the average change in outcomes between schools that received an inexperienced principal from a selected program and the average change in outcomes among schools that received other inexperienced principals is the "comparative" component of CITS.

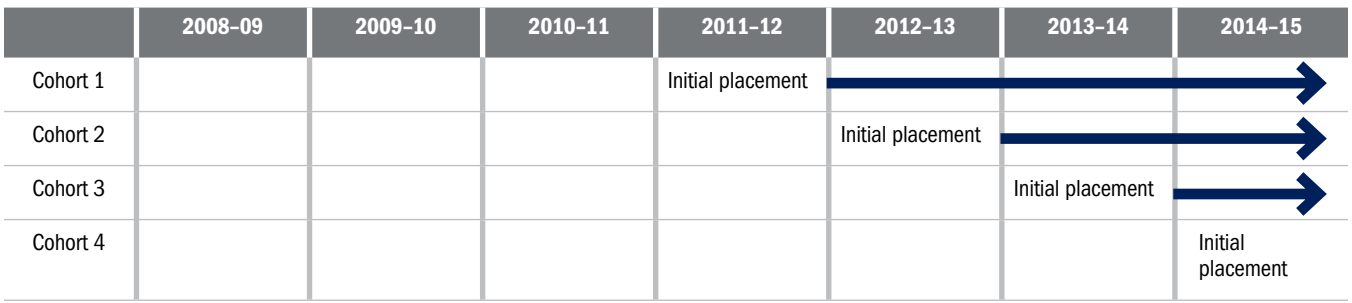
The comparison schools—schools that received a new principal who was not trained by one of the selected programs—were included in the analysis to provide an estimate of a counterfactual for the treatment schools during the "post" period (i.e., following the placement of the inexperienced principal). For example, if the achievement in comparison schools dipped following the arrival of the inexperienced principal, then one might expect achievement in treatment schools to dip following the arrival of the inexperienced principal as well. Similarly, if achievement in comparison schools increased following the arrival of the inexperienced principal, then one might expect achievement in treatment schools to increase as well.

Two assumptions that must be true for the CITS design to produce unbiased estimates of the relative effectiveness of inexperienced principals from selected programs are as follows:

1. In a typical school included in the analysis, if an inexperienced principal had not been placed in the school, the trend in outcomes at the school would have continued along its previous linear path.
2. If an inexperienced principal from one of the selected programs had not been placed in the school, but an inexperienced principal from another program had been placed there instead, the change in outcomes one could expect to observe in that school would be the same as the typical change in outcomes in following the arrival of an inexperienced principal in comparison schools.

The analysis covers the years 2008–09 through 2014–15. To include at least three pretreatment years of data in the analysis, we examined outcomes for four cohorts of schools (Figure 2). The analysis for Cohort 1 included three pretreatment years and four treatment years; Cohort 2 included four pretreatment years and three treatment years; Cohort 3 included five pretreatment years and two treatment years; and Cohort 4 included six pretreatment years and one treatment year.

Figure 2. Overview of Graduate Cohorts Included in the Analysis



Principal Attrition in Our Analysis of Inexperienced Principals

Our analysis of inexperienced principals includes only those principals who were placed during 2011–12, 2012–13, or 2013–14 and who stayed at the same school through 2014–15. Not all inexperienced program principals who were placed in 2011–12, 2012–13, or 2013–14 stayed at the same school through 2014–15. For example, a principal from one of the selected programs might have been placed in a school in 2011–12 and then left that school after 2012–13. If the average effectiveness of program principals who leave their schools before 2014–15 is different from the average effectiveness of program principals who stay through 2014–2015, our findings will not be generalizable to the group of principals (program and nonprogram) who change schools. Similarly, if the average effectiveness of nonprogram principals who leave their schools before 2014–15 is different from the average effectiveness of nonprogram principals who stay through 2014–2015, our findings will not be generalizable to the group of inexperienced principals (program and nonprogram) who change schools. We considered several strategies to handle these situations, but ultimately decided to drop these schools from the analysis.

One possible solution to this problem would have been to match every inexperienced program principal who left before 2014–15 with a comparison-group principal who started and left at the same times as the program principal and whose school had similar characteristics as the program principal's school. This would allow us to compare two principals, one program and one nonprogram, who led similar schools, became principals at the same time, and remained at their schools for the same amount of time. Unfortunately, we could not always find comparison-group principals who met all these criteria.

Another strategy would be to simply retain the school in the analysis through 2014–15 and continue to look at outcomes at the school after the principal had left. With this approach, however, our models would not clearly distinguish between the effectiveness of the principal who left and the effectiveness of that principal's replacement. If a principal's departure and the arrival of a new principal is disruptive to the school, this strategy might affect the achievement outcome we plan to study.

In the end, we decided that the best strategy would be to simply remove these principals and schools from the analysis. This strategy limits the generalizability of our findings to inexperienced principals who stayed in their schools through the available time period (i.e., for either 1, 2, 3, or 4 years depending on when they were first placed). Note that this potential shortcoming applies only to our analysis of inexperienced principals; it does not apply to our analysis of all principals, which is described in greater detail as follows.

Table 3 shows the numbers of selected program principals included in the analysis of inexperienced principals and the numbers who were dropped because they did not remain at their schools. Overall, only 5 of the 60 selected program principals were excluded from the analysis because they did not remain at their schools. Overall, sample sizes among selected programs are likely more limiting than potential differences among those included and excluded because of attrition.

Table 3. Number of Principals From Selected Programs Included in the Analysis of Inexperienced Principals

District	Number of Principals Included in Inexperienced Principal Analysis	Number of Selected Program Principals Dropped From Inexperienced Principal Analysis Because of Attrition
A	5	0
B	5	1
C	13	0
D	21	3
E	16	1

Selection of Comparison Schools

The disruption associated with principal turnover may influence student achievement in a school, regardless of how well or where a principal was trained. As described earlier, to account for this possibility, we included comparison schools in our models. These schools also received an inexperienced principal who was not trained by one of the selected programs. This is the first—and perhaps most important—criterion we used to determine the set of comparison schools: Only those schools that received a new principal who was not trained by one of the selected programs were included in the set of comparison schools.

A second criterion relates to the baseline achievement and trends of the comparison schools. Comparison schools with baseline achievement levels and trends similar to those of schools that received an inexperienced principal from one of the selected programs may provide a better estimate of the counterfactual for treatment schools in the post period than one based on all schools that received an inexperienced principal. For example, the disruption associated with principal turnover may be greater in schools with lower baseline achievement levels. If that is the case, it is important that we base our estimate of the counterfactual on schools with lower baseline levels of achievement. We therefore also matched schools receiving principals from one of the selected programs to comparison schools with similar average test scores in the pretreatment period.

To select comparison schools with similar average test scores in the pretreatment period, we used one of two approaches, depending on the district: Euclidean distance matching (Districts A, B, and C) or propensity score matching (District D). In the fifth district (District E), we were unable to identify comparison schools because we could not reliably identify when or where new principals from outside the selected program were placed. For the program serving that district, we modified our overall analytic strategy.

In Districts A, B, and C, sometimes only one or two treatment schools were in each cohort. In these cohorts, little or no variation existed in the characteristics of schools receiving a principal from one of the selected programs. As a result, it is not possible to estimate propensity scores for these cohorts. Instead, we match based on the Euclidean distance between each treatment school's annual pretreatment average reading/ELA and mathematics test scores and comparison schools' annual pretreatment average reading/ELA and mathematics test scores.[8] To be consistent within districts, we used this Euclidean distance approach for every cohort in Districts A, B, and C, rather than matching some cohorts based on propensity scores and other cohorts in the same district based on Euclidean distance. In District A, where the number of potential comparison schools in each cohort was small, the treatment schools were matched to their two nearest comparison schools with replacement. In Districts B and C, the treatment schools were matched to their five nearest comparison schools, with replacement. In our analysis of the relative effectiveness of inexperienced principals from selected programs, comparison schools were weighted based on the number of times they were matched to a school that received an inexperienced principal from one of the selected programs.

8 For example, the distance between Comparison School 1 (*c*1) and Treatment School 1 (*t*1), both of which received an inexperienced principal in 2011–12, is calculated as follows:

$$distance_{c1,t1} = \sqrt{\sum_{s Ereading,math} \sum_{y=2008\text{-}09}^{2010\text{-}11} [(\overline{\text{test score}(s,y)_{c1}} - \overline{\text{test score}(s,y)_{t1}})^2]},$$

where test score $(s, y)_{c1}$ is the average test score in subject s in school *c*1 during year *y*, and test score (s, y)t1 is the average test score in subject s in school *t*1 during year *y*.

In District D, which has several principals from one of the selected programs in each cohort, we used propensity score matching. Propensity scores were estimated separately by cohort of inexperienced principals: graduates from selected programs whose first principal assignment was in 2011–12 were matched with others whose first principal assignment was in 2011–12, graduates from selected programs whose first principal assignment was in 2012–13 were matched with others whose first principal assignment was in 2012–13, and so on. Matches were based on the average ELA and mathematics scores of the school in the pretreatment period. For example, the propensity scores for schools receiving inexperienced principals in 2011–12 were based on six average scores for each school: average ELA scores in 2008–09, 2009–10, and 2010–11 and average mathematics scores in 2008–09, 2009–10, and 2010–11. Each treatment school was matched to the five nearest comparison schools, with replacement. In our analysis of the relative effectiveness of inexperienced principals from selected programs, comparison schools were weighted based on the number of times they were matched to a school that received an inexperienced principal from one of the selected programs. Details on the baseline test scores of treatment and comparison schools can be found in Appendix F.

District E could not provide us with reliable information about principal assignments. In some years, the percentage of schools where District E data reported no principal was as high as 25%. However, we were able to obtain placement information from the preparation program itself.[9] Our analysis for District E, therefore, did not include comparison schools and can be more accurately described as an interrupted time series rather than a CITS. Our model for District E described the change in student achievement following the arrival of an inexperienced principal, accounting for levels and trends in student achievement and changes in observable student characteristics at that school.

We cannot necessarily attribute change in achievement, relative to expectations, to the principal. For example, change in achievement could be attributed to the impact of the principal, the disruption caused by principal turnover in the school, reversion to the mean of student achievement following the departure of a less-effective principal, or changes in districtwide school policies, among other factors. More details on the methodology used for District E can be found in Appendix F.

Estimating Variation In Effectiveness Among Principals

Although RQ3 focused on average effectiveness of a program's graduates, RQ3a asked about the variation in the effectiveness of program graduates in their first placements as principals. In addition to estimating average differences in effectiveness between inexperienced principals trained by selected programs and other inexperienced principals in the same district, we also estimated the impact of each principal, which allowed us to quantify the variation of the effectiveness of inexperienced principals within each district. This analysis builds on the same samples of principals included in the previous analysis.

To estimate the impact of individual principals on student achievement, we accounted for differences in levels and trends in student achievement between different cohorts of schools and between treatment and comparison schools within each cohort of schools. We also accounted for year-to-year changes in observable student characteristics in each school. We then determined how much higher or lower student test scores were at that school, on average, following the arrival of the inexperienced principal, compared with where one

9 This program carefully tracks program graduates to provide ongoing coaching and support, and we therefore had confidence that the data about principal assignments were accurate.

would have expected student test scores to have been. This determination was based on both previous levels and trends in student achievement in different groups of schools and changes in observable student characteristics within each school. The magnitude of this increase or decrease in average student achievement at a school following the arrival of the inexperienced principal, accounting for levels and trends in achievement and changes in student characteristics, was our estimate of the individual principal's contribution to student achievement.

Estimating Effects of All Principals From Selected Programs

Initial review of the program graduate data indicated that some program graduates already had experience as a principal either prior to or concurrent with attending the program. Other program graduates were placed as principals too early in the time series available for our analysis to meet the conditions necessary for the CITS (i.e., 3 years of pretreatment data for the schools they were placed in were not available). These individuals consequently did not meet the criteria of inexperienced and newly placed principals; excluding them from the analysis limited our ability to report on the overall effectiveness of the selected programs.

To provide the most representative view of the program's graduates as possible, we added an additional research question (RQ4), which was aimed at examining the effects of all program graduates (regardless of experience). Table 4 shows the numbers of graduates included for each selected program.

Table 4. Numbers of Principals From Selected Programs Included in Analysis

District	Number of Principals Included in "All Principals" Analysis	Total Number of Graduates Serving as Principals for at Least 1 Year Between 2008–09 and 2014–15[a]
A	11	11
B	6	6
C	33	47
D	274	382
E	–	76

a Graduates may be excluded if they did not serve as principal at least 6 months in a school year or if they served in a school without Grades 3–8 ELA or mathematics.

The goal of RQ4 was to determine whether students who attended schools led by principals trained by one of the selected programs had higher- or lower-than-expected levels of achievement, given their observable characteristics.

To analyze the relative effectiveness of all (not just inexperienced) principals from selected programs, it was necessary to implement a different analytic strategy than the one used for RQ3. Recall that our CITS strategy grouped schools into cohorts that received principals with the same amount of experience (in this case, zero) in the same year. The analysis also required that several years of achievement data be available for those schools prior to the change in principals in that school. Those data were not available for all principals. Also, identifying comparison schools for all principals from one of the selected programs during the time period of our analysis that would match on relevant criteria, such as length of tenure in a school, total years of experience, achievement, and principal assignment, was not possible. We therefore adopted a different analytic strategy for this analysis.

This strategy, a regression model with student and school fixed effects, followed the RAND (Gates et al., 2014) study of the relative effectiveness of principals trained by the New Leaders Program and serving as principals in 10 districts. The authors of that study noted that one might expect principal effects on student achievement to differ based on the number of years the student attends a school led by a treatment principal. For example, a student's achievement might increase in proportion to the number of years that the student attends a school led by a highly effective principal. The authors also noted that one might expect principal effects on student achievement to differ based on the length of the principal's tenure at the school. For example, if a highly effective principal has led a school for a number of years, that principal has had time to implement effective policies, hire effective teachers, provide coaching to less effective teachers, and improve the culture of the school, all of which could lead to an increase in student achievement. Like Gates et al. (2014), we therefore take two distinct approaches to defining students' treatment status: exposure and tenure.

Exposure

This model allows for the possibility that students with 1 year of attendance at a school led by a principal trained by one of the selected programs will be affected differently from students with 2 years of attendance at a school led by a principal trained by one of the selected programs. Similarly, students with 2 years of attendance at a school led by a principal trained by one of the selected programs may be affected differently from students with 3 years of attendance at a school led by a principal trained by one of the selected programs.

Tenure

We expected that the longer a principal's tenure at a school, the more time the principal would have had to implement policies and other changes at the school. This model allowed principals' impact in their first year of tenure at a school to be different from their impact during their second year of tenure at a school, on average, and also allowed principals' impact in their second year of tenure at a school to be different from their impact during their third year or greater of tenure at a school. Moreover, it allowed the impact of treatment principals in their first year of tenure at a school to be different from the impact of all other principals in their first year of tenure at a school; the impact of treatment principals in their second year of tenure at a school to be different from the impact of all other principals in their second year of tenure at a school; and the impact of treatment principals in their third year of tenure at a school to be different from the impact of all other principals in their third year of tenure at a school.

The primary differences between the exposure and tenure models are as follows:

- The exposure models assumed that the impact of principals from one of the selected programs was permanent. In contrast, the tenure models assumed principals affect students only when students were attending those principals' schools. As soon as the student changed to a school that was not led by a principal from one of the selected programs, or as soon as leadership at the school changed from a selected program principal to another principal, the impact of the selected program principal dissipated entirely.
- The exposure models assumed that the impact of a principal from one of the selected programs increases in proportion to the number of years that a student attends a school led by a principal from one of the selected programs. The tenure models did not make this assumption.
- The tenure models assumed that the impact of principals in their first year of tenure at a school was different from the impact of principals in their second year of tenure at a school, and the impact of principals in their second year of tenure at a school is different from the impact of principals with more than 2 years of tenure at a school.

- Moreover, the tenure models assumed that the impact of principals from one of the selected programs in their first year of tenure at a school was different from the impact of other principals in their first year of tenure at a school, the impact of principals from one of the selected programs in their second year of tenure at a school was different from the impact of other principals in their second year of tenure at a school, and the impact of principals from one of the selected programs with more than 2 years of tenure at a school was different from the impact of other principals with more than 2 years of tenure at a school.
- The exposure models did not account for principal tenure at the school.

Accounting for Differences Between Students

To account for the fact that students who attend schools led by treatment principals may have higher or lower baseline levels of achievement, on average, than the typical student in that district, we implemented a student fixed-effects model. In the exposure models, the student fixed-effects approach compared a student's achievement in years prior to attending a school led by a treatment principal with that student's achievement in years during or after which the student attended a school led by a treatment principal. In the tenure models, the student fixed-effects approach compared a student's achievement in years the student did not attend a school led by a treatment principal with that student's achievement in years the student attended a school led by a treatment principal.

Because these analyses depended critically on comparing a student's performance in treatment years with that student's performance in nontreatment years, the models included the following controls for time-varying individual student characteristics:

- A binary "skip" variable, indicating the student was in a higher grade than one would expect given the student's first observed grade
- A binary "retain" variable, indicating the student was in a lower grade than one would expect given the student's first observed grade
- A binary "move" variable, indicating the student was attending a different school in the current year than the student attended the previous year
- A vector of binary enrolled grade indicators
- The "move" indicator interacted with enrolled grade indicators, to allow (for example) for the possibility that changing schools between Grades 5 and 6 might affect students differently from changing schools between Grades 6 and 7.
- Binary variables indicating English language learner (ELL) status, students with disabilities (SWDs), and eligibility for participation in the free or reduced-price meal program in the current year

Students' year-to-year movement between schools may explain important within-student changes in student achievement. For example, we might expect a dip in achievement among students who change schools between Grades 4 and 5, relative to students who do not change schools, because of the stresses related to changing schools. We identified the relative effectiveness of principals from selected programs based, in part, on student movement between schools led and not led by principals from selected programs. If students recently exposed to principals from selected programs also were students who had recently changed schools, failure to account this movement could bias our estimates of the relative effectiveness of principals from selected programs.

Because our data sets cover only the years 2008–09 through 2014–15, we did not have accurate measures of student movement between 2007–08 and 2008–09. To ensure that we had accurate measures of student movement in all years covered by the analysis, we therefore dropped student test scores from 2008–09 from our analysis. This limited our analysis of the relative effectiveness of all principals to the years 2009–10 through 2014–15.

Accounting for Differences Between Schools

Our models accounted for the fact that students attending schools led by treatment principals may be different, on average, from other students in the district. Our models also accounted for the fact that the schools themselves might be different from the typical school in a district. To account for these differences, our model controlled for the characteristics of students at the school each year, including the share of students who were female (where available), ELLs, SWDs, and eligible for free or reduced-price meals (where available), and the share of students in each of several large ethnicity categories. In addition, because schools where principals from selected programs were placed might be different in unobservable ways as well—the teachers and other staff may be different, the facilities may be different, and the surrounding community may be different—and these differences could affect student achievement, our models included time-invariant school fixed effects to allow for these potential differences.

Accounting for Differences in Principal Experience

Our models accounted for principal experience through a series of five binary variables (first year of experience, second year of experience, . . . , fifth year of experience, and an omitted category of six or more years of experience). Principal experience and principal tenure will differ for all principals who have led more than one school. The details of the exposure and tenure models can be found in Appendix F.

Prior Research and Challenges

Our analysis of the relative effectiveness of inexperienced principals trained by selected programs used a within-school design similar to that employed by Corcoran, Schwartz, and Weinstein (2012), although our study uses student-level, rather than aggregate school-level, data. Our analysis of the relative effectiveness of both experienced and inexperienced principals from selected programs followed directly from the strategy implemented by Gates et al. (2014). A number of challenges affect any research of this type.

First, the process by which individuals are selected (or self-select) into preparation programs cannot be disentangled from estimates of program effectiveness. For example, some programs may be better at selecting individuals who become more effective principals (e.g., those with greater content knowledge or other relevant skills) than others. A program may then appear to be more effective because it selects highly qualified applicants, even though the program does little to improve the skills of those it prepares. However, the process by which a principal preparation program selects its applicants may be viewed as an important component of the program. The goal of this study was to determine the effect of principals from one of the selected programs and thus cannot explain why those principals were more effective. Follow-up studies of successful principals or programs with less variation might provide more insight into the specific practices of the programs that led to the observed outcomes.

In some schools in our study, a principal trained by one of the selected programs was placed at a school, served for a number of years, left the school, and was replaced by another principal from one of the selected programs. This created a problem for our identification strategy for our models based on inexperienced principals: Should the first year the second principal leads the

school be considered the first year the school is treated by an inexperienced principal from one of the selected programs or a continuation of the leadership from the previous principal trained by one of the selected programs? Because neither approach would provide a clean measure of the number of years the school was led by an inexperienced principal from one of the selected programs, we dropped from our sample all observations where the school was led by a second principal from one of the selected programs.

In some districts, many years pass between the time an individual completes one of the selected programs and the time the individual first becomes a principal. We did not control for the number of years that passed between the time an individual completed a principal preparation program and the time the individual became a principal. Individuals who did not secure a principal position until several years after completing their principal preparation program might be different, on average, from individuals who secured a principal position shortly after completing a principal preparation program. For example, individuals who did not secure a position until several years after completing the program might have been less effective than principals who secured a position immediately for reasons that had nothing to do with the span of time between completing the program and securing a position. Therefore, controlling for the number of years that passed between when an individual completed a preparation program and the time he or she secured a principal position could remove important variation in principal quality from our estimates of the relative effectiveness of the selected programs, and we therefore chose not to include such a control.

In addition, as a practical matter, it would not be possible to compare principals from selected programs for whom a certain number of years passed between the completion of the selected program and their first principal assignment with principals from other programs for whom a similar number of years passed between the completion of their principal preparation program and their first principal assignment. We were not able to make such a comparison. Although we often had this information for principals trained from selected programs, we usually did not have this information for principals from other programs as a result of data quality issues. To the extent that the potential effect of the selected program decayed between the time the individual completed the program and the time the individual received his or her first principal assignment, our estimates of the relative effectiveness of principals from selected programs were attenuated. Finally, the time series of our analysis represents a 6-year period. To the extent that it may take principals several years to affect student achievement, it may be difficult to find effects for principals who assumed their leadership roles several years into this time period.

Overview of Programs Selected for Study

The programs selected for the study were based on the extent of their alignment to the selection criteria drawn from the best available literature on promising practices in preparing principals. The selected programs represent a broad range of both geographic location and program design. They include both traditional programs operated by large universities and large and small programs operated by nonprofit organizations. Some programs are run as a partnership between a university and a nonprofit provider. The programs vary in how long they have been in existence—with some being founded more than a decade ago and others still in their early years.

Each selected program partners closely with one or more medium-to-large urban districts across the United States to place their graduates as leaders following graduation.[10] Some programs aim to place their graduates immediately into the principalship, whereas others place some graduates in an assistant principal or other leadership role, with the long-term goal of attaining a principal position.

The program lengths range from 14 months to 5 years, with some programs resulting in a master's degree, a doctoral degree, or principal licensure. Several programs require their applicants to obtain their principal license or certification prior to enrolling in the program.

All five selected programs include both graduate-level coursework and a minimum of one school year in an intensive clinical residency in one or more schools with support from a mentor principal. For some programs, the support for graduates continues after the graduate is placed as a principal (or other leader) in the partner district. We provide here a synthesis of how the five selected programs align to the selection criteria and more detailed specific examples of selected programs for each criterion.

Although some of the five selected programs aim to place their graduates as principals within 1 year of graduation from the program, others typically expect their graduates to go on to be assistant principals or serve in other leadership roles before becoming school principals. Four programs provided information for the rate at which their graduates are placed as principals within 1 year of graduation. Two programs provided additional placement rate information in alignment with the expected trajectory of their graduates into the placement role (Table 5).

Table 5. Rate at Which Selected Programs Place Graduates Into the Principal Role

District	Number of Graduates as of 2013–14	Percentage of Graduates Placed as Principals Within 1 Year of Graduation	Additional Placement Rates Provided by Program
District A	128	12%	
District B	35	37%	
District C	186	N/A	42% (within 3 years) 52% (within 5 years)
District D	517	80%	
District E	148	51%	41% placed as assistant principals within 1 year

10 Although some of the selected programs placed graduates as principals in more than one district, this study only examined schools led by principals in one partner district for each program.

Program Alignment to Research-Based Competencies

The structure and curriculum of the five selected programs are organized according to a set of research-based standards and practices and display alignment to these research-based competencies. Most selected programs align their work to the Interstate School Leaders Licensure Consortium (ISLLC) standards, although they also may align to district-specific standards or competencies. Examples from two of the selected programs follow:

- One program was codesigned by the university and the district. The internship and coursework is aligned to the district's leadership framework, which guides district assistant principal and principal evaluation. The framework is aligned to both the state principal standards and the ISLLC standards. The coursework focuses on developing specific skills, knowledge, and experiences related to specific expectations or competencies within the district leadership framework. Program faculty include university instructors and district leaders, and the internship is supported by practicing principals serving as mentors. This team uses the framework and several skills and competency-based rubrics to provide feedback and assess candidate performance on the projects and portfolios. Program faculty also assess participant performance on the leadership competencies through the district's assistant principal evaluation system. Program faculty meet with participants and mentor principals quarterly to discuss their performance and leadership competencies.
- For another program, the competencies that drive the program most centrally are the district's principal competencies. These competencies are aligned closely to the ISLLC standards and were developed through collaboration among the district, the school, and other partners and reviewed by a district taskforce. Both the district's principal eligibility examination and principal evaluation system are aligned to the competencies. The program coursework also addresses a range of professional standards and content areas that are independent of district principal competencies, such as addressing the needs of ELLs. Throughout the program, participants receive continuous formative assessment of their school leadership practice as it aligns to the competencies. The program includes frequent documentation and assessment of candidates on critical program components. For example, coaches rely on cumulative documentation of leadership learning through structured logs and school-based work products that illustrate progressive problem solving.

Partnerships for Excellence

In each selected program, district schools serve as sites for learning; in some cases, district personnel coteach classes and provide feedback on graduate quality and program curriculum. Each selected program has a strong partnership with the district(s) where graduates are placed as principals, although these partnerships can take different forms, such as the following:

- One program was cofounded with district leadership as a collaborative effort, with district staff included on the program advisory board and in some cases serving as adjunct professors. As part of this partnership, following a candidate's residency placement in the district, district staff members evaluate the performance of the resident. This type of feedback loop continues after the program graduate is placed in the district as a principal; district staff members provide ongoing feedback on the graduates who are placed as principals in their schools.

- Another program has a formal partnership with the district, where the district commits to recruit, select, and train a set number of principals to lead schools. As part of the contract, the district requires targeted recruitment of qualified district talent and alignment of the program curriculum to the district's principal evaluation rubric. In addition to these requirements, the program and the district have a data-sharing agreement, whereby data related to program graduate progress as measured by program assessments and related action plans are made available to the district, and district principal evaluation data of program graduates are shared with the program. Through this partnership, the program commits to conducting ongoing evaluation of graduates and providing quality mentors (i.e., the mentor principals at the residency schools). The selection of residency sites and mentor principals is done by the program but must be approved by the district.
- Another program has signed memorandums of understanding (MOUs) with each partner district. The MOU stipulates shared responsibilities across the program and the partner districts during a 4-year period. District staff members are asked to encourage their best teacher leaders to apply to the program and publicize the program throughout the district. The MOU obligates districts to "provide dedicated and qualified" principals to serve as mentors to the program's residents, but it is up to the program to ultimately train these mentors. Both the district and the program are tasked with monitoring the residents' progress in fulfilling all the program's competencies. The MOU stipulates that the district should encourage key personnel to participate in program design and revision meetings. District leaders occasionally serve on panels for classes or give guest lectures, but they do not serve as full-time instructors to first-year students.

Experiential Learning

Each selected program includes coursework and other student learning experiences that expose participants to the problems of school leadership practice, with the intent of building practical and technical knowledge. Although specific learning experiences vary across the programs, they are typically scaffolded, moving from classroom or online learning simulations to internship experiences, where students lead all or a significant portion of a school's operations. Here are some examples:

- One program begins the curriculum sequence with candidates participating in a 6-week summer induction course, which serves as a simulation school. The purpose of this component of the program is to offer new participants a simulated leadership experience without the risks associated with a real school setting. This program develops an elementary and secondary simulation school along with detailed contextual information, operational documents (e.g., schedules and budgets), artifacts of teacher practice, such as videos of classroom instruction, profiles of teachers, and fictionalized student achievement data. Participants rotate through various leadership roles throughout the summer intensive course and engage in a series of high-stakes tasks. After completing the induction component of the program, program participants go through a comprehensive residency program at a host school, where they serve as an apprentice to an experienced mentor principal, which is an opportunity to gain field-based experience in a school similar to the one they will lead when completing the program. To support their work with the apprentices, mentor principals receive initial training and recurring visits by program facilitators, who collaborate with them to create learning experiences that meet the evolving needs of the program participant. The residency also includes regular check-ins with the mentor principal, program peers, and program staff facilitators. These facilitators engage in periodic observations of the participant to provide feedback, inform practice, and monitor the participant's progress toward goals.

- One program includes a full-time paid internship that is integrated with inquiry-based projects. Interns work with their mentor principal and faculty to identify areas within the leadership framework of the partnership school district where they need additional experience. Mentors and cohort instructors work to provide on-the-job leadership experiences aligned with interns' needs to develop their leadership skills. This program's coursework includes four inquiry-based projects that are job-embedded with their internship. Each project is aligned to the leadership framework competencies and a problem of practice in a school setting. The project is customized to the intern's learning needs and the context and needs of the host school. For each project, interns collect, present, and analyze data through a portfolio website and receive feedback from peers, mentor principals, and cohort instructors.
- Another program includes a 12-month paid residency during which the candidates have the opportunity to lead staff and build their own capacity as school leaders. After coursework in the winter and spring of their first year, each participant is matched with a mentor principal and residency school site in June and becomes a resident. The district selects mentor principals with input from the program. Mentor principals build relationships and meet regularly with the resident and program coach, introduce the resident to teachers and other school staff, facilitate access to classroom observations to provide teacher feedback, include the resident in leadership team meetings, and provide opportunities for the resident to take on leadership roles. Each resident also has a program coach. Coaches are retired district principals deemed highly successful by the program. During the residency phase, coaches focus on the developmental needs of the resident in relation to the district's leadership competencies, residency goals, and action plan. Coaches conduct weekly 2-hour visits with the residency site and meet monthly with the mentor principal for a perspective on the resident's performance. In addition, the coach provides support and guidance to the resident regarding all interviews and placement offers that occur near the end of the residency.

High-Quality, Rigorous Recruitment and Selection

The selected programs engage in recruiting high-ability candidates with experience as expert, dynamic teachers and a commitment to instructional improvement. Some examples are as follows:

- For one program, the university preparation provider and the district work in partnership to recruit and select participants for the program. The district has a process for collecting nominations that district staff members recommend for the program. Nominees who wish to be admitted must apply to the university master's program using traditional admissions procedures. Eligible applicants then participate in an in-person, three-part screening process: a writing prompt, a role-playing activity in which the applicant offers feedback to a teacher based on a video of the teacher's instruction, and a prioritization activity. An interview with university and district personnel is then held, and all applicant responses are rated on a rubric. The rubric measures several district principal competencies, including how the applicant works with people and what his or her basic human capital management and time management skills are. Faculty members then conduct a telephone interview with the applicant's referring principal, after which the program develops a list of the top 20–25 candidates. This final list of candidates is shared with district regional superintendents who review the selected participants and inform the applicants in writing of the program admission decision.

- Another program has a multistage recruitment process. The process consists of nomination by a partner district, application to the program, a telephone interview, and an in-person exercise at the program's assessment center. Participants commit to the program for 5 years, and they must meet all the entry requirements for the graduate school where the program is housed. After candidates submit a written application, the next step is a 2-hour, two-part telephone interview. Immediately before the interview, candidates receive a case study and have 1 hour to examine it and think about how they would handle the described situation. Applicants spend the next half hour discussing the case with the interviewer, and the interviewer scores the candidates' responses using a rubric based on the program's core competencies. The final half hour consists of a more traditional job interview. Candidates who pass the telephone interview stage are recommended to the assessment center for in-person activities, which includes an intensive interview and appraisal that lasts approximately 4 hours. Candidates go through a series of activities that simulate the experiences that a new principal may encounter on the job. For instance, candidates might role-play scenarios in which they interact with a student, a teacher, and a parent. They also are asked to observe video recordings of teachers, evaluate the instruction, and then provide feedback in a role-playing scenario. Program staff members evaluate candidates' instructional knowledge and their ability to communicate and have difficult conversations with staff. Finally, there is an exit interview, where candidates are given tough feedback to assess how they deal with criticism. These exercises are assessed using a rubric that aligns with the program's competencies for transformational leadership. Some candidates are offered admission to the program immediately after the in-person exercises; others may be required to complete one final interview to learn more about their qualifications before a final decision is reached. Approximately 30% to 40% of candidates who participate in the assessment center exercise are offered admittance into the program.
- The recruitment and selection process for a third program involves the university's admissions office and faculty, program graduates, and district and school leaders. The process includes general information sessions, meetings with superintendents and principals on the benefits of the program for the school and district, communication with program graduates about nominating prospective candidates, and conversations with principals and district leaders about opportunities to partner with the program. Alumni referrals are the most common recruitment effort, and graduates are encouraged to nominate potential candidates. Graduates also typically lead recruitment events by sharing their experiences and answering questions. The program recruits primarily from within the partner district but also recruits nationally through a partnership with an alternative teaching certification program. Applicants must demonstrate effectiveness as a teacher or comparable effectiveness in another role within the district. The program receives approximately 50 applications per year for 16 open spots. The application package requires a personal essay, a transcript, a résumé, a copy of the teacher's license, and two nominations from school or district leadership. The university and district staff partner to review each application and rate applicants based on their leadership and teaching experience, commitment to lead change toward high achievement and equity, and evidence of a learning and growth mind-set. Applicants who survive this first screening then participate in a 2-hour interview that includes scenarios or activities based on competencies from the district's leadership framework (which is used to evaluate sitting assistant principals and principals). A panel of university faculty, program graduates, and district administrators score each activity on a competency-based rubric that is aligned to the district's standards for principals. The final selection of candidates depends on the needs of the district, including a prioritization of the diversity of the cohort.

Early Years on-the-Job Support

The selected programs include intensive on-the-job support (i.e., induction) for program graduates who are principals, such as mentoring, coaching, or a peer network for at least 1 year after graduation. Some examples are as follows:

- Until recently, when grant funding provided for an expansion of coaching support, one program provided 1 year of coaching support to graduates in their first year as principals, with about 72 hours of support funded by the district during the course of the school year. After the first year of district-funded coaching support, principals had the option of purchasing additional coaching support in subsequent years from their school budget. Program coaches receive extensive professional development, including support for contextual needs (e.g., district initiatives, accountability measures, and the use of data) and best practices in coaching support. Throughout their tenure, coaches receive feedback to improve their practice, observations in the field by program staff, and both large-group and individual professional development. Coaches create a professional development plan aligned to their individual goals. This program recently expanded its coaching support with grant funding to include up to 164 coaching hours for first-year principals, including a diagnostic assessment of school and leader needs, visits to other schools led by program graduates, and annual convenings across schools for reviewing and sharing accomplishments. Coaches who are part of this expanded model receive training in team coaching, as well as the school diagnostic process, in addition to the training provided to all coaches described earlier.
- Another program blends theory and practice during and after the residency. The preservice part of the program concludes 18 months after matriculation, when all state requirements are met and the yearlong residency has been completed. In the final months of their residency year, participants actively seek out in-service leadership positions, ranging from principal to assistant principal to district-level administrator, and they begin to receive in-service supports provided by the program. The program believes that guided reflective practice through coaching holds candidates accountable for continuous long-term growth and is critical for producing truly transformational instructional leaders. The school leadership coaching that begins during the residency continues when each candidate assumes a position as a newly licensed principal, as an assistant principal, or in a district-level leadership role. Coaches continue to work with candidates who were initially assigned to them for up to 3 years after the residency. The frequency of on-site coaching support for novice principals depends on the needs of the new principal as determined by the coach.
- One program provides participants with several layers of support from the program during their initial years of leadership in the form of coaching and mentorship. Participants first receive mentoring during their residency year (Year 2 of the program), where they are paired with a mentor principal. Mentor principals must apply to the program and demonstrate strong achievement and values that align with the program's leadership competencies. The mentor may or may not be the resident's host principal. Mentors are tasked with creating learning opportunities, supporting residents' action-learning projects, providing feedback along the program's core competencies, and allowing residents to sit in on high-level school and district meetings. The program provides mentors with a series of professional development sessions. Mentors also assist in the recruitment process by evaluating candidates in the assessment center. Mentors meeting all the criteria for the year are paid a small stipend. The program also employs a team of former principals or experienced school leaders as leadership development coaches to support residents

and recent graduates. These coaches are expected to check in with an assigned cadre of residents for two 2-hour sessions per month to provide feedback on residents' progress as school leaders. The coaches also observe residents in their schools, and they meet with the residents' host and mentor principals every other month to assess their progress toward meeting the program's competencies. The coaches provide similar but less intensive supports to recent graduates after their residency based on need and the participant's role in school leadership.

Evidence of Effects

The selected programs seek out evidence of effects on advancing leadership practice, school culture, or student learning that have been developed through rigorous study. In two states where the selected programs are located, law and administrative rules require that the programs collect graduate placement and performance data. The selected programs have established routines for collecting program effectiveness information and use the data to adjust program design, including the following:

- For one program, after graduates have been in a principal position for at least a year, the program solicits an evaluation of the graduate from his or her supervisor in the district. The program also solicits district feedback on program participants after their internships. The program analyzes publicly available data from the district, including teacher surveys and working conditions surveys, to gauge graduate effectiveness and potential changes to the program's curriculum. The program has an advisory board of graduates who meet twice per year. Findings from all data collected are shared with the board, and the board provides recommendations as to what might be added, changed, or deleted in the current program.
- One program has adjusted its curriculum and program components to adapt to emerging needs in the district. The program has a quarterly meeting with faculty instructors to discuss recommendations and areas for improvement in the curriculum. Instructors have adjusted the criteria and requirements of the inquiry-based projects to better support the development of participants' leadership skills based on the district's leadership framework. Graduates of the program also provide feedback and input to the program through a professional learning community consisting of graduates who are currently serving as principals. The program is evaluated both internally and externally. Internally, program faculty collect both formative and summative feedback. Program staff members examine data such as graduate placement and the performance of schools led by graduates. Program staff members conduct surveys of their graduates, asking their perceptions of the program's effectiveness in preparing interns for each competency. Program interns also are evaluated by the district's assistant principal evaluation system during their internship.
- One program annually presents progress on outcomes to their board, in addition to engaging in multiple types of internal and external data collection and evaluation. The outcomes the program tracks and reports include cohort diversity, graduation rates, rate of placement in the first year after graduation, retention beyond the first year, tenure rates, retention beyond 5 years, cohort satisfaction with coaching services, and the percentage of program principals who stay involved with the program in various capacities (e.g., as mentors, coaches, or participants). In 2013, the program reported meeting or exceeding nearly all its success metrics. For example, the program exceeded its recruitment diversity and graduation rate targets and met its principal placement rate target. The program also surveys its graduates each year on their own perceptions of the program and how the program prepared them to lead a school. These surveys have found that the majority of graduates are satisfied with the preparation they received through the program. The

program also collects principal effectiveness data compiled by the district to monitor the effectiveness of its graduates, as measured by school progress reports and student achievement data for the schools their graduates lead. Finally, this program has engaged in several external evaluations and research studies, including a study examining the impact of graduates on student achievement. The program also is currently undergoing a rigorous evaluation study to evaluate the program's effectiveness in its stated goals for coaching, support, and retention of graduates as principals in district schools, as well as the effects of principal and assistant principal partnerships on student achievement, school climate, retention, and teacher satisfaction in the schools they lead.

Principal Perceptions of Programs

The results of the 68 interviews conducted with principals who graduated from the five selected programs included generally positive feedback on the programs. The goal of these interviews was to gather additional information about the practices employed by selected programs. Principal respondents described program design and program supports that were aligned both to the selection criteria used to identify programs for participation in the study and how the programs described themselves through program documentation and interviews. Key findings from these interviews are described here. The detailed findings from these interviews are in Appendix E.

- All principals interviewed indicated that the selected principal preparation program they attended was aligned to a specific set of research-based principal standards or competencies. When asked to what extent, the vast majority (90%) said that their program was aligned to a set standards to "a great extent," and the remaining 10% of the respondents said to "a moderate extent."
- Approximately 75% of the respondents found the coursework to be supportive of their practice in the principal role to "a great extent," with the majority also reporting that they applied their learning in the selected principal preparation program to their work in the principal role.
- The respondents generally reported favorable perceptions of the residencies and internships they experienced during their preparation, noting the value of these hands-on experiences in preparing them for the principal role. In one program, participants were afforded two types of internship experience and may have had issues with one, but overall favored the internship or residency experiences.
- Ninety-nine percent of the respondents described multiple components and phases of the recruitment process (e.g., impromptu essays and scenario role-plays). Only one respondent described a straightforward interview process. In providing descriptions of the selection process, 9% of the respondents used the word rigorous, 6% of the respondents used the word intense, and 1% of the respondents described the selection process as extensive.
- Across all the selected principal preparation programs, the respondents described varied levels of support they received once they were in the principal role. Respondents from some selected programs noted that support for sitting principals was primarily offered through the district, with the respondents from one district describing a multiyear comprehensive support system. The respondents from other selected programs continued to receive coaching support from the program once they were in the principal role. They also described more informal supports that they received through colleagues and other leaders in the district.

- Approximately half of the respondents (51% of the 41 respondents who answered this question) whose programs provided coaching support to new principals found the coaching support they received from their program to be "greatly beneficial" to their practice in the principal role. Other respondents described the coaching provided as "somewhat beneficial" (37%) or only "beneficial" (7%).
- When asked about the most useful aspects of the program, the respondents had many favorable perceptions to share, noting that the most useful aspects of the selected principal preparation programs were as follows:
  - Internship or residency
  - Mentoring
  - Coaching
  - Focus on instructional leadership
  - Reflections on the realities of the job of principal
  - Cohort model and networking
  - Role-playing and simulation exercises
- The respondents reported variability in the district support they received once they assumed the role of principal. For example, one district had a structured program of support, whereas other districts offered optional support components or components that could be purchased after a provision period that was free of charge.
- The respondents also had mixed perceptions of the usefulness of the district support, with some respondents noting very minimal or ineffective district support, and others praising extensive support from the district. Some respondents also noted a lack of differentiation in district support.

Effects of Newly Placed (Inexperienced) Principals on Student Achievement

In this section, we provide the results of the CITS analysis of principals in Districts A, B, C, and D. First, we describe demographic information for each district. Following this descriptive information, we present the results of the CITS analysis. Detailed findings (including some of the tables referenced in the body of the report) are in Appendix G.

The results for District E are described separately in a subsequent section because of differences in the analytic strategy used to estimate the results.

Students and Schools Included in the Analysis of Inexperienced Principals

District A

Table 6 shows the numbers of schools and principals included in analysis of inexperienced principals (i.e., schools in District A that received newly trained principals in 2011–12, 2012–13, or 2013–14).

Altogether, 11 schools included in our study received inexperienced principals in one of the 3 years, and five of the schools had principals who were trained by the selected program (Table 6). Only Grades 3–5 students were included in the models for District A (Table G-5) because only elementary schools received an inexperienced principal from one of the selected programs during this period.

Schools led by a principal from one of the selected programs had larger percentages of Asian-American and White (Table G-3) students and smaller percentages of African-American students, Hispanic students (Table G-3), ELLs, and SWDs (Table G-4). Information on students' eligibility for free or reduced-price meals was not available for District A.

Detailed information on how long principals served in schools from 2011–12 to 2014–15 and the numbers and demographics of students in schools can be found in Appendix G, Table G-1 through Table G-5.

Table 6. Number of Schools in the Analysis of Relative Impact of Inexperienced Principals From One of the Selected Programs for District A

Year	Cohort 2012		Cohort 2013		Cohort 2014		Cohort 2015		Total Number of Schools	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	4	0	3	0	4	0	0	0	11	0
2009–10	4	0	3	0	4	0	0	0	11	0
2010–11	4	0	3	0	4	0	0	0	11	0
2011–12	2	2	3	0	4	0	0	0	9	2
2012–13	2	2	2	1	4	0	0	0	8	3
2013–14	2	2	2	1	2	2	0	0	6	5
2014–15	2	2	2	1	2	2	0	0	6	5

District B

Table 7 shows the numbers of schools and principals included in the analysis of inexperienced principals (i.e., schools in District B that received newly trained principals in 2011–12, 2012–13, or 2013–14).

Altogether, 22 schools included in our study received inexperienced principals in one of the 3 years, and five of the principals were trained by one of the selected programs. Only Grades 3–5 students were included in the analysis for District B (Table G-11) because only elementary schools received an inexperienced principal from one of the selected programs during this period.

Among schools in District B where an inexperienced principal was placed in 2012–13, 2013–14, or 2014–15, schools led by a principal from one of the selected programs had larger percentages of White students (Table G-9), ELLs, and SWDs (Table G-10), and these schools had smaller percentages of Asian-American (Table G-9) students.

Detailed information on how long principals served in schools from 2011–12 to 2014–15 and the numbers and demographics of students in schools can be found in Appendix G, Table G-6 through Table G-11.

Table 7. Number of Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District B

Year	Cohort 2012		Cohort 2013		Cohort 2014		Cohort 2015		Total Number of Schools	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	0	0	6	0	9	0	7	0	22	0
2009–10	0	0	6	0	9	0	7	0	22	0
2010–11	0	0	6	0	9	0	7	0	22	0
2011–12	0	0	6	0	9	0	7	0	22	0
2012–13	0	0	5	1	9	0	7	0	21	1
2013–14	0	0	5	1	7	2	7	0	19	3
2014–15	0	0	5	1	7	2	5	2	17	5

District C

Table 8 shows the numbers of schools and principals included in the analysis of inexperienced principals (i.e., schools in District C that received newly trained principals in 2011–12, 2012–13, or 2013–14).

Altogether, 41 schools included in our study received inexperienced principals in one of the 3 years, and 13 of the principals were trained by one of the selected programs.

Among schools in District C where an inexperienced principal was placed in 2011–12, 2012–13, 2013–14, or 2014–15, schools led by a principal from one of the selected programs had large percentages of Hispanic students (Table G-15), ELLs, SWDs, students from low-income families (Table G-16), and Grades 3–5 (Table G-17) students, and these schools had smaller percentages of African-American, Asian-American, White (Table G-15), and Grades 6–8 (Table G-17) students.

Detailed information on how long principals served in schools from 2011–12 to 2014–15 and the numbers and demographics of students in schools can be found in Appendix G, Table G-12 through Table G-17.

Table 8. Number of Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District C

Year	Cohort 2012		Cohort 2013		Cohort 2014		Cohort 2015		Total Number of Schools	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	8	0	11	0	13	0	9	0	41	0
2009–10	8	0	11	0	13	0	9	0	41	0
2010–11	8	0	11	0	13	0	9	0	41	0
2011–12	5	3	11	0	13	0	9	0	38	3
2012–13	5	3	7	4	13	0	9	0	34	7
2013–14	5	3	7	4	9	4	9	0	30	11
2014–15	5	3	7	4	9	4	7	2	28	13

District D

Table 9 shows the numbers of schools and principals included in the analysis of inexperienced principals (i.e., schools in District D that received newly trained principals in 2011–12, 2012–13, or 2013–14). We were not provided placement information for principals from one of the selected programs for 2014–15.

Altogether, 75 schools included in our study received inexperienced principals in one of the 3 years, and 21 of the principals were trained by one of the selected programs.

Among schools in District D where an inexperienced principal was placed in 2011–12, 2012–13, or 2013–14, schools led by a principal from one of the selected programs had larger percentages of Asian-American students, African-American students (Table G-21), ELLs, students from low-income families (Table G-22), and Grades 3–5 (Table G-23) students; these schools had smaller percentages of Hispanic students, White students (Table G-21), SWDs, and Grades 6–8 (Table G-23) students.

Detailed information on how long principals served in schools from 2011–12 to 2014–15 and the numbers and demographics of students in schools can be found in Table G-18 through Table G-23 in Appendix G.

Table 9. Number of Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District D

Year	Cohort 2012		Cohort 2013		Cohort 2014		Cohort 2015		Total Number of Schools	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	27	0	30	0	18	0			75	0
2009–10	27	0	30	0	18	0			75	0
2010–11	27	0	30	0	18	0			75	0
2011–12	21	6	30	0	18	0			69	6
2012–13	21	6	23	7	18	0			62	13
2013–14	21	6	23	7	10	8			54	21
2014–15	21	6	23	7	10	8			54	21

Relative Effectiveness of Inexperienced Principals From Selected Programs

Table 10 and Table 11 describe the relative effectiveness of principals from selected programs across Districts A, B, C, and D. The findings for District E are presented separately. We describe the findings from each district in more detail following these tables. The detailed findings are in Appendix G.

Across all four districts, we found little evidence that inexperienced principals from selected programs were more or less effective at fostering student achievement in mathematics. In one of the four districts (District A), we found that reading/ELA achievement is lower than expected in schools that received an inexperienced principal from one of the selected programs. This difference was driven primarily by newer cohorts of principals who had shorter tenures in their schools; as such, this may not reflect the long-term relative effectiveness of principals from selected programs. In Districts B, C, and D, we found no evidence that inexperienced principals from selected programs were more or less effective than other inexperienced principals.

Table 10. Relative Effectiveness of Inexperienced Principals From Selected Programs

Covariate	District A		District B		District C		District D	
	Reading	Mathematics	Reading	Mathematics	Reading	Mathematics	ELA	Mathematics
Treatment * Post	-0.077**	-0.059	0.083	-0.070	0.029	0.020	-0.048	-0.021
	(0.038)	(0.057)	(0.091)	(0.102)	(0.030)	(0.040)	(0.026)	(0.032)
Post	0.025	0.005	0.033	-0.121*	-0.031*	-0.032*	-0.030*	-0.052**
	(0.025)	(0.040)	(0.031)	(0.051)	(0.017)	(0.017)	(0.014)	(0.016)
Students	24,382	24,457	20,661	33,413	64,906	66,406	191,627	194,635
R-Squared	0.32	0.32	0.09	0.09	0.42	0.38	0.37	0.39

Robust standard errors, clustered within school-by-year cell, are in parentheses.

**$p < 0.01$. *$p < 0.05$. See Table F-1 in Appendix F for a complete list of model covariates.

Table 11. Relative Effectiveness of Principals From Selected Programs, by Cohort

Covariate	District A		District B		District C		District D	
	Reading	Mathematics	Reading	Mathematics	Reading	Mathematics	ELA	Mathematics
(Cohort = 2011–12) * Treatment * Post	0.122	0.010			0.059	0.071	-0.029	0.010
	(0.072)	(0.073)			(0.064)	(0.102)	(0.048)	(0.056)
(Cohort = 2011–12) * Post	-0.137**	-0.156**			0.010	-0.030	-0.039	-0.044
	(0.048)	(0.048)			(0.046)	(0.058)	(0.042)	(0.065)
(Cohort = 2012–13) * Treatment * Post	-0.161	0.180	0.246	-0.396*	0.034	0.017	-0.077*	-0.034
	(0.085)	(0.108)	(0.174)	(0.165)	(0.060)	(0.073)	(0.037)	(0.048)
(Cohort = 2012–13)* Post	0.121*	-0.115	-0.002	-0.016	-0.024	-0.027	-0.010	-0.049
	(0.057)	(0.073)	(0.053)	(0.074)	(0.025)	(0.029)	(0.022)	(0.029)
(Cohort = 2013–14) * Treatment * Post	-0.267**	-0.196	-0.111	-0.314*	0.041	0.104	0.005	-0.069**
	(0.074)	(0.099)	(0.107)	(0.121)	(0.042)	(0.059)	(0.027)	(0.025)
(Cohort = 2013–14)* Post	0.177**	0.092	0.066	-0.115	0.002	-0.044	-0.073**	-0.039
	(0.060)	(0.061)	(0.074)	(0.062)	(0.026)	(0.037)	(0.020)	(0.031)
(Cohort = 2014–15) * Treatment * Post			0.361**	0.213	-0.077	-0.139		
			(0.133)	(0.133)	(0.068)	(0.097)		
(Cohort = 2014–15)* Post			0.016	-0.197*	-0.115**	-0.043		
			(0.038)	(0.091)	(0.038)	(0.031)		
Students	24,382	24,457	20,661	33,413	64,906	66,406	191,627	194,635
R-Squared	0.32	0.32	0.10	0.09	0.41	0.36	0.37	0.39

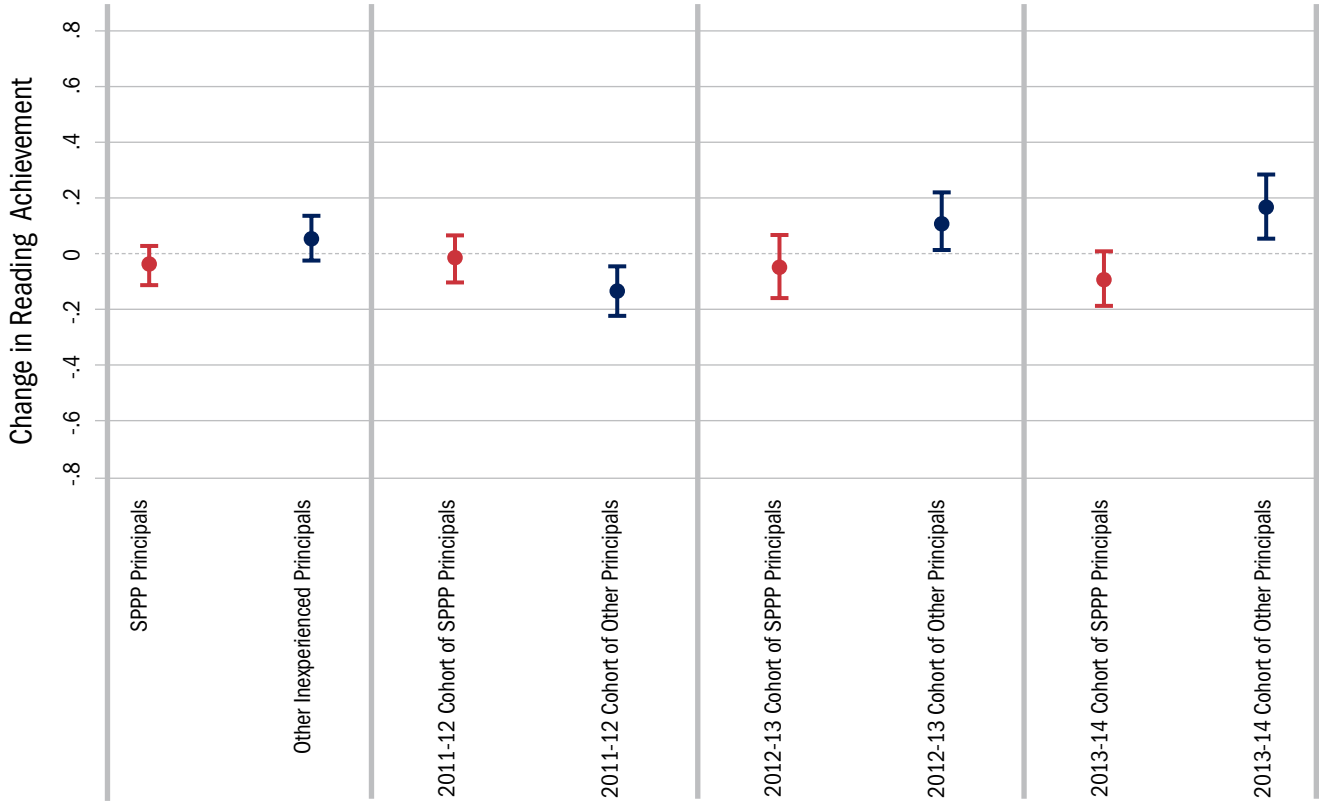
Robust standard errors, clustered within school-by-year cell, are in parentheses.

**$p < 0.01$. *$p < 0.05$. See Table F-1 in Appendix F for a complete list of model covariates.

District A

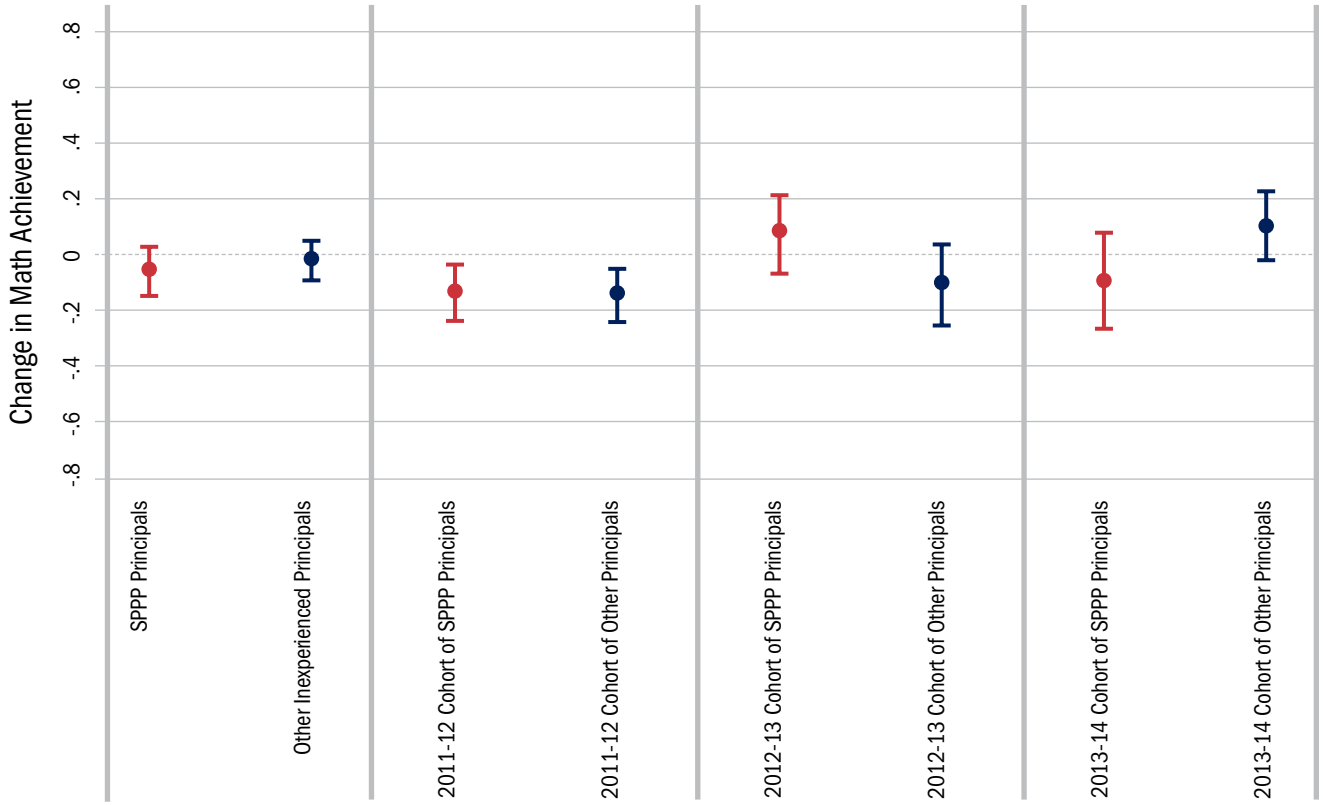
In District A, following the arrival of a new inexperienced principal from the selected program, achievement was, on average, 0.08 SD lower than expected in reading and 0.06 SD lower than expected in mathematics. Only the result for reading was statistically significant. (See Figure 3 and the first two columns of Table 10.) These average differences between principals from one of the selected programs and other inexperienced principals in District A were driven primarily by principals who were placed in 2013–14. In schools where inexperienced principals from one of the selected programs were placed in 2013–14, student achievement was 0.27 SD lower than expected in reading and 0.20 SD lower than expected in mathematics relative to changes in achievement in the comparison schools, although only the result for reading was statistically significant. (See Figure 4 and the first two columns of Table 11.) These results are based on only five principals from one of the selected programs in District A; as such, the results may not be representative of all principals from one of the selected programs in that district.

Figure 3. Change in Student Reading Achievement Following the Placement of an Inexperienced Principal, District A



Following the placement of an inexperienced principal, average change in student achievement (in s.d. units) across all years, relative to baseline trend. Bars represent 95% confidence intervals. Note: SPPP = selected principal preparation program.

Figure 4. Change in Student Mathematics Achievement Following the Placement of an Inexperienced Principal, District A

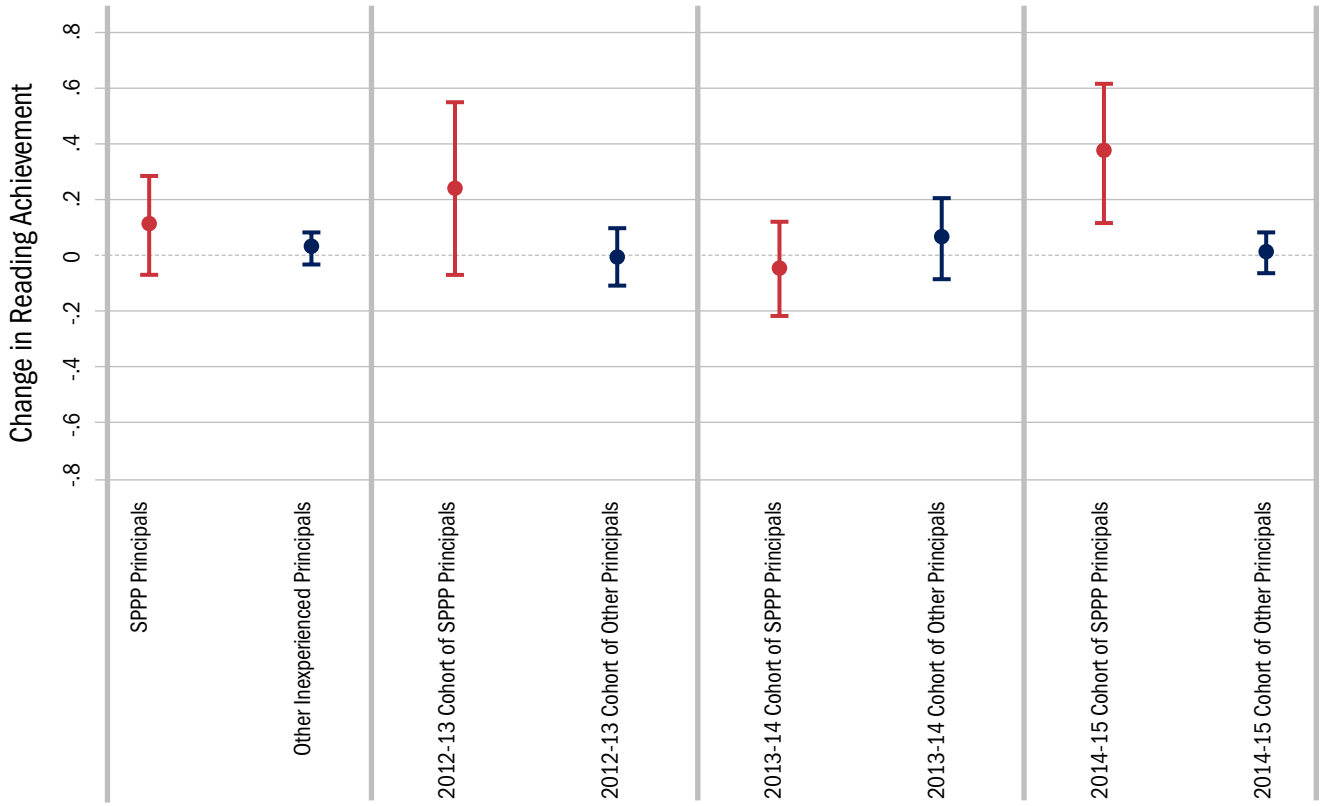


Following the placement of an inexperienced principal, average change in student achievement (in s.d. units) across all years, relative to baseline trend. Bars represent 95% confidence intervals. Note: SPPP = selected principal preparation program.

District B

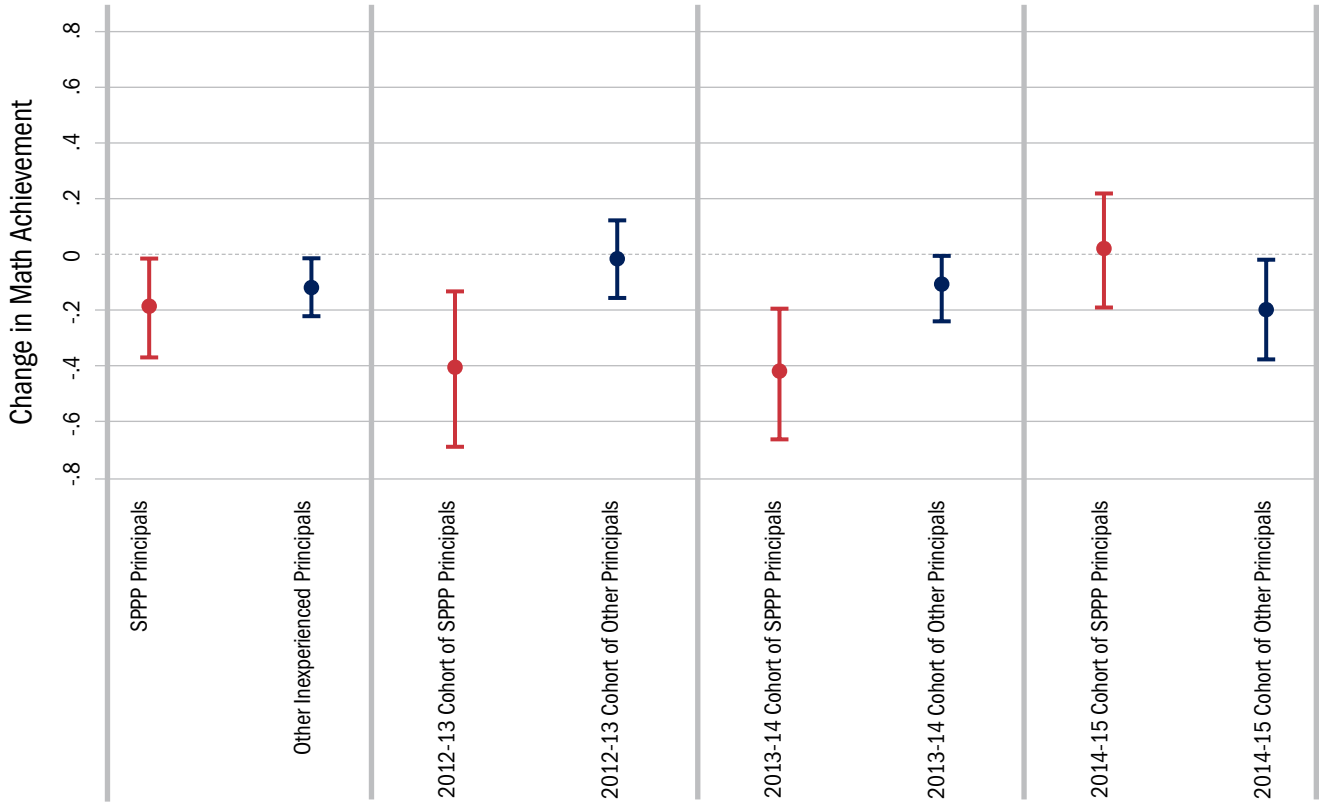
In schools where inexperienced principals from one of the selected programs were placed in District B, achievement was 0.08 SD higher than expected in reading and 0.07 SD lower than expected in mathematics relative to other schools in the district where inexperienced principals were placed, but neither difference was statistically significant. (See Figure 5, Figure 6, and the third and fourth columns of Table 10.) However, as the third and fourth columns of Table 11 show, the relative effectiveness of principals from one of the selected programs differed across cohorts. In schools where an inexperienced principal from one of the selected programs was placed in 2014–15, student achievement in reading was 0.36 SD higher than expected, and the difference was statistically significant. But in schools where an inexperienced principal from one of the selected programs was placed in 2012–13, student achievement in mathematics was about 0.40 SD lower than expected, whereas in schools where an inexperienced principal from one of the selected programs was placed in 2013–14, student achievement was 0.31 SD lower than expected. As with District A, however, the results for District B are based on only five principals from one of the selected programs.

Figure 5. Change in Student Reading Achievement Following the Placement of an Inexperienced Principal, District B



Following the placement of an inexperienced principal, average change in student achievement (in s.d. units) across all years, relative to baseline trend. Bars represent 95% confidence intervals. Note: SPPP = selected principal preparation program.

Figure 6. Change in Student Mathematics Achievement Following the Placement of an Inexperienced Principal, District B

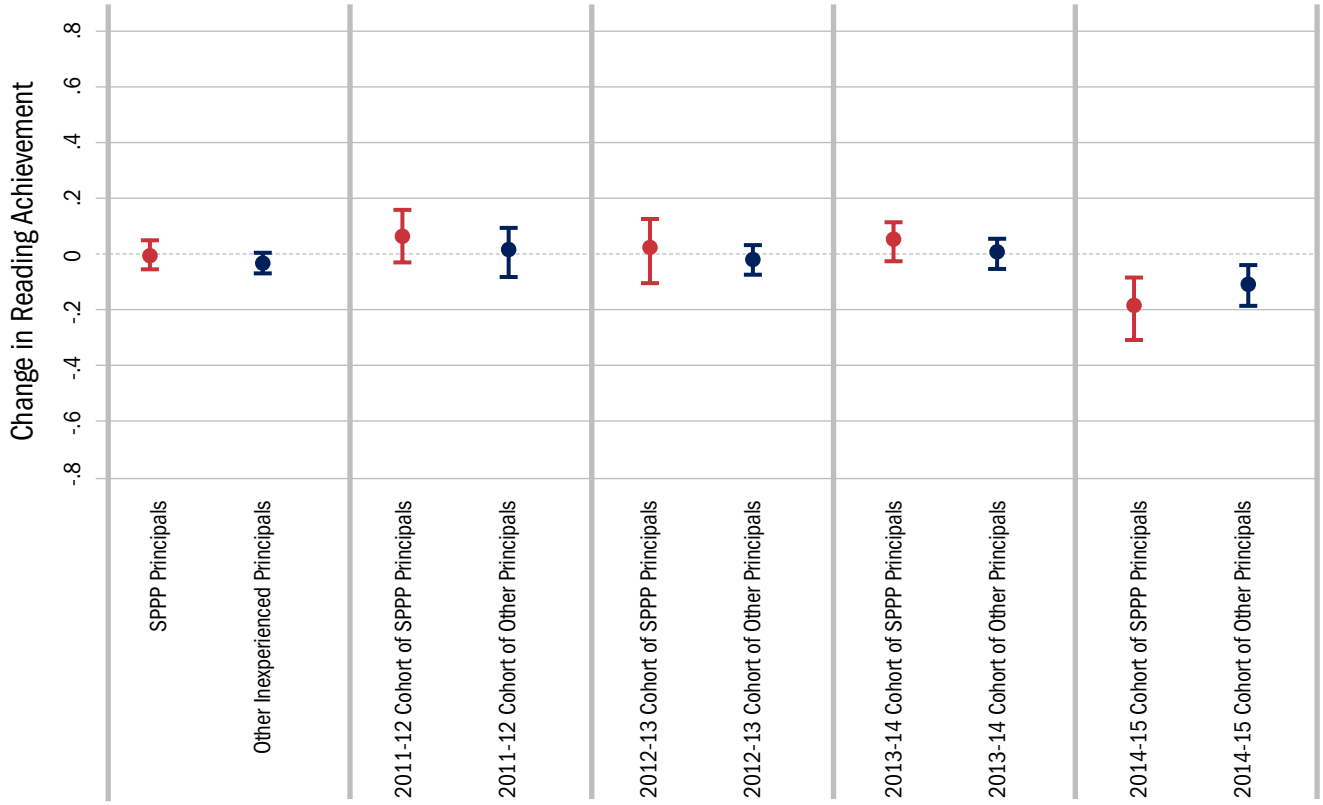


Following the placement of an inexperienced principal, average change in student achievement (in s.d. units) across all years, relative to baseline trend. Bars represent 95% confidence intervals. Note: SPPP = selected principal preparation program.

District C

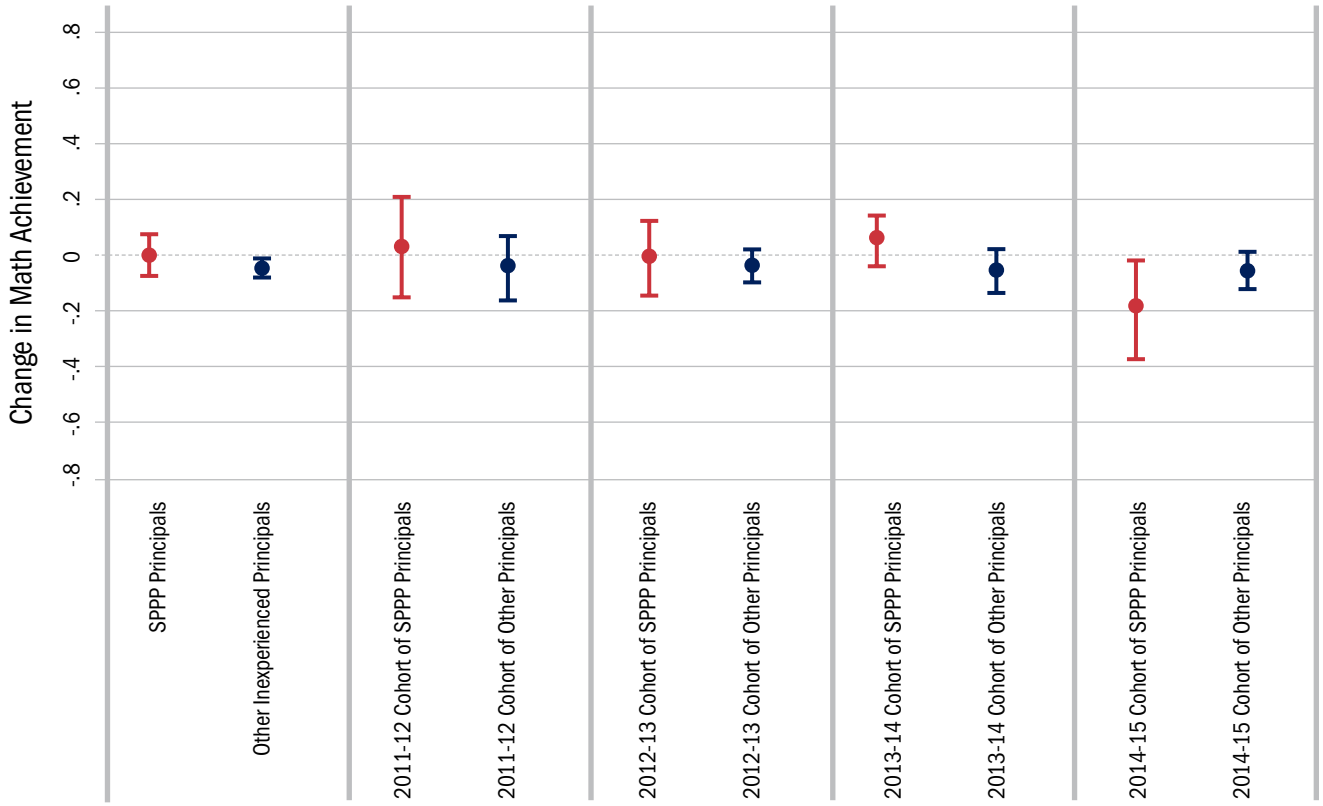
In schools where inexperienced principals from one of the selected programs were placed in District C, reading achievement was 0.03 SD higher than expected, whereas mathematics achievement was 0.02 SD higher than expected, but neither difference was statistically significant. (See Figure 7, Figure 8, and the fifth and sixth columns of Table 10.) In schools where inexperienced principals from one of the selected programs were placed between 2011–12 and 2013–14, student achievement was higher than expected in both mathematics and reading, but neither difference was statistically significant. (See the fifth and sixth columns of Table 11.) In schools where inexperienced principals from one of the selected programs were placed in 2014–15, student achievement in both mathematics and reading were lower than expected, but the differences were not statistically significant.

Figure 7. Change in Student Reading Achievement Following the Placement of an Inexperienced Principal, District C



Following the placement of an inexperienced principal, average change in student achievement (in s.d. units) across all years, relative to baseline trend. Bars represent 95% confidence intervals. Note: SPPP = selected principal preparation program.

Figure 8. Change in Student Mathematics Achievement Following the Placement of an Inexperienced Principal, District C

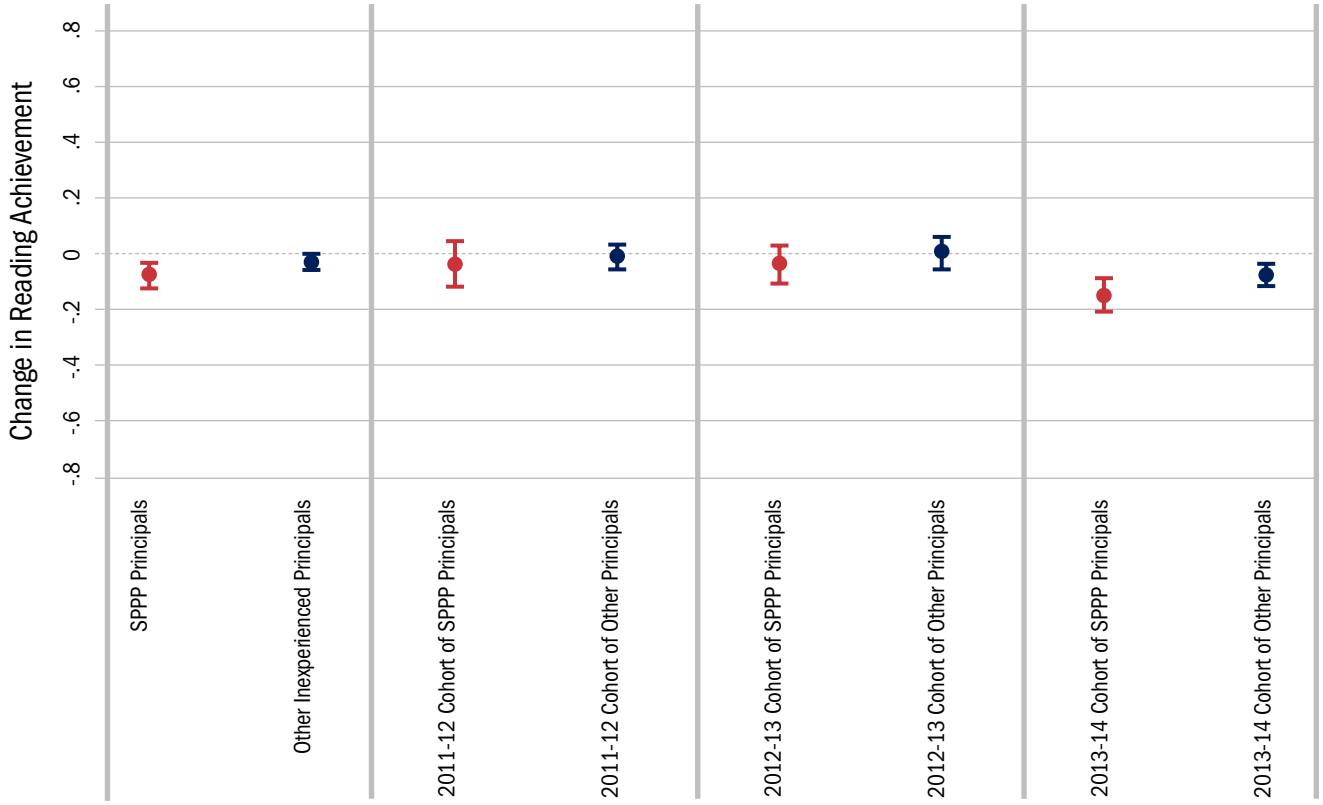


Following the placement of an inexperienced principal, average change in student achievement (in s.d. units) across all years, relative to baseline trend. Bars represent 95% confidence intervals. Note: SPPP = selected principal preparation program.

District D

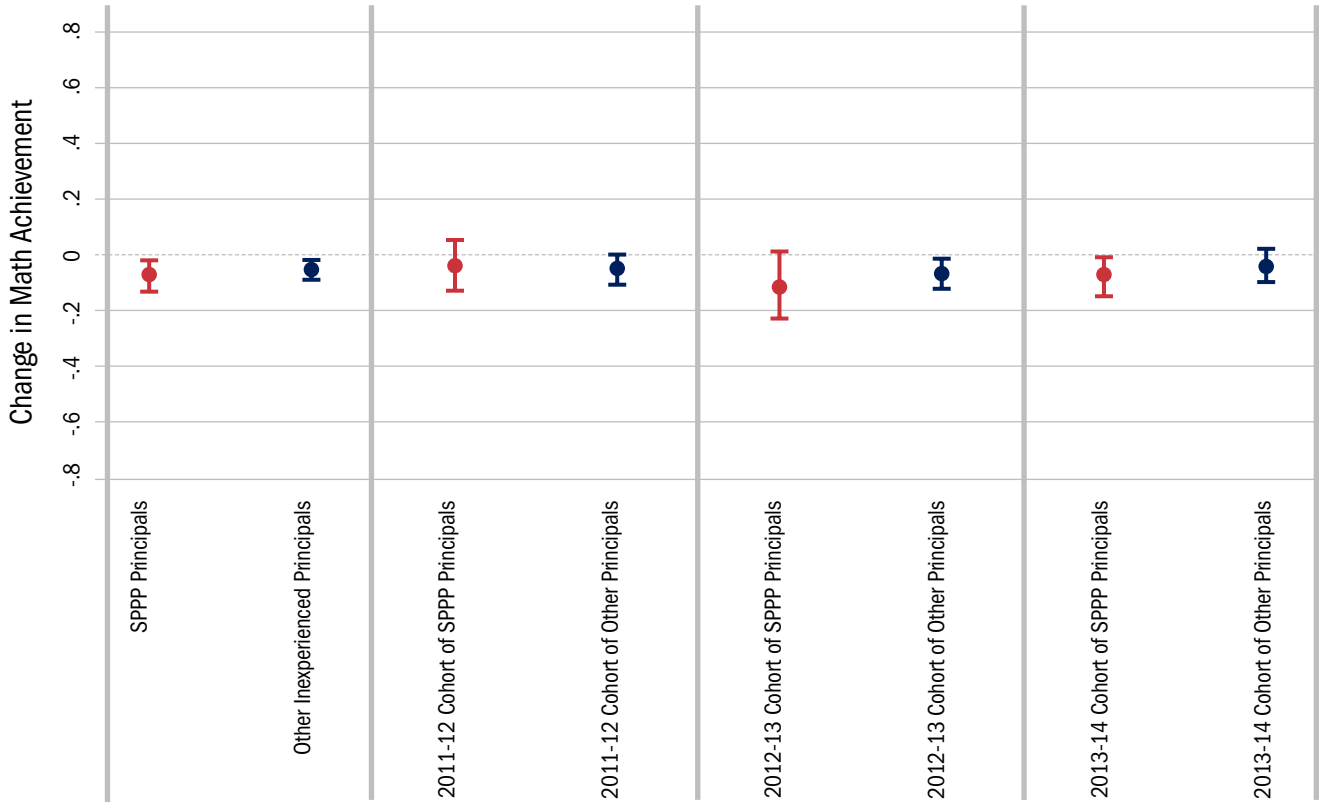
In schools where inexperienced principals from one of the selected programs were placed in District D, achievement was 0.05 SD lower than expected in ELA and 0.02 SD lower than expected in mathematics relative to other schools where inexperienced principals were placed, but neither result was statistically significant. (See Figure 9, Figure 10, and the sixth and seventh columns of Table 10.) We observed some statistically significant differences within cohorts. In schools where inexperienced principals from one of the selected programs were placed in 2012–13, student ELA achievement was 0.08 SD lower than expected, on average, and the difference was statistically significant. In schools where inexperienced principals from one of the selected programs were placed in 2012–13, student mathematics achievement was 0.07 SD lower than expected, on average, and the difference was statistically significant. (See the seventh and eighth columns of Table 11.)

Figure 9. Change in Student Reading Achievement Following the Placement of an Inexperienced Principal, District D



Following the placement of an inexperienced principal, average change in student achievement (in s.d. units) across all years, relative to baseline trend. Bars represent 95% confidence intervals. Note: SPPP = selected principal preparation program.

Figure 10. Change in Student Mathematics Achievement Following the Placement of an Inexperienced Principal, District D



Following the placement of an inexperienced principal, average change in student achievement (in s.d. units) across all years, relative to baseline trend. Bars represent 95% confidence intervals. Note: SPPP = selected principal preparation program.

Changes in Student Achievement (District E)

We performed a separate analysis for District E, based on the limited availability of principal placement data from the district (described in more detail in the Methods section of this report). Here, we describe demographic information about District E, followed by the results of our analysis.

Students and Schools Included in the Analysis of District E

Sixteen schools were included in our analysis of District E: Four schools received an inexperienced principal from one of the selected programs in 2011–12, three schools received an inexperienced principal from one of the selected programs in 2012–13, two schools received an inexperienced principal from one of the selected programs in 2013–14, and seven schools received an inexperienced principal from one of the selected programs in 2014–15. Additional findings are in Appendix G.

Changes in Student Achievement Following the Arrival of a Principal From One of the Selected Programs in District E

Following the arrival of an inexperienced principal from one of the selected programs in District E, student reading achievement was about 0.06 SD lower than would otherwise be expected (Table 12), but the results were not statistically significantly different from zero (i.e., we cannot reject the possibility that there was no change). In mathematics, student achievement was about 0.04 SD lower than would otherwise be expected, but again the results were not statistically significant.

Looking at the changes in student achievement separately by cohort of inexperienced principals, we saw that most of the drop in student achievement can be attributed to inexperienced principals who were placed in 2014–15, with a lesser extent by inexperienced principals who were placed in 2012–13. In schools where inexperienced principals from one of the selected programs were placed in 2014–15, student reading achievement was about 0.19 SD lower than would otherwise be expected, given prior levels and trends in student achievement in those schools and changes in the characteristics of students in the schools. Similarly, in schools where inexperienced principals from one of the selected programs were placed in 2014–15, student mathematics achievement was about 0.15 SD lower than would otherwise be expected, given prior levels and trends in student achievement in those schools and changes in the characteristics of students in schools. Similar drops occurred in reading and mathematics following the arrival of an inexperienced principal in 2012–13, but one cannot reject the null hypothesis that no change occurred following the placement of inexperienced principals from one of the selected programs.

It is possible that student reading and mathematics achievement in District E schools where inexperienced principals were placed in 2014–15 will eventually return to their previous levels, as appears to be the case for the other cohorts. It also is possible that the drop in achievement experienced by these schools is unrelated to the arrival of inexperienced principals in one of the selected programs.

Table 12. Change in Student Achievement Following the Arrival of a Principal From One of the Selected Programs in District E

Covariate	Reading		Mathematics	
	Model 1	Model 2	Model 1	Model 2
Post		-0.059		-0.043
		(0.035)		(0.043)
(Cohort = 2011–12) * Post	0.089		0.074	
	(0.058)		(0.060)	
(Cohort = 2012–13)* Post	-0.081		-0.109	
	(0.077)		(0.079)	
(Cohort = 2013–14)* Post	0.120		0.166	
	(0.080)		(0.121)	
(Cohort = 2014–15)* Post	-0.194**		-0.152*	
	(0.045)		(0.071)	
Students	37,262	37,262	37,437	37,437
R-Squared	0.464	0.464	0.447	0.447

Robust standard errors, clustered within school-by-year cell, in parentheses.

** $p < 0.01$. * $p < 0.05$. See Table F-1 in Appendix F for a complete list of model covariates.

Variation in Effectiveness Among Newly Placed (Inexperienced) Principals

To explore heterogeneity in effectiveness among inexperienced principals, we estimated a separate post effect for each inexperienced principal who started at a school during the 2011–12, 2012–13, 2013–14, or 2014–15 school years. Additional findings are in Appendix G.

Figure 11 through Figure 14 show the distributions of principal effects in each district. The distributions are presented separately for principals trained by selected programs (treatment principals) and all other principals (comparison principals). Distributions are presented as box-and-whisker plots: the box represents the interquartile range of principal effects; the vertical line within the box represents the median principal effect; the whiskers represent the upper and lower adjacent values, where the whiskers are defined as plus or minus 1.5 times the interquartile range; and points beyond the upper and lower adjacent values represent outliers. In District A, we did not observe any variation in effectiveness among inexperienced principals.

In most districts, the variation in effectiveness among inexperienced principals from selected programs was smaller than but of similar magnitude as the variation in effectiveness among all inexperienced principals (see Table 13). In reading/ELA, the smallest variation in inexperienced principal effectiveness occurred among principals from one of the selected programs in District A, where we did not observe any variation in effectiveness among inexperienced principals. We were unable to observe variation in principal effectiveness in District A because of the way our empirical Bayes estimates weighted the very small amount of information available from the small number of inexperienced principals we observed in District A, compared with the weight placed in the large variation in student test scores within each school following the arrival of the inexperienced principal.[11]

11 When we model the principal effects as fixed effects in District A, the individual effects have a range of about 0.45 *SD* in the normalized distribution of test scores. Although the fixed effects principal estimates are unbiased, we prefer the best linear unbiased predictors from the random effects, which minimize the mean squared error of the principal estimates.

Figure 11. Distribution of Inexperienced Principal Effectiveness in Reading and Mathematics, by Treatment Status, District A

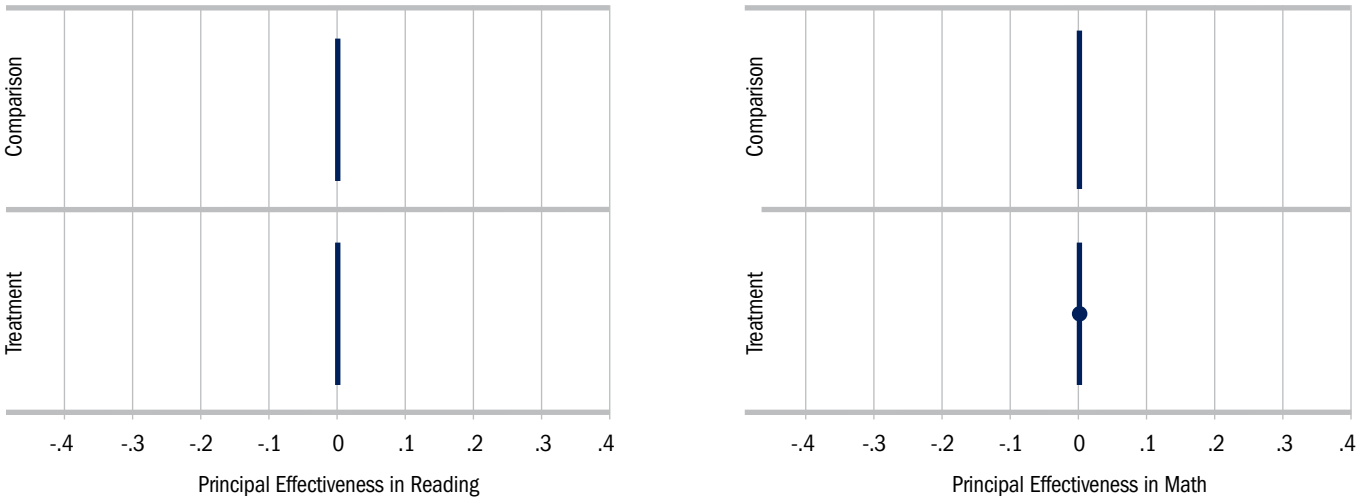


Figure 12. Distribution of Inexperienced Principal Effectiveness in Reading, by Treatment Status, District B

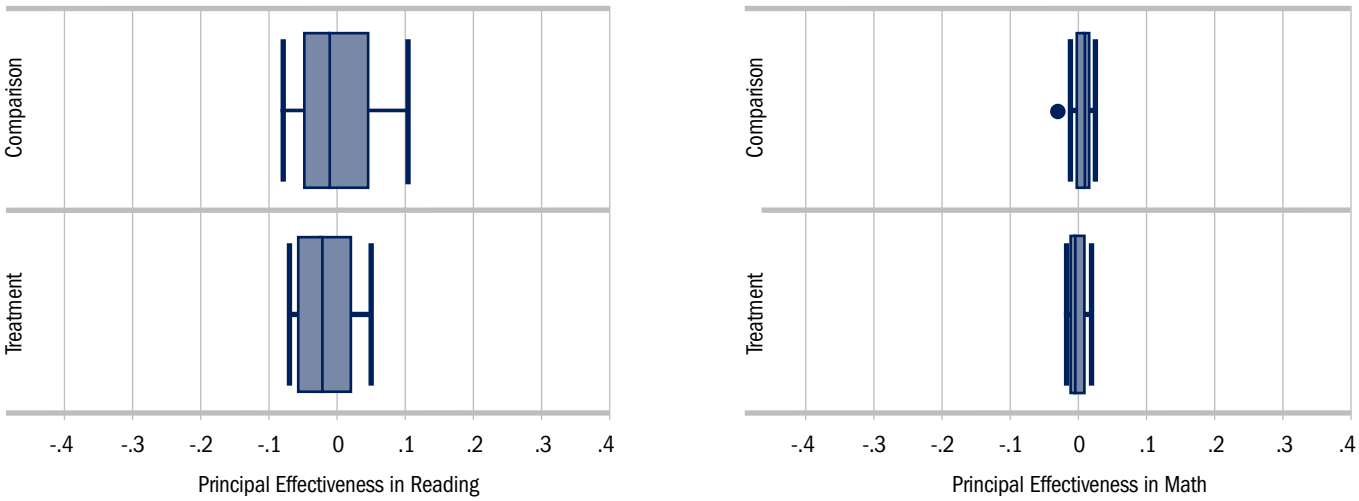


Figure 13. Distribution of Inexperienced Principal Effectiveness in Reading, by Treatment Status, District C

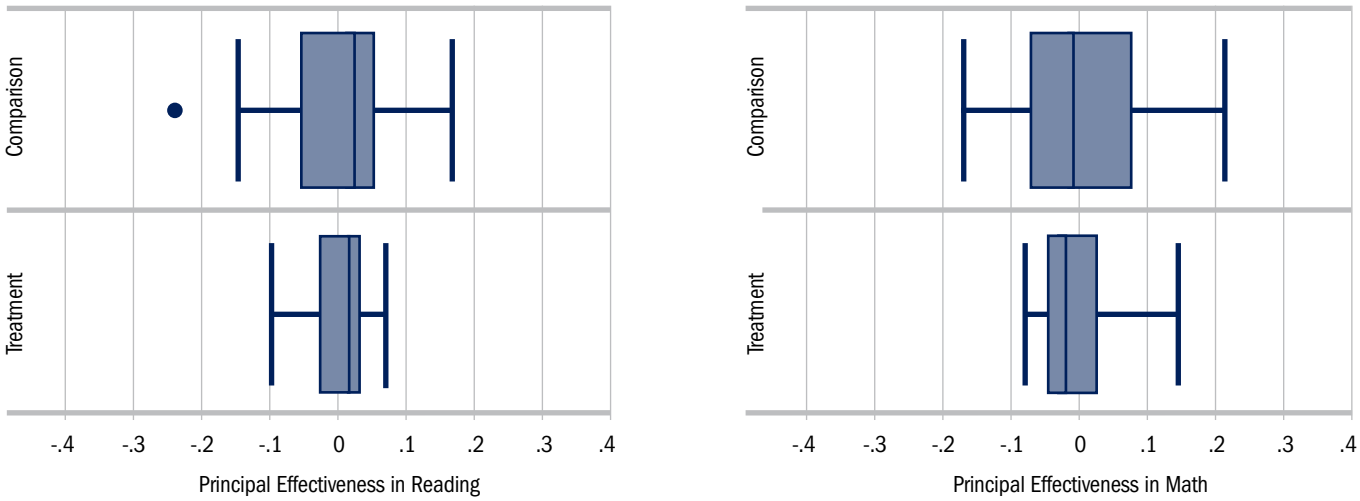


Figure 14. Distribution of Inexperienced Principal Effectiveness in Reading, by Treatment Status, District D

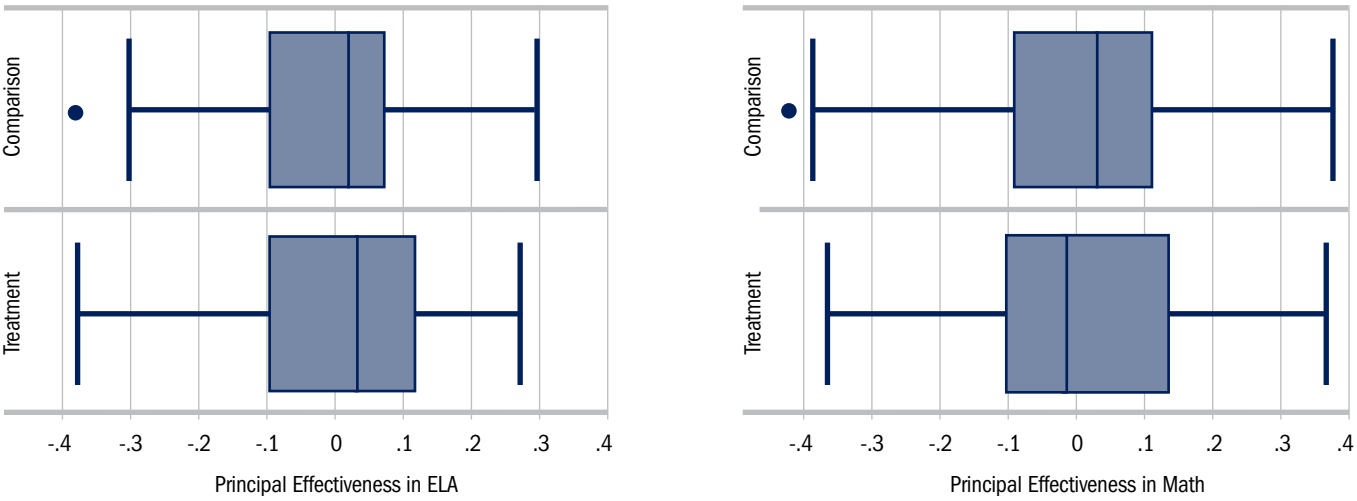


Table 13. Variation in Inexperienced Principal Effectiveness by District, Subject, and Principal Preparation Program

District	Standard Deviation of Principal Effects: Reading/ELA		Standard Deviation of Principal Effects: Mathematics	
	Selected Program	Other	Selected Program	Other
A	0.000	0.000	0.000	0.000
B	0.062	0.063	0.013	0.013
C	0.050	0.082	0.071	0.100
D	0.157	0.146	0.186	0.182

The largest variation in inexperienced principal reading/ELA effectiveness occurred among treatment principals in District D, where a 1 *SD* increase in principal effectiveness was associated with a 0.157 *SD* increase in student achievement in reading. As an example, this finding suggests that replacing a below-average principal with an average principal would be associated with an average change across the school of about 6 test score points in reading achievement (assuming the *SD* of student test scores is about 38 points). The largest variation in inexperienced principal mathematics effectiveness occurred among treatment principals in District D, where a 1 *SD* increase in principal effectiveness was associated with a 0.186 *SD* increase in student achievement in mathematics.

To put these estimates in perspective, a 1 *SD* increase in teacher effectiveness in reading is typically associated with a 0.11 *SD* increase in student achievement in reading, whereas a 1 *SD* increase in teacher effectiveness in mathematics is typically associated with a 0.15 *SD* increase in student achievement in mathematics (Hanushek & Rivkin, 2010). In Districts A, B, and C, our estimates of the impact of a 1 *SD* increase in principal effectiveness were typically about half as large as those reported by Hanushek and Rivkin (2010), whereas in District D our estimates were larger.

Effects of All Selected Program Principals on Student Achievement

This section reports results of our analysis that includes all selected program graduates serving as principals in schools for at least 1 year from 2009–10 to 2014–15.

We first provide demographic information for the students and schools included in the analysis. Next, we summarize the results across Districts A, B, C, and D, followed by more detailed results for all four districts. We were unable to obtain data to support this analysis in District E. Additional findings for Districts A, B, C, and D are in Appendix G.

Students and Schools Included in the Analysis of All Principals

District A. Table G-27 through Table G-33 in Appendix G summarize the characteristics of schools included in our analysis of the relative effectiveness of all principals from one of the selected programs in District A. Table 14 (also shown as Table G-28 in Appendix G) shows the years of experience for principals from one of the selected programs. For the year 2014–15, 134 schools were included in the study, 11 of which were led by principals from one of the selected programs (Table G-28). The number of students included in the analysis averaged more than 55,000 per year (Table G-29).

More details about the achievement and demographic characteristics of students in schools led by principals from one of the selected programs are in Appendix G.

Table 14. Years of Experience Among Principals Who Were Trained by One of the Selected Programs in the Analysis of All Principals for District A

Year	Years of Experience as Principal—Treatment Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	0	0	0	0	0	0	0	0
2010–11	2	0	0	0	0	0	0	2
2011–12	5	3	0	0	0	0	0	8
2012–13	1	5	3	0	0	0	0	9
2013–14	2	1	5	3	0	0	0	11
2014–15	1	2	1	5	2	0	0	11

District B. Table G-34 through Table G-39 in Appendix G summarize the characteristics of schools included in our analysis of the relative effectiveness of principals from one of the selected programs in District B. For the year 2014–15, 214 schools were included in the study, five of which were led by principals from one of the selected programs (Table G-34 and Table G-35). Table 15 (also shown as Table G-34 in Appendix G) shows the years of experience for principals from one of the selected programs. The number of students included in the analysis averaged approximately 54,000 per year (Table G-36).

Table 15. Years of Experience Among Principals Who Were Trained by One of the Selected Programs in the Analysis of All Principals for District B

Year	Years of Experience as Principal—Treatment Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	0	0	0	0	0	0	0	0
2010–11	0	0	0	0	0	0	0	0
2011–12	0	0	0	0	0	0	0	0
2012–13	2	0	0	0	0	0	0	2
2013–14	2	2	0	0	0	0	0	4
2014–15	2	2	1	0	0	0	0	5

District C. Table G-41 through Table G-47 in Appendix G summarize the characteristics of schools included in our analysis of the relative effectiveness of principals from one of the selected programs in District C. For the year 2014–15, 121 schools were included in the study, 26 of which were led by principals from one of the selected programs (Table G-41 and Table G-42). Table 16 (also shown as Table G-42 in Appendix G) shows the years of experience for principals from one of the selected programs. The number of students included in the analysis averaged approximately 30,000 per year (Table G-43).

Table 16. Years of Experience Among Principals Who Were Trained by One of the Selected Programs in the Analysis of All Principals for District C

Year	Years of Experience as Principal—Treatment Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	5	2	2	2	0	0	0	11
2010–11	3	5	2	2	2	0	0	14
2011–12	3	3	3	2	2	2	0	15
2012-13	5	4	5	3	2	4	0	23
2013–14	4	5	4	5	2	5	0	25
2014–15	4	5	5	4	5	3	0	26

District D. Table G-48 through Table G-54 in Appendix G summarize the characteristics of schools included in our analysis of the relative effectiveness of principals from one of the selected programs in District D. For the year 2013–14, 1,350 schools were included in the study, 183 of which were led by principals from one of the selected programs (Table G-48 and Table G-49). Table 17 (also shown as Table G-48 in Appendix G) shows the years of experience for principals from one of the selected programs. The number of students included in the analysis was greater than 440,000 per year (Table G-50).

Table 17. Years of Experience Among Principals Who Were Trained by One of the Selected Programs in the Analysis of All Principals for District D

Year	Years of Experience as Principal—Treatment Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	27	31	21	38	35	28	0	180
2010–11	22	29	32	21	31	56	0	191
2011–12	13	19	33	29	18	80	0	192
2012–13	17	14	19	29	23	86	0	188
2013–14	14	16	13	16	25	99	0	183
2014–15								

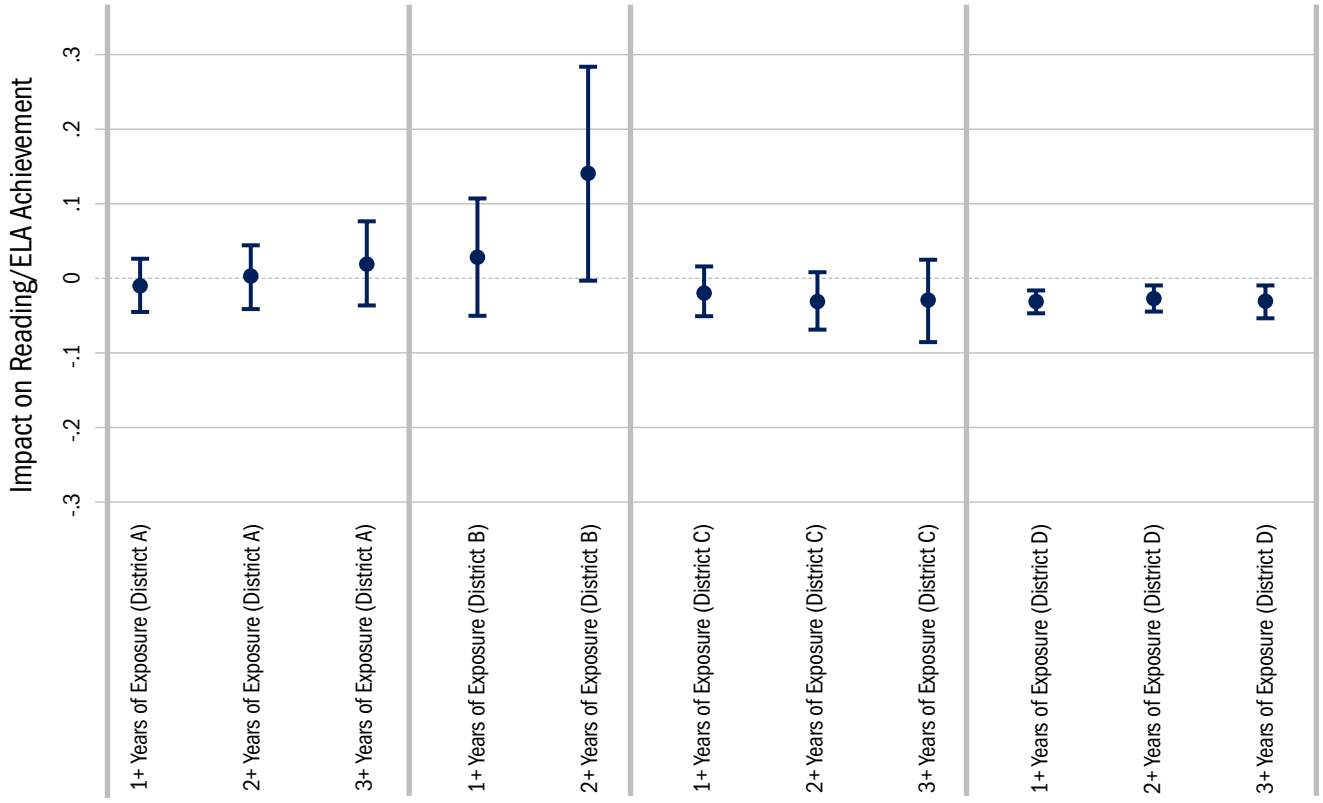
Principals From Selected Programs: Impacts on Student Achievement

When examining the impact of principals from selected programs (inexperienced and experienced) on student achievement, we looked at two variables: exposure and tenure. The exposure model allowed for the possibility, for example, that students with 1 year of attendance at a school led by a principal trained by one of the selected programs would be affected differently from students with 2 years of attendance at a school led by a principal trained by one of the selected programs. For the tenure model, we expected that the longer a principal's tenure at a school, the more time the principal has had to implement policies and other changes at the school.

All Districts (A, B, C, D). Results for our models estimating the relative effectiveness of both experienced and inexperienced principals as it relates to both exposure and tenure can be summarized as follows (see Figure 15, Figure 16, Table 18, and Table 19; detailed by-district results can be found in Appendix G, Figure G-1 to Figure G-4):

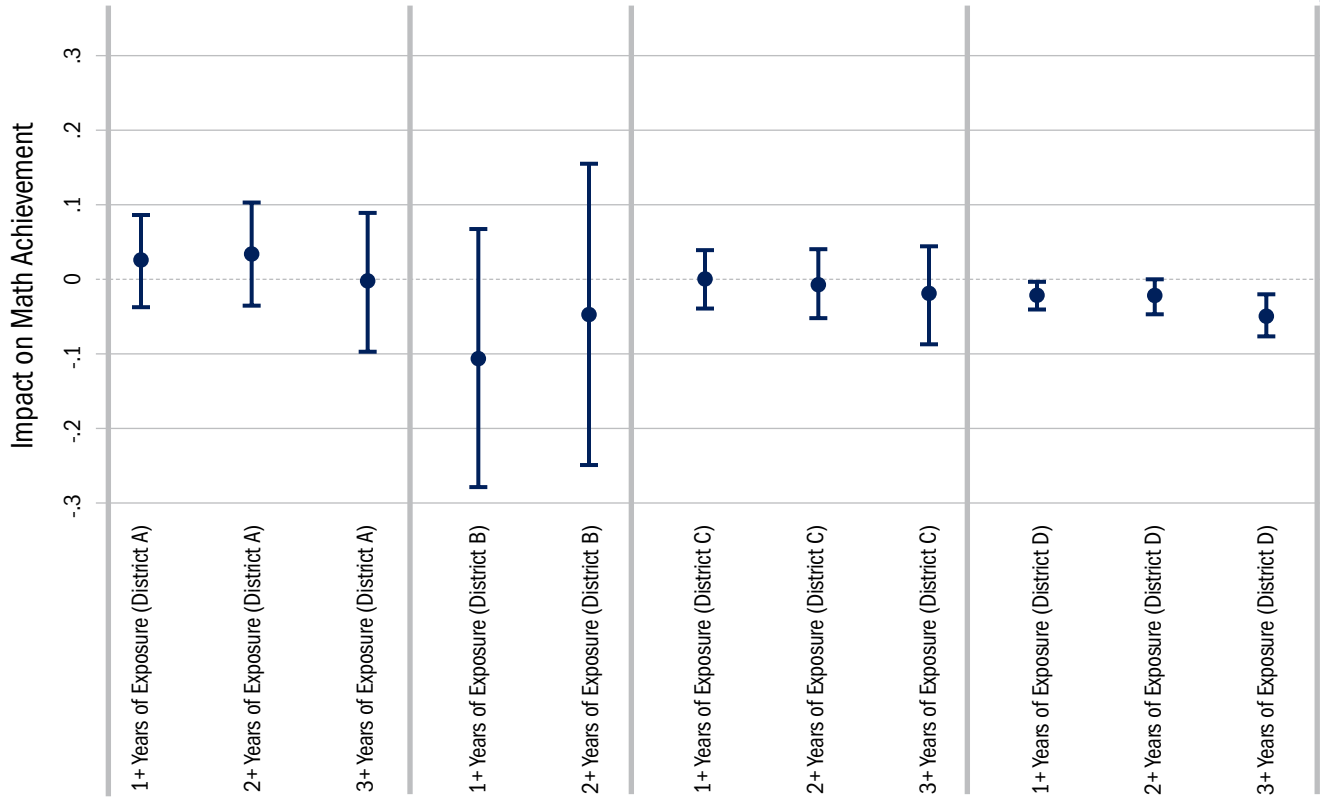
- We found no evidence that principals in District A and District C from one of the selected programs were more or less effective, on average, at fostering reading and mathematics achievement than District A and District C principals from other programs.
- We found no evidence that District B principals from one of the selected programs were more or less effective, on average, at fostering reading and mathematics achievement than District B principals from other programs. We found some evidence that District B principals may have been more effective at fostering reading achievement than principals from other programs. These results were based on only six principals from one of the selected programs in District B.
- Evidence for District D suggested that principals from one of the selected programs may have been slightly less effective at fostering ELA achievement than District D principals from other programs. The effects of principals from one of the selected programs on mathematics achievement in District D were mixed.

Figure 15. Impact of Principals From Selected Programs on Student Reading/ELA Achievement, by Students' Years of Exposure and District



Average impact of program principal on student achievement (in s.d. units) relative to student's baseline achievement. Bars represent 95% confidence intervals.

Figure 16. Impact of Principals From Selected Programs on Student Mathematical Achievement, by Students' Years of Exposure and District



Average impact of program principal on student achievement (in s.d. units) relative to student's baseline achievement. Bars represent 95% confidence intervals.

Table 18. Impact of Principals From Selected Programs on Student Mathematical Achievement, by Students' Years of Exposure and District

Covariate	District A		District B		District C		District D	
	Reading	Mathematics	Reading	Mathematics	Reading	Mathematics	ELA	Mathematics
One or more years of exposure	-0.010	0.027	0.030	-0.099	-0.021	0.002	-0.032**	-0.019*
	(0.018)	(0.031)	(0.039)	(0.088)	(0.017)	(0.019)	(0.007)	(0.009)
Two or more years of exposure	0.012	0.009	0.110*	0.055	-0.011	-0.006	0.002	-0.001
	(0.013)	(0.024)	(0.055)	(0.095)	(0.012)	(0.016)	(0.006)	(0.007)
Three or more years of exposure	0.016	-0.036			-0.000	-0.014	-0.002	-0.025**
	(0.018)	(0.035)			(0.018)	(0.021)	(0.006)	(0.007)
First year as principal	-0.005	-0.012	-0.033**	-0.074**	-0.045**	-0.069**	-0.010*	-0.036**
	(0.008)	(0.013)	(0.011)	(0.015)	(0.013)	(0.015)	(0.005)	(0.007)
Second year as principal	-0.008	-0.006	-0.025*	-0.044*	-0.032*	-0.056**	-0.013*	-0.036**
	(0.009)	(0.014)	(0.011)	(0.017)	(0.013)	(0.016)	(0.006)	(0.007)
Third year as principal	-0.008	-0.021	-0.012	-0.029	-0.025	-0.035*	-0.010	-0.028**
	(0.009)	(0.015)	(0.012)	(0.019)	(0.015)	(0.017)	(0.006)	(0.008)
Fourth year as principal	0.003	-0.018	0.002	-0.018	-0.022	-0.040*	-0.009	-0.022**
	(0.008)	(0.013)	(0.012)	(0.017)	(0.015)	(0.018)	(0.005)	(0.007)
Fifth year as principal	0.002	0.000	-0.016	-0.003	-0.025	-0.022	0.001	-0.001
	(0.007)	(0.011)	(0.012)	(0.015)	(0.015)	(0.015)	(0.005)	(0.006)
Experience missing	0.003	-0.001	-0.046**	-0.071**	-0.017	-0.119**	0.019	0.017
	(0.011)	(0.020)	(0.015)	(0.024)	(0.027)	(0.028)	(0.020)	(0.020)
Observations	344,072	345,545	306,947	372,607	173,227	177,487	2,186,712	2,215,866
Pseudo-R-squared	0.89	0.90	0.86	0.84	0.90	0.92	0.86	0.86

Robust standard errors, clustered within school-by-year cell, are in parentheses.

**$p < 0.01$. *$p < 0.05$. See Table F-1 in Appendix F for a complete list of model covariates.

Table 19. Impact of Principals From Selected Programs on Student Achievement, by Tenure at School

Covariate	District A		District B		District C		District D	
	Reading	Mathematics	Reading	Mathematics	Reading	Mathematics	ELA	Mathematics
First year of tenure	-0.016	-0.014	0.011	-0.008	-0.002	-0.019	-0.022	-0.017
	(0.008)	(0.012)	(0.016)	(0.019)	(0.014)	(0.016)	(0.015)	(0.018)
First year of tenure * treatment principal	-0.004	0.047	-0.012	-0.097	-0.033	0.004	-0.015	0.010
	(0.020)	(0.038)	(0.043)	(0.101)	(0.020)	(0.025)	(0.011)	(0.015)
Second year of tenure	-0.009	-0.001	0.021*	0.022	-0.003	-0.001	-0.021	-0.023
	(0.007)	(0.013)	(0.011)	(0.019)	(0.016)	(0.016)	(0.013)	(0.015)
Second year of tenure * treatment principal	-0.006	0.071	0.029	-0.020	-0.033	0.040	-0.021	0.026
	(0.022)	(0.040)	(0.058)	(0.077)	(0.025)	(0.029)	(0.013)	(0.016)
Three or more years of tenure * treatment principal	-0.029	0.027	0.046	-0.118	-0.035	0.022	-0.024	-0.015
	(0.020)	(0.037)	(0.077)	(0.078)	(0.026)	(0.034)	(0.013)	(0.015)
First year as principal	0.007	-0.001	-0.041*	-0.064**	-0.050**	-0.066**	0.009	-0.021
	(0.011)	(0.017)	(0.018)	(0.021)	(0.013)	(0.015)	(0.016)	(0.019)
Second year as principal	-0.001	-0.008	-0.042**	-0.062**	-0.030	-0.036	0.002	-0.018
	(0.011)	(0.017)	(0.014)	(0.022)	(0.016)	(0.020)	(0.014)	(0.016)
Third year as principal	-0.006	-0.022	-0.011	-0.028	-0.023	-0.036	-0.009	-0.025**
	(0.010)	(0.015)	(0.012)	(0.019)	(0.019)	(0.021)	(0.006)	(0.008)
Fourth year as principal	0.005	-0.018	0.003	-0.017	-0.021	-0.041*	-0.008	-0.020**
	(0.008)	(0.013)	(0.012)	(0.016)	(0.015)	(0.018)	(0.005)	(0.007)
Fifth year as principal	0.005	0.001	-0.018	-0.004	-0.024	-0.024	0.002	0.001
	(0.007)	(0.011)	(0.012)	(0.015)	(0.015)	(0.015)	(0.005)	(0.006)
Experience missing	-0.003	-0.006	-0.042**	-0.071**	-0.018	-0.119**	-0.003	0.002
	(0.012)	(0.021)	(0.015)	(0.025)	(0.027)	(0.028)	(0.026)	(0.027)
Observations	344,072	345,545	306,947	372,607	173,227	177,487	2,186,712	2,215,866
Pseudo-R-squared	0.89	0.90	0.86	0.84	0.90	0.92	0.86	0.86

Robust standard errors, clustered within school-by-year cell, are in parentheses.

**$p < 0.01$. *$p < 0.05$. See Table F-1 in Appendix F for a complete list of model covariates.

Discussion and Implications

This study analyzed the relative effectiveness of graduates from five selected principal preparation programs who served as principals in their program's partner district between 2008–09 and 2014–15. These five programs were identified as having features thought to represent good preparation practice and are located throughout the United States.

Although the principals reported generally positive perceptions of their preparation programs, we found little evidence that newly placed or more experienced principals from one of the selected programs were more or less effective, on average, than inexperienced principals trained by other programs. It is important to note that this finding does not indicate that these programs are not effective. It does mean that within the time period that we studied, we were unable to identify average effects of the programs on student achievement.

We found significant variation in effectiveness among all newly placed principals. The principals also reported significant variation in the amount and types of supports provided by their districts (and varying levels of satisfaction with those supports). These results suggest that further exploration of the factors associated with variation in principal effectiveness may provide important insights on how best to develop excellent school principals.

The potential for researchers and policymakers to identify factors associated with principal effectiveness may be limited, however, by the information available in state and local data systems. Another finding of this study was that high-quality information about principal preparation, education, experiences, and assignments was rarely available within districts (see also the related brief on this topic [George W. Bush Institute & American Institutes for Research, 2016]). States and districts will need more and better information about principals and student outcomes, and programs themselves will need these data for their own improvement efforts.

These results may point to several potential directions for further research, addressing questions such as the following:

- What principal and preparation program characteristics are associated with greater principal effectiveness?
- What types of supports after placement as a principal are associated with greater effectiveness?
- How can we assess principal impact on other outcomes?
- How does selection into programs vary, and what is its relationship to impact on student outcomes?
- How does tenure in a school as a principal and in other school leadership positions relate to student outcomes?

References

Anderson, E., & Reynolds, A. (2015). The state of state policies for principal preparation program approval and candidate licensure. *Journal of Research on Leadership Education.* 10(3), 193-221.

Branch, G., Hanushek, E., & Rivkin, S. (2012). *Estimating the effect of leaders on public sector productivity: The case of school principals* (Working Paper 17803). Cambridge, MA: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w17803.pdf

Clifford, M., Behrstock-Sherratt, E., & Fetters, J. (2012). *The ripple effect: A synthesis of research on principal influence to inform performance evaluation design.* Naperville, IL: American Institutes for Research, Retrieved from http://www.air.org/sites/default/files/downloads/report/1707_The_Ripple_Effect_d8_Online_0.pdf

Cornelissen, T. (2008). The Stata command felsdvreg to fit a linear model with two high-dimensional fixed effects. *The Stata Journal,* 8(2), 170–189.

Corcoran, S., Schwartz, A., & Weinstein, M. (2012). Training your own: The impact of New York City's Aspiring Principals Program on student achievement. *Education Evaluation and Policy Analysis,* 34(2), 232–253.

Davis, S., Darling-Hammond, L., LaPointe, M., & Meyerson, D. (2005). *School leadership study: Developing successful principals.* Palo Alto, CA: Stanford University, Stanford Educational Leadership Institute. Retrieved from https://edpolicy.stanford.edu/sites/default/files/publications/school-leadership-study-developing-successful-principals.pdf

Darling-Hammond, L., LaPointe, M., Meyerson, D., Orr, M. T., & Cohen, C. (2007). *Preparing school leaders for a changing world: Lessons from exemplary leadership development programs.* Stanford, CA: Stanford University, Stanford Educational Leadership Institute. Retrieved from http://www.wallacefoundation.org/knowledge-center/school-leadership/key-research/Documents/Preparing-School-Leaders.pdf

Farkas, S., Johnson, J., Duffett, A., & Foleno, T. (with Foley, P.). (2001). *Trying to stay ahead of the game: Superintendents and principals talk about school leadership.* New York, NY: Public Agenda. Retrieved from http://www.publicagenda.org/files/ahead_of_the_game.pdf

Gates, S. M., Hamilton, L. S., Martorell, P., Burkhauser, S., Heaton, P., Pierson, A., . . . Gu, K. (2014). *Preparing principals to raise student achievement: Implementation and effects of the New Leaders Program in ten districts.* Santa Monica, CA: RAND Corporation. Retrieved from http://www.rand.org/content/dam/rand/pubs/research_reports/RR500/RR507/RAND_RR507.pdf

George W. Bush Institute. (2014). *Great principals at scale: Creating district conditions that enable all principals to be effective.* Dallas, TX: Author. Retrieved from http://gwbcenter.imgix.net/Resources/gwbi-greatprincipalsatscale.pdf

George W. Bush Institute, & American Institutes for Research. (2016). *What districts know—and need to know—about their principals.* Dallas, TX: Author. Retrieved from http://gwbcenter.imgix.net/Publications/Resources/gwbi-whatdistrictsknowaboutprincipals.pdf

Grissom, J. A., Kalogrides, D., & Loeb, S. (2015). Using student test scores to measure principal performance. *Educational Evaluation and Policy Analysis,* 37(1), 3–28.

Hallinger, P., & Heck, R. H. (1998). Exploring the principal's contribution to school effectiveness: 1980–1995. *School Effectiveness and School Improvement,* 9(2), 157–191.

Hanushek, E. A, & Rivkin, S. G. (2010). Generalizations about using value-added measures of teacher quality. *American Economic Review: Papers & Proceedings,* 100, 267–271.

Jackson, B. L., & Kelley, C. (2002). Exceptional and innovative programs in educational leadership. *Educational Administration Quarterly,* 38(2), 192–212.

Leithwood, K., Louis, K. L., Anderson, S., & Wahlstrom, K. (2004). *How leadership influences student learning.* New York, NY: Wallace Foundation. Retrieved from http://www.wallacefoundation.org/knowledge-center/Documents/How-Leadership-Influences-Student-Learning.pdf

Rubin, D. B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology,* 66(5), 688–701. Retrieved from http://www.biostat.jhsph.edu/~dscharf/Causal/rubin.journ.psych.ed.pdf

Shelton, S. (2012). *Preparing a pipeline of effective principals: A legislative approach.* Denver, CO: National Conference of State Legislatures. Retrieved from http://www.wallacefoundation.org/knowledge-center/Documents/Preparing-a-Pipeline-of-Effective-Principals-A-Legislative-Approach.pdf

Somers, M., Zhu, P., Jacob, R., & Bloom, H., (2013). *The validity and precision of the comparative interrupted time series design and the difference-in-difference design in educational evaluation (*MDRC working paper in research methodology). New York, NY: MDRC. Retrieved from http://www.mdrc.org/publication/validity-and-precision-comparative-interrupted-time-series-design-and-difference

St. Clair, T., Cook, T. D., & Hallberg, K. (2014). Examining the internal validity and statistical precision of the comparative interrupted time-series design by comparison with a randomized experiment. *American Journal of Evaluation, 3*5(3), 311–327.

St. Clair, T., Cook, T. D., & Hallberg, K. (2016). The validity and precision of the comparative interrupted time-series design: three within-study comparisons. *Journal of Educational and Behavioral Statistics,* 41(3), 269–299.

Wallace Foundation. (2016). *Improving university principal preparation programs: Five themes from the field.* New York, NY: The Wallace Foundation. Retrieved from http://www.wallacefoundation.org/knowledge-center/Documents/Improving-University-Principal-Preparation-Programs.pdf

Introduction

In developing principal preparation program selection criteria, AIR reviewed the research on best practices in principal preparation and synthesized the findings from several highly regarded institutions currently engaged in research and evaluation related to school leadership, including the following:

- The Alliance to Reform Educational Leadership (AREL)'s nine principal preparation competencies
- A study of exemplary leadership development programs commissioned by the Wallace Foundation and conducted by Linda Darling-Hammond at the Stanford Educational Leadership Institute in partnership with The Finance Project and WestEd
- A report on case studies from these same exemplary programs commissioned by the Wallace Foundation and conducted by the Stanford Educational Leadership Institute in conjunction with The Finance Project
- UCEA's criteria for exemplary university-based educational leadership preparation
- The Rainwater Leadership Alliance's principal preparation program competencies, described in their study on approaches to principal preparation

AIR also considered study requirements, including program capacity to provide candidate data and intervention stability.

Proposed Principal Preparation Program Selection Criteria

1. **Feasibility for Study**
   - Program capacity to provide sufficient data impact (e.g., number of graduates per year and number of cohorts)
   - Program stability
   - Program includes certification process (i.e., participants do not enter the program having already completed a certification program through a university)
   - Program policy context, including state and district policies
   - Program participation in other studies
2. **Program Alignment to Research-Based Competencies.** The program's structure and curriculum is organized according to a set of research-based standards and practices and displays alignment to these research-based competencies.
3. **Experiential Learning.** Student learning (including coursework and other learning experiences) experiences expose students to the problems of school leadership practice, with the intent to build practical and technical knowledge. Learning experiences are scaffolded, moving from classroom or online learning simulations to internship experiences where students lead all or a significant portion of a school's operations.
4. **High-Quality, Rigorous Recruitment and Selection.** Vigorous recruitment of high-ability candidates with experience as expert, dynamic teachers and a commitment to instructional improvement.
5. **Early Years on-the-Job Support.** The program includes intensive on-the-job support (i.e., induction) for program graduates who are principals, such as mentoring, coaching, or a peer network for at least 1 year after graduation.
6. **Partnerships for Excellence.** The program's administrative structure engages district personnel in (a) coteaching classes, (b) serving as sites for learning, (c) providing feedback on graduate quality, and (d) curriculum review and alignment.
7. **Evidence of Effects.** The program can provide evidence of effects on advancing leadership practice, school culture, or student learning that have been developed through rigorous study. The program also has established routines for collecting program effectiveness information and uses data to adjust its programs.

Table A-1. Principal Preparation Criteria Comparison Matrix

Proposed Selection Criteria	AREL's Nine Principal Preparation Competencies	Stanford University Educational Leadership Institute's Exemplary Leadership Program Criteria	UCEA's Criteria for Exemplary University-Based Educational Leadership Preparation Award	Rainwater Leadership Alliance's Principal Preparation Competency Framework
1. **Feasibility for Study** • Program capacity to provide sufficient data impact (e.g., number of graduates per year and number of cohorts) • Program stability • Program policy context, including state and district policies • Program participation in other studies • Program includes certification process	N/A	N/A	N/A	N/A
2. **Program Alignment to Research-Based Competencies.** The program's structure and curriculum is organized according to a set of research-based standards and practices and displays alignment to these research-based competencies.	**Competency Framework.** All program components are organized around a competency framework based on research and evidence of effective practice that defines the set of skills, knowledge, and dispositions in both instructional and operational domains that a principal must have to drive high levels of student achievement.	Research-based content that is aligned with professional standards and focused on instruction, organizational development, and change management; Curricular coherence that links goals, learning activities, and assessments around a set of shared values, beliefs, and knowledge about effective organizational practice;	Reflects **current research** on the features, content, and experiences associated with effective leadership preparation. **Knowledge and Skills:** Is the program anchored to a set of nationally recognized leadership standards? How does the program integrate research and professional knowledge with leadership practice? In what ways are issues related to leading diverse and/or low-income student populations dealt with?	U**ndergirding competency framework:** A competency framework embodies the set of skills, knowledge, and dispositions that an effective principal needs in order to drive student achievement. The competency framework serves as the standards for the program and all program components—recruiting, selection, training, support, and evaluation—are aligned and designed to ensure that graduates leave with these requisite competencies.

Table A-1. Principal Preparation Criteria Comparison Matrix

Proposed Selection Criteria	AREL's Nine Principal Preparation Competencies	Stanford University Educational Leadership Institute's Exemplary Leadership Program Criteria	UCEA's Criteria for Exemplary University-Based Educational Leadership Preparation Award	Rainwater Leadership Alliance's Principal Preparation Competency Framework
3. Experiential Learning: Student learning (including coursework and other learning experiences) experiences expose students to the problems of school leadership practice, with the intent to build practical and technical knowledge. Learning experiences are scaffolded, moving from classroom or online learning simulations to internship experiences where students lead all or a significant portion of a school's operations.	**Coursework.** Program coursework is aligned to the competency framework and is highly experiential and applied, with candidates receiving frequent feedback and assessment about their performance and progress toward acquisition of the competencies. **Clinical Leadership Experiences.** The program provides candidates leadership opportunities with real responsibilities for driving student achievement gains, leading adults, and performing an array of leadership functions with structured coaching or other mechanisms to support their reflection, practice and growth.	Field-based internships that enable candidates to apply leadership knowledge and skills under the guidance of an expert practitioner; Problem-based learning strategies, such as case methods, action research, and projects, that link theory and practice and support reflection;	Reflects current research on the features, content, and experiences associated with effective leadership preparation. **Internship:** How does the internship support leadership development? How is it supervised and by whom? What does it involve and how is it funded?	**Relevant and practical coursework:** Course content is aligned to the competency framework with a strong emphasis on instructional leadership, human capital performance management, and school culture. The delivery is practical and applied—not merely theoretical—and allows aspiring principals to practice their skills and approximate real-life, on-the-job situations through role-play, case studies, and simulations. **Experiential, clinical school-based opportunities:** Through partnerships with school districts or charter schools for clinical school-based experiences, trainees are given authentic opportunities to test their leadership mettle in school settings over a significant period of time (at least six Principal preparation programs and standards falling short | www.americanprogress.org 11 months), while receiving support and feedback from experienced mentors and/or coaches. Programs expect their trainees to demonstrate proficiency in the competency framework areas as a requirement for graduation.

Table A-1. Principal Preparation Criteria Comparison Matrix

Proposed Selection Criteria	AREL's Nine Principal Preparation Competencies	Stanford University Educational Leadership Institute's Exemplary Leadership Program Criteria	UCEA's Criteria for Exemplary University-Based Educational Leadership Preparation Award	Rainwater Leadership Alliance's Principal Preparation Competency Framework
4. **High-Quality, Rigorous Recruitment and Selection.** Vigorous recruitment of high-ability candidates with experience as expert, dynamic teachers and a commitment to instructional improvement.	**Recruitment.** The program has a proactive, targeted recruitment strategy that attracts an expanded candidate pool with skills and dispositions aligned with the competency framework. **Candidate Selection.** The program uses a rigorous selection process aligned to the competency framework that only admits those candidates who demonstrate the knowledge, skills, and dispositions required to develop into effective school leaders.	Vigorous recruitment of high-ability candidates with experience as expert, dynamic teachers and a commitment to instructional improvement;	Recruitment: What strategies are used to recruit candidates? What perspectives, priorities and data inform the development of recruitment materials? Who participates in the recruitment process and why? **Selection:** What strategies, information and criteria are used to select candidates for participation in the preparation program? How is the selection criteria and process integral to the program's goals and approach? Who participates in candidate selection and how? Does the student body reflect the diversity of the area served by the program?	**Strategic and proactive recruiting:** Strategic and proactive recruitment of high-potential candidates is critical. High-quality candidates with the skills and dispositions aligned to the competency framework are identified and targeted, which in turn provides programs strong candidate pools. **Rigorous selection process:** Candidates are required to demonstrate their skills, knowledge, and dispositions through a rigorous, multistep selection process. A series of real-time performance-based assessments is used to amass data on candidates in order to spotlight those with the highest potential to be best prepared for success as principals.
5. **Early Years on-the-Job Support.** The program includes intensive on-the-job support (i.e., induction) for program graduates who are principals, such as mentoring, coaching, or a peer network for at least 1 year after graduation.	**Post-Graduate Support.** The program provides tailored support for placing graduates and ensuring their success during at least their first year as a school principal.	Mentoring or coaching that supports modeling, questioning, observations of practice, and feedback;	Reflects **current research** on the features, content, and experiences associated with effective leadership preparation. **Supportive Structures**. What program structures (e.g., cohorts, mentoring, coaching) are provided to support communities of practice?	**Placement and on-the- ob support:** Upon successful completion of the program, trainees are given further assistance on their road to effective school leadership. Programs assist their graduates in identifying and securing school leadership positions and provide continued support to help them grow and be effective on the job.

Table A-1. Principal Preparation Criteria Comparison Matrix

Proposed Selection Criteria	AREL's Nine Principal Preparation Competencies	Stanford University Educational Leadership Institute's Exemplary Leadership Program Criteria	UCEA's Criteria for Exemplary University-Based Educational Leadership Preparation Award	Rainwater Leadership Alliance's Principal Preparation Competency Framework
6. **Partnerships for Excellence.** The program's administrative structure engages school district personnel in (a) co-teaching classes, (b) serving as sites for learning, (c) providing feedback on graduate quality, and (d) curriculum review and alignment.	**Context.** The program partners with local school districts or other operators of schools to influence the conditions and level of decision-making authority necessary for the principal to impact student achievement successfully. Throughout this document, the term "districts" should be interpreted to include all organizations that operate schools, including charter schools and private schools.	Collaboration between universities and school districts to create coherence between training and practice as well as pipelines for recruitment, preparation, hiring, and induction.	**Partnerships:** What kinds of partnerships inform the program? How have district personnel influenced and/or informed the program?	
7. **Evidence of Effects.** The program can provide evidence of effects on advancing leadership practice, school culture, or student learning that have been developed through rigorous study. The program also has established routines for collecting program effectiveness information and uses data to adjust programs.	**Evaluation.** The program actively collects data to continuously improve its own performance and measure the effectiveness of its graduates.		Has demonstrated **evidence of program effectiveness.** **Program Improvement:** How are candidate and program assessments used to promote program improvement?	**Robust data collection and continuous learning:** To continuously improve the program and ensure trainee effectiveness, data are collected and monitored during the program and after graduation. Programs track the effectiveness of their principal graduates on student achievement and school performance over time. This vision differs dramatically from the traditional university-based master's in educational leadership program that prepares most of our country's principals for the job. There is little match between what we now know of effective program elements and the elements of many university programs that are approved by states.

Source Information: Complete List of Standards From Each Organization

AREL's Nine Principal Preparation Competencies

(From http://www.bushcenter.org/sites/default/files/ninecompetencies.pdf)

1. **Program Purpose** The program is designed for the express purpose of producing and placing school principals who dramatically improve student learning and sustain that improvement. While graduates of school leadership programs may also serve in other leadership capacities at the campus and district level, the focus of the AREL project is on preparing and empowering principals.
2. **Competency Framework** All program components are organized around a competency framework based on research and evidence of effective practice that defines the set of skills, knowledge, and dispositions in both instructional and operational domains that a principal must have to drive high levels of student achievement.
3. **Recruitment** The program has a proactive, targeted recruitment strategy that attracts an expanded candidate pool with skills and dispositions aligned with the competency framework.
4. **Candidate Selection** The program uses a rigorous selection process aligned to the competency framework that only admits those candidates who demonstrate the knowledge, skills and dispositions required to develop into effective school leaders.
5. **Coursework** Program coursework is aligned to the competency framework and is highly experiential and applied, with candidates receiving frequent feedback and assessment about their performance and progress toward acquisition of the competencies.
6. **Clinical Leadership Experiences** The program provides candidates leadership opportunities with real responsibilities for driving student achievement gains, leading adults, and performing an array of leadership functions with structured coaching or other mechanisms to support their reflection, practice and growth.
7. **Post-Graduate Support** The program provides tailored support for placing graduates and ensuring their success during at least their first year as a school principal.
8. **Context** The program partners with local school districts or other operators of schools to influence the conditions and level of decision-making authority necessary for the principal to impact student achievement successfully. Throughout this document, the term "districts" should be interpreted to include all organizations that operate schools, including charter schools and private schools.
9. **Evaluation** The program actively collects data to continuously improve its own performance and measure the effectiveness of its graduates.

Exemplary Leadership Program Criteria From the Stanford Educational Leadership Institute

(From http://www.wallacefoundation.org/knowledge-center/school-leadership/key-research/Documents/Preparing-School-Leaders.pdf [p. 68])

1. Research-based content that is aligned with professional standards and focused on instruction, organizational development, and change management;
2. Curricular coherence that links goals, learning activities, and assessments around a set of shared values, beliefs, and knowledge about effective organizational practice;
3. Field-based internships that enable candidates to apply leadership knowledge and skills under the guidance of an expert practitioner;
4. Problem-based learning strategies, such as case methods, action research, and projects, that link theory and practice and support reflection;
5. Cohort structures that enable collaboration, teamwork, and mutual support;
6. Mentoring or coaching that supports modeling, questioning, observations of practice, and feedback;
7. Collaboration between universities and school districts to create coherence between training and practice as well as pipelines for recruitment, preparation, hiring, and induction (Davis, Darling-Hammond, LaPointe & Meyerson, 2005; Jackson & Kelley, 2002).

Several other factors appeared to contribute to program effectiveness, including:

- Vigorous **recruitment of high-ability candidates** with experience as expert, dynamic teachers and a commitment to instructional improvement;
- **Financial support** for pre-service candidates to enable them to undertake an intensive program with a full-time internship; and
- **District or state infrastructure** that supports specific program elements and embeds programs within a focused school reform agenda.

UCEA's Criteria for Exemplary University-Based Educational Leadership Preparation Award

(From http://www.ucea.org/opportunities/exemplary-educational-leadership-preparation/)

The recipient of this award is generally selected based on the extent to which the program:

1. Reflects **current research** on the features, content, and experiences associated with effective leadership preparation, and
2. Has demonstrated **evidence of program effectiveness.**

Selection criteria for this award specifically include detailed information related to the following questions:

- **Program Focus**: What kind of leader does the program claim to prepare and how is that type of leadership reflected in the various dimensions of the program (e.g., recruitment, curriculum, practical experiences, and assessment)?
- **Recruitment:** What strategies are used to recruit candidates? What perspectives, priorities and data inform the development of recruitment materials? Who participates in the recruitment process and why?
- **Selection:** What strategies, information and criteria are used to select candidates for participation in the preparation program? How is the selection criteria and process integral to the program's goals and approach? Who participates in candidate selection and how? Does the student body reflect the diversity of the area served by the program?
- **Learning Experiences:** What is the point of view about learning in the program? How does teaching reflect this perspective? What kinds of learning experiences are integrated into the program?
- **Knowledge and Skills:** Is the program anchored to a set of nationally recognized leadership standards? How does the program integrate research and professional knowledge with leadership practice? In what ways are issues related to leading diverse and/or low-income student populations dealt with?
- **Internship:** How does the internship support leadership development? How is it supervised and by whom? What does it involve and how is it funded?
- **Supportive Structures:** What program structures (e.g., cohorts, mentoring, coaching) are provided to support communities of practice?
- **Partnerships**: What kinds of partnerships inform the program? How have district personnel influenced and/or informed the program?
- **Candidate Assessment:** How do you know that candidates' are gaining the intended knowledge, skills and dispositions? How are candidate assessments used by to support candidate growth?
- **Program Improvement:** How are candidate and program assessments used to promote program improvement?
- **Faculty:** How many faculty teach in this program? Do program faculty represent expertise from the research and practice communities? How does the program ensure that its faculty have the capabilities to prepare effective educational leaders? How do faculty members work together to design, improve and deliver the program?

The Rainwater Leadership Alliance's Key Principal Preparation Program Design Elements

(From http://www.anewapproach.org/download.html)

1. **Undergirding competency framework:** A competency framework embodies the set of skills, knowledge, and dispositions that an effective principal needs in order to drive student achievement. The competency framework serves as the standards for the program and all program components—recruiting, selection, training, support, and evaluation—are aligned and designed to ensure that graduates leave with these requisite competencies.
2. **Strategic and proactive recruiting:** Strategic and proactive recruitment of high-potential candidates is critical. High-quality candidates with the skills and dispositions aligned to the competency framework are identified and targeted, which in turn provides programs strong candidate pools.
3. **Rigorous selection process:** Candidates are required to demonstrate their skills, knowledge, and dispositions through a rigorous, multistep selection process. A series of real-time performance-based assessments is used to amass data on candidates in order to spotlight those with the highest potential to be best prepared for success as principals.
4. **Relevant and practical coursework**: Course content is aligned to the competency framework with a strong emphasis on instructional leadership, human capital performance management, and school culture. The delivery is practical and applied—not merely theoretical—and allows aspiring principals to practice their skills and approximate real-life, on-the-job situations through role-play, case studies, and simulations.
5. **Experiential, clinical school-based opportunities:** Through partnerships with school districts or charter schools for clinical school-based experiences, trainees are given authentic opportunities to test their leadership mettle in school settings over a significant period of time (at least six Principal preparation programs and standards falling short | www.americanprogress.org 11 months), while receiving support and feedback from experienced mentors and/or coaches. Programs expect their trainees to demonstrate proficiency in the competency framework areas as a requirement for graduation.
6. **Placement and on-the-job support:** Upon successful completion of the program, trainees are given further assistance on their road to effective school leadership. Programs assist their graduates in identifying and securing school leadership positions and provide continued support to help them grow and be effective on the job.
7. **Robust data collection and continuous learning:** To continuously improve the program and ensure trainee effectiveness, data are collected and monitored during the program and after graduation. Programs track the effectiveness of their principal graduates on student achievement and school performance over time. This vision differs dramatically from the traditional university-based master's in educational leadership program that prepares most of our country's principals for the job. There is little match between what we now know of effective program elements and the elements of many university programs that are approved by states.

Overview

As described in more detail in the enclosed brochure, American Institutes for Research (AIR) is conducting a study on innovative principal preparation programs serving a small number of districts across the United States. The initial stage of AIR's analysis will describe the characteristics of schools within identified districts led by principals from selected principal preparation programs, along with the characteristics of the programs themselves. The second stage of the analysis will estimate the effects that principals from the selected programs have had on student and school outcomes. This letter outlines AIR's request for information from your program for this important study.

Table B-1 describes the types of information we are seeking. For each type, we ask that you submit relevant documentation that provides more detail than that which is publicly available on your program's website or which may not be publicly available at all. In the column to the right, please note which documents correspond with each type and send this table along with your submission.

Document Format and Submission

All documents and files must be clearly labeled with your institution's name, the name and description of the document, and the date (e.g., PROGRAM NAME_2014Syllabus_06.12.14). This will help us easily store and identify your documents. You can e-mail documents in a compressed Zip file to Dana Chambers at dchambers@air.org. Please send all available documents by Monday, July 28, 2014.

For More Information

To find out more or discuss questions or concerns, please contact Dana Chambers at dchambers@air.org or 202-403-6899.

Table B-1. Documentation Request

Type of Information Requested	Example Description or Content	Document and File Name
Description of Principal Preparation Program and Components	• Program description and structure • Program mission and goals • Degrees or certifications offered • Duration of the program • Typical time between graduation and placement as a principal	
Graduation Information and Statistics	• Graduation requirements, including capstone and internship requirements • Graduation statistics (e.g., number of previous graduates from the program for the past 6 years, 2009–2014) • Percentage or number of graduates who are placed as principals in partner district	
Program Alignment With Competencies	• Description of standards or competencies with which the program is aligned • Documentation of alignment of curriculum or coursework with program competencies or standards • Documentation of alignment of field-based learning experiences with program competencies or standards	
Experiential Learning	• Course description or syllabi • Student course sequence • Description of any experiential learning components of coursework • Description of any field-based learning experiences (e.g., internships, observations, or residencies)	
Faculty Information	• Curricula vitae of faculty, including professional status and courses taught	
Recruitment and Selection Information	• Program recruitment materials for candidates • Documentation regarding program's recruitment process or any recruitment initiatives • Minimum program acceptance requirements (e.g., assessment scores, grade point average, or years of teaching experience) • Documentation of leadership competencies or qualities sought in candidates • Information regarding application process • Information regarding interview and hiring process	
Early Years on-the-Job Support	• Description of university's mentorship and coaching support offerings for program graduates • Description of district's mentorship and coaching support offerings for program graduates • Timelines for coaching and mentoring • Goals, expectations, and requirements for coaching or mentoring component of program • Qualifications and experience (e.g., curricula vitae) of mentors and coaches	
Partnership Information	• Documents describing partnerships with local school districts • Documentation regarding any district personnel involvement in program (as mentors, course instructors, or other involvement) • Documentation regarding any district personnel involvement in curriculum development, review, or refinement • Number of existing district partners • Years of current partnerships	
Evaluation and Research	• Description of any participation in research or evaluation with other partner organizations • Description of any evaluation or assessment of program or graduate effectiveness • Reports data or outcomes of any research or evaluation of program or graduates	

Introduction

Hello, I'm _____ from American Institutes for Research, which conducts educational research and evaluations. I am a member of a team that is working with the George W. Bush Institute to study the impact of principal preparation programs and the districts they partner with on graduates' leadership abilities, the schools that they lead, and the students that they serve. The purpose of this interview is to understand more about how your program prepares school principals. We have already reviewed publicly available information about your program (and documentation provided by the program, if applicable); this interview is intended to be a follow-up to help us gather additional details.

If at any point during this interview you feel that you do not have the information required to answer the question, or you feel that someone else in the program may be better able to answer the question, please let me know and we will make a note to follow up with that person directly for more information.

Confidentiality

This interview should take 45–60 minutes. Your responses will be used to add detail to the description of your program's characteristics and provide context for the quantitative analysis of impact. We will not identify you by name in our reporting of findings, although it may be possible for some individuals to infer your identity.

You do not have to participate in this interview if you do not want to, but we hope you will because we value your perspective. If you decide to participate, you may withdraw at any time without penalty or risk of harm to your relationship with the district. You may refuse to answer any question.

I will be taking notes as we talk and would like to record our conversation to ensure accuracy. May I have your permission to record this conversation?

Respondent's permission given for audio recording: ☐ Yes ☐ No

Note to interviewer: if answer is yes, turn on voice recorder and proceed. Repeat your request for permission to record after turning on the audio recorder so permission is documented. For purposes of labeling the recording, note the respondent's position and program.

General Program Background and Respondent Information

1. **What is your current position?**
   a. Probe: How long have you worked in your current position?
   b. Probe: How long have you been at this program?
2. **Is it okay to refer to your program as [INSERT NAME] in our description?**

Feasibility and Context

3. **How long has this program been operating?**
   a. Probe: Given that programs can change, can you tell me how long the program has been in place in its current form?
   b. Probe: Do you anticipate that a redesign of the program will occur during the next 2 years?
4. **How many graduates has your program had in the past 6 years?**
   a. Probe: What is the average cohort size (or if not organized by cohort, principal preparation program matriculation numbers) for the program during the past 6 years (2009–2014)?
   b. Probe: How many candidates do you anticipate enrolling to start your program in fall 2014?
   c. Probe: What percentage of candidates enrolled in the program would be considered full-time students and what percentage would be considered part-time students?
   d. Probe: What percentage of candidates does the program consider to be on track for timely graduation?
5. **Is your program currently participating in any other research studies or evaluations?**
   a. Probe: Can you describe the nature of any other studies or evaluations in which you are or will be participating?
6. **Are any other school leadership initiatives taking place in the district in which your program places graduates as school leaders? If yes, please describe.**
7. **What is the percentage of program graduates who obtain principal positions in elementary or secondary schools immediately after graduation?**
   a. Probe: What is the percentage of program graduates that obtain principal positions in elementary or secondary schools within 3 years of graduation?
   b. Probe: How do you know the data are accurate?

Alignment With Principal Preparation Selection Criteria

Program Alignment to Professional Standards or Competencies

8. **To what degree is the program aligned with professional standards or competencies?**
   a. Probe: Describe the standards or competencies that underlie your program.
   b. Probe: Why did you choose these standards or competencies?
   c. Probe: How do you know the standards or competencies are integrated into coursework?
   d. Probe: How are other elements of the program—such as field-based learning experiences or post-graduate support—aligned with these competencies?
   e. Probe: How do you know if your graduates achieved these competencies?
   f. Probe: Has your program made any significant changes to its competencies during the past 6 years? If yes, please describe.

9. How is the coursework in your program structured? [12]

a. Probe: What is the order and sequencing of the coursework in your program, and on what basis was this structure determined?

b. Probe: How, if at all, is the coursework integrated with field-based learning experiences?

c. Probe: What specific instructional strategies does your program use repeatedly in its coursework?

Experiential Learning

10. To what degree does the program structure incorporate experiential or field-based learning?

a. Probe: What approaches does the program use? Why does the program use these approaches?

b. Probe: Does the coursework include simulations of leadership experience?

c. Probe: Does the program include field-based opportunities such as internships, school observations, fieldwork, or other opportunities for students to apply their learning in real-world settings? If so, please describe the amount of time that candidates spend in internship schools and the tasks that they complete in those schools. In addition, tell us about the qualifications of coaches and mentors who support candidate internship experiences.

d. Probe: Given that you have an internship experience, can you tell me how candidates' experiences vary during the internship? For example, candidates may do the same activities throughout the experience or they may have escalating leadership responsibilities culminating in leading the entire school for a period of time.

e. Probe: Has your program made any significant changes to its experiential learning component during the past 6 years? If yes, please describe.

Recruitment and Selection

11. Which strategies, if any, do you use to recruit candidates for the program?

a. Probe: Does your program actively recruit candidates from outside the school district in which you place principals?

b. Probe: Are most applicants self-selected or do other recruitment initiatives exist?

c. Probe: What are candidates' typical characteristics? (e.g., what type of experience or role responsibilities do they have)?

d. Probe: Has your program made any significant changes to its recruitment process during the past 6 years? If yes, please describe.

12. What is the selection process for applicants?

a. Probe: What are the minimum admission requirements?

b. Probe: Do applicants participate in any scenarios or other interactive simulations during the interview process?

c. Probe: Are applicants screened for any particular qualities associated with effective school leadership beyond academic and experience-based criteria (e.g., transcripts, years of effective teaching experience, or letters of recommendation)? In what ways?

d. Probe: Has your program made any significant changes to its selection process during the past 6 years? If yes, please describe.

12 See also Darling-Hammond et al. (2007), p. 177.

Early Years on-the-Job Support

13. What types of postgraduate or induction support does the program provide its graduates?

a. Probe: Are graduates provided with coaches or mentoring? If so, for how long?

b. Probe: What are the qualifications and experience of any mentors or coaches that support your graduates?

c. Probe: Does your program provide any peer networking opportunities for new principals after graduation? If so, please describe.

d. Probe: Does your program provide any professional development or training opportunities to new principals after graduation? If so, please describe.

e. Probe: Has your program made any significant changes to its induction support during the past 6 years? If yes, please describe.

Partnerships for Excellence

14. Does the program engage in any partnerships with districts or other organizations to support program effectiveness?

a. Probe: Do district personnel teach any of the classes in the program?

b. Probe: Do districts provide sites or schools for field-based learning?

c. Probe: Do districts or other organizations provide feedback on or evaluation of your graduates or program participants?

d. Probe: Are districts or other organizations involved in the development or alignment of your program curriculum?

e. Probe: Have any significant changes been made to the district's partnership with your program during the past 6 years? If yes, please describe.

Evaluation of Effectiveness

15. How does your program evaluate its effectiveness?[13]

a. Probe: What data does your program collect to measure program quality and effectiveness? How are these data analyzed?

b. Probe: How frequently does your program collect and analyze effectiveness data?

c. Probe: Are your evaluations conducted internally or externally? By whom?

d. Probe: To what extent, if at all, does your program use evaluation data to make changes to the program?

e. Probe: Has your program made any changes to the way it evaluates program effectiveness during the past 6 years? If yes, please describe.

16. How does your program facilitate continuous improvement?[14]

a. Probe: Does your program engage in course syllabi review and revision? If so, how frequently?

b. Probe: What processes does your program have in place to review and revise course syllabi for alignment with program standards and competencies (i.e., who reviews, what is the review process, and what is the revision process)?

17. Do you have any questions or comments you would like to add?

Thank you for a rich discussion today. We really appreciate the feedback you have given us.

13 See also Darling-Hammond et al. (2007), p. 186.

14 See also Darling-Hammond et al. (2007), p. 179.

Introduction

Hello, I'm _____ from American Institutes for Research, which conducts educational research and evaluations. I am a member of a team that is working with The George W. Bush Institute to study the impact of principal preparation programs and the districts they partner with on graduates' leadership abilities, the schools they lead, and the students they serve. We have already collected publicly available information about the principal preparation program you attended and the district where you serve as a principal, and we have conducted interviews with program and district personnel. The goals of this principal interview are as follows:

- To verify any information we received from the principal preparation program you attended and the district where you currently work, including your general background and experience and your tenure at your current school.
- To determine if your school or district is participating in any special initiatives that would affect the outcomes of our research.
- To understand other supports you may be receiving from the district, the program you attended, or other sources that may influence your leadership of the school.
- To gather data that will help us understand the ways in which you have applied the learning acquired during your training program or induction as a new principal.

If at any point during this interview you feel that you do not have the information required to answer the question, please let me know.

Confidentiality

This interview should take 30–45 minutes. Your responses will be used to add detail to the description of your program's training and district's principal placement and support processes, and they will provide context for the quantitative analysis of impact. We will not identify you by name in our reporting of findings, but it is possible that some individuals may infer your identity.

You do not have to participate in this interview if you do not want to, but we hope you will because we value your perspective. If you do decide to participate, you may withdraw at any time without penalty or risk to your relationship with the district or program. You may refuse to answer any question.

I will be taking notes as we talk and would like to record our conversation to ensure accuracy. May I have your permission to record this conversation?

Respondent's permission given for audio recording: ☐ Yes ☐ No

Note to interviewer: if answer is yes, turn on voice recorder and proceed. Repeat your request for permission to record after turning on the audio recorder so permission is documented. For purposes of labeling the recording, note the respondent's position and program.

General Principal Background and Data Confirmation

1. **Where did you receive your principal preparation training?**
   a. Probe: In what year were you admitted to [PROGRAM NAME]?
   b. Probe: When did you graduate from [PROGRAM NAME]?
   c. Probe: From the time of graduation, about how long did it take for you to be hired and placed as a principal?
2. **What is your current position?**
   a. Probe: How long have you worked in your current position? (Note: Confirm start date.)
   b. Probe: How long have you been a principal?
   c. Probe: What other school-based roles have you served in throughout your career? (Note: Clarify any other school leadership experience, including assistant principalships or previous principal experience.)

Alignment With Principal Preparation Selection Criteria

Alignment to Professional Standards or Competencies

Note to Interviewer: Please preface the next two questions and all Likert scale questions with the following: "For the next question, I'm going to ask you to give a rating, and there are three options: not at all, to a moderate extent, or to a great extent."

3. **To what extent did you feel that [PROGRAM NAME] was aligned to a clear set of competencies or standards related to the qualities of an effective principal? Would you say the program was not aligned to standards at all, was aligned to a moderate extent, or was aligned to a great extent? Please explain your answer.**
   a. Probe: Describe the standards or competencies that are used by the program you attended.
4. **To what extent did the content of your coursework support your practice as a principal? Would you say the coursework did not support your practice as a principal at all, supported your coursework to a moderate extent, or supported your practice to a great extent? Please provide specific examples.**

Experiential Learning

5. **Did your principal preparation program include any experiential learning opportunities (such as preservice residencies, internships, or observations)?**
6. **Describe your overall experience with any experiential learning opportunities during the program.**
   a. Probe: To what extent, if at all, do you feel that the preservice experiential learning opportunities prepared you to be an effective principal? Would you say the preservice learning opportunities did not prepare you at all, prepared you to a moderate extent, or prepared you to a great extent? Please explain your answer.
   b. Probe: To what extent, if at all, do you feel that the preservice experiential learning opportunities facilitated your placement as a principal in the district? Would you say the preservice learning opportunities did not facilitate your placement at all, facilitated your placement to a moderate extent, or facilitated your placement to a great extent? Please explain your answer.

Program Recruitment and Selection

7. **How did you learn about [PROGRAM NAME]?**
8. **Please briefly tell me about the selection process for [PROGRAM NAME].**

District Recruitment, Selection, and Placement

9. **Tell me how you ended up in your current principal position, including the recruitment and hiring processes.**

Early Years on-the-Job Support

10. **What types of support did you receive from as a new principal, and how long did you receive this support?**
    a. What types of support did you receive from your preparation program?
    b. What types of support did you receive from your school district?
    c. Did you receive support from other sources? [if yes] In what ways and from whom?

Note to interviewer: If necessary, probe the interviewee with the following questions to gather more information about his or her induction support.

11. **Please tell me more about your experiences with coaching or mentoring as a new principal.**
    a. To what extent did you feel that the coaching or mentoring support you received as a new principal was beneficial to your practice? Would you say the support was not at all beneficial, was somewhat beneficial, or was greatly beneficial? Please explain your answer.
    b. Probe (for principals with more than 2 years of experience in their current role): Do you still receive any mentoring, coaching, peer network, professional development, or training support? [If yes] Could you please tell me about this support?

Overall Perception of Preparedness

12. **Are there specific practices that you learned through [PROGRAM NAME] or supports provided by the district that have especially helped you be successful in your role as principal?**
    a. Probe [If yes]: Could you please describe them and tell me how you have applied them in your principal practice?
13. **What do you feel was the most useful aspect of the training you received through [PROGRAM NAME]? Why was it valuable?**
14. **What do you feel was the least useful aspect of the training you received through [PROGRAM NAME]? Please explain why it was the least useful.**
15. **What do you feel was the most useful aspect of the support you received from your district as a new principal? Why was it valuable?**
16. **What do you feel was the least useful aspect of the support you received from your district as a new principal? Please explain why it was the least useful.**

Conclusion

17. **Do you have any questions or comments you would like to add?**

Thank you for a rich discussion today. We really appreciate your time and the feedback you have given us.

The results of the 68 interviews conducted with principals that graduated from the five selected programs included generally positive feedback on the programs. Principal respondents described program design and program supports that were both aligned to the selection criteria used to identify programs for participation in the study, and aligned with how programs described themselves through program documentation and interviews. The key findings from these interviews include the following:

- All principals interviewed indicated that the selected principal preparation program that they attended was aligned to a specific set of research-based principal standards or competencies. When asked to what extent, the vast majority (90%) said their program was aligned to a set standards to "a great extent," and the remaining 10% of the respondents said to "a moderate extent."
- Approximately 75% of the respondents found the coursework to be supportive of their practice in the principal role to "a great extent," with the majority also reporting that they applied their learning in the selected principal preparation program to their work in the principal role.
- The respondents generally reported favorable perceptions of the residencies and internships they experienced during their preparation, noting the value of these hands-on experiences in preparing them for the principal role. In one program, participants were afforded two types of internship experience and may have had issues with one but overall favored the internship or residency experiences.
- Ninety-nine percent of the respondents described multiple components and phases of the recruitment process (e.g., impromptu essays and scenario role-plays). Only one respondent described a straightforward interview process. In providing descriptions of the selection process, 9% of the respondents used the word *rigorous*, 6% of the respondents used the word *intense*, and 1% of the respondents described the selection process as *extensive*.
- Across all selected principal preparation programs, the respondents described varied levels of support they received once they were in the principal role. Respondents from some selected programs noted that support for sitting principals was primarily offered through the district, with the respondents from one district describing a multiyear comprehensive support system. The respondents from other selected programs continued to receive coaching support from the program once they were in the principal role. They also described more informal supports that they received through colleagues and other leaders in the district.
- Approximately half of the respondents (51% of the 41 respondents that provided an answer to this question) whose programs provided coaching support to new principals found the coaching support they received from their program to be "greatly beneficial" to their practice in the principal role. Other respondents described the coaching provided as "somewhat beneficial" (37%), or only "beneficial" (7%).

- When asked about the most useful aspects of the program, respondents had many favorable perceptions to share, noting that the most useful aspects of the selected principal preparation programs were are follows:
  - Internship or residency
  - Mentoring
  - Coaching
  - Focus on instructional leadership
  - Reflections on the realities of the job of principal
  - Cohort model and networking
  - Role-playing and simulation exercises
- The respondents reported variability in the district support they received once they assumed the role of principal. For example, one district had a structured program of support, whereas other districts offered optional support components or components that could be purchased after a provision period that was free of charge.
- The respondents also had mixed perceptions of the usefulness of the district support with some respondents noting very minimal or ineffective district support, and others praising extensive support from the district. Some respondents also noted a lack of differentiation in district support.

Perceived Alignment of Programs to Standards

Across the five selected programs, the vast majority of the respondents said that the program in which they participated was aligned to a specific set of standards or competencies to a great extent, and these competencies were embedded throughout the program. Several respondents reported that the programs in which they participated consistently made them aware of the competencies they were expected to fulfill as part of their participation in the program and described the rubrics. According to the respondents, the competencies were related to instructional leadership, data-driven decision making, and creating a values-based culture. Of the few respondents who reported that their programs were aligned with a clear set of standards to a moderate extent, some noted they were in the initial cohort of enrollees at which time the program was not yet fully aligned with a clear set of standards. Another respondent reported that the program was moderately aligned to a clear set of standards because some standards were emphasized more than others.

Perception on Extent to Which Coursework Supported Practice

A majority of the interview respondents (74%) across all the programs said that the coursework of their program supported their practice as school leaders to a great extent. The respondents who indicated that the coursework supported their practice to a great extent said that the coursework reflected the practical application of competencies and duties of an effective principal. One respondent explained, “I could do projects and papers studying problems in my school. What I would do was directly applicable to my school and ways to improve my school.” Several interview respondents mentioned that the coursework activities provided opportunities to address challenging issues in a safe setting. The program participants applauded several aspects of their coursework, including group projects, case studies, role-playing activities, the book selection, resources, and the quality of course content. Several interview respondents also reported that they learned about a variety of instructional leadership frameworks and how to provide quality feedback to teachers. One respondent commented, “All those courses were and still are incredibly useful to my work.” Interview respondents who said that coursework supported their practice as a principal to a moderate extent asserted that the coursework was

more theoretical than practical. Some respondents who said that coursework supported their practice to a moderate extent said the residency experience was more valuable to them than the coursework. Other respondents reported that some courses were more relevant than others.

Reflections on Experiential Learning Opportunities Within Programs

Although most of the interview respondents across all programs reported participating in a residency or internship (referred to here as experiential learning opportunities), some participants from some programs reported not participating in any experiential learning component. Participants in two of the five programs noted that those in earlier cohorts were not exposed to experiential learning; feedback from those in earlier cohorts prompted a change, and an internship component was added to the program. Overall, the interview respondents who engaged in summer or yearlong residencies or internships reported that these experiential learning opportunities prepared them for the role of principal to a great extent. The respondents said that the experiential components were purposeful and aligned with standards.

The respondents also expressed great appreciation for the experiential learning component, noting that it exposed them to a variety of facets of the principalship and afforded valid opportunities to learn from mistakes. One respondent noted the advantage of "being coached through a mistake before you are actually in the hot seat yourself." The participants described engagement in substantive responsibilities and tasks before actually becoming a principal. They reported being given autonomy related to specific projects, being given "real work," and "diving into big issues." The interview respondents for two of the programs described how the experiential learning component was designed to take them out of their comfort zone by assigning them a grade or school setting with which they were not familiar to make them well rounded. For example, one program offered two residencies, and there was a deliberate attempt to place aspiring principals in two very different schools for the two residencies. Often, the two residencies would differ in student enrollment, leadership style, and student demographics.

Several respondents noted that one powerful component of the residency experience was being paired with a strong mentor principal. Several respondents across the five programs noted that the mentor principal often was strong in an area in which the aspiring principal was weak. One respondent who participated in internships or residencies and felt that the experiential learning prepared him or her to be an effective principal to a moderate extent said that he or she felt that way because at the conclusion of the internship or residency, he or she was not prepared to be principal and needed more time as an administrator. Another respondent who said the experiential learning component prepared him or her to a moderate extent remarked,

> I don't think there's anything that can prepare you to a great extent. I don't think there's anything like just being in the job and doing the job, and having that responsibility . . . because I think there's still a very steep learning curve in that first year especially.

Reflections on the Recruitment and Selection Process for Programs

The majority of the respondents reported finding out about their programs through professional connections or word of mouth. Other applicants found out about their program through informational events, flyers, and online search or receiving an e-mail regarding the program.

Across all five programs, the interview respondents consistently described the selection process for the program to which they were admitted using terms such as "extensive," "intense," "very rigorous," or "overall one of the best processes I've seen." The respondents reported that as

program candidates they had to submit a written application, letters of recommendation, and a leadership portfolio. The application process included simulations, individual and group data analysis exercises, case study analysis, presentations, and impromptu essays. One respondent indicated that he or she could tell that he or she was being judged against the competencies that would comprise the program. Applicants reported participating in traditional interviews, panel interviews, and group interviews that required multiple applicants to work together. One respondent remarked, "The interview itself was multiple people representing different angles of what it might take to be a principal, including former principals, current principals, and education license staff." A component of the selection process for one program was described as follows: "We would be in a fish bowl, where there were observers all around us, and they would throw scenarios at us and let us brainstorm and have discussions as if we were a team working together."

Perceptions of Early Career Supports

Many of the interview respondents indicated that they received support once they completed the principal preparation program. Support in their new role as principal came from the program, the district, or other sources.

Support From the Programs

The interview respondents from two of the five programs indicated that their program did not offer structured or formal types of support, such as coaching or mentoring to graduates after they were placed as principals in the district. The respondents in these two programs mentioned they were still in touch with their professors and other cohort members, and some receive informal support from certain program graduates. The respondents who had participated in the other three programs mentioned that coaching support was provided through the program for a minimum of 1 year and up to 3 years.

Two participants in one program that provides coaching support said that although they felt supported by their program, they felt as if they received less support from their program than other program participants. The rationale they gave is that they have enrolled another school leadership program offered by the same organization that prepared them, which is designed to help develop school leadership teams. The program is based on competencies similar to those of their preparation program and comprises workshops as well as ongoing coaching.

Participants in two of the five programs said that their principal preparation program supports principals through regular meetings of participants who have concluded the program's experiential component. For both programs, the meetings are designed to provide professional development and networking opportunities for program alumni. One respondent noted that attendance is not always high at these events, and the content program was not always relevant to participants' needs. Another respondent described how at such sessions participants would engage in professional conversations about what they were doing and how they were progressing in their role as principals.

Support From the Districts

All participants from one of the five programs described a 5-year comprehensive induction and development program offered by the district. Participants from this program offered positive remarks on the walk-throughs that were a part of the professional learning communities offered in Year 1 of this program and described another aspect of this 5-year development program that included individual leadership style development as "a really, really wonderful way of looking at ourselves as leaders."

Support provided to participants in the remaining four programs was not as structured. The interview respondents from one program reported on support district support provided by network chiefs or executive directors. Views on this type of district support were mixed.

In two of the five districts, the sentiment was that more early support is received from the program than from the district. One respondent remarked, "I would say that I've gotten more support from my [principal preparation program] coach than I have my network chief. They are just too busy; they are too overwhelmed trying to manage [a large number of] schools."

Participants in one district mentioned that the superintendent provides monthly districtwide professional development. Other interview respondents mentioned that some districts provided coaches and mentors; however, it was not always consistent. For example, in one district, principals could opt to use funds from their school budget to obtain coaching from the district. The interview respondents in two districts mentioned receiving support from district networks or district leadership on budgeting, compliance issues, and human resources issues that many respondents found to be very beneficial.

Support From Other Sources

Approximately 90% of the interview respondents reported receiving support or mentoring from an informal source that they sought out themselves. They said that strong bonds were developed with their cohort-mates while they were students and residents in their preparation programs. Many noted that veteran principals were happy to oblige requests for advice and assistance, and former professors and instructors also were supportive. In addition to informal support, the respondents mentioned receiving support from Teach For America through a leadership electronic mailing list, from a university executive leadership program, from the Gates Foundation, and from the Network for College Success. Some interview respondents mentioned receiving support from grant funding or support provided to principals of nontraditional types of schools, such as an international school, a charter school, or those opening a specially themed school.

Perceptions of Coaching Supports

The vast majority of the respondents from three programs described the coaching they received as greatly beneficial to their practice as a principal. (The respondents from the other two programs did not describe coaching support.) Program participants received between 1 and 5 years of coaching after becoming a principal. Some program participants had multiple coaches (e.g., a district provided coach or a coach provided by the program). A respondent from one program said,

> Every 2 weeks [my coach] comes to campus. We go into classrooms. I call it my therapy sessions where he comes in and he coaches me . . .. We may sit and talk about systems that need to be tweaked and get ideas.

The respondents from another program described their interactions with program coaches who are retired administrators as effective. Another respondent from the same program described monthly visits by a coach from the program who provided strategic advice and helped the respondent parse through student data in ways in which he or she might not otherwise. Another respondent from the same program said that his or her coach came to the campus frequently during the first year as a principal, and the coach was on call 24/7 if he or she was struggling with an issue.

The respondents from a different program who rated the coaching as greatly beneficial mentioned that the topics on which they received coaching support included organizing teams and learning communities, budgeting, hiring, classroom observations, data, and instructional strategies. The respondents mentioned that coaches held them accountable, were knowledgeable, asked pertinent questions, and helped them think through strategies and communication with staff. Coaches also helped in the review of ideas and documents; provided sound advice regarding teacher observations, school improvement, and other topics; and made frequent visits to the schools. Of one coach a respondent said, "I had tremendous support. [The coach] was top-notch, and I learned so much about what to do and what not to do."

A few principals in one program perceived the coaching support as somewhat beneficial to their practice as a principal. The rationale was that the coaching was on an as-needed basis. One respondent admitted being hesitant to reach out to a coach for assistance when situations occurred, preferring to take on the responsibility, knowing that help was available if needed. Another said that things went well the first year of the principalship, so the coaching was not intensive because "they didn't feel I needed that much support." One respondent, out of all program respondents, explained as follows:

> [Coaching has] not been beneficial at all because I don't feel like I'm receiving it. . . . It's just frustrating. . . I know 99% of the job. I feel like going into the second year, I don't know it well, but I know it. So, having support, or at least feedback of what I am doing well and what I'm not doing well, that would be appreciated.

Perceptions of the Application of Program Learning to Principal Role

The respondents provided numerous examples of how they applied what they learned through their principal preparation program. One respondent provided an example of applying what had been learned in the program by working with teachers in grade-level teams related to student work and standards-based outcomes to drive teachers to change their instructional practices.

The respondents across three of the programs specifically identified practices that they applied that were aligned to the competencies of observation and providing effective feedback, data-driven instruction, and developing action plans. The interview respondents for two programs indicated that the preparation program provided them with a better and renewed understanding about the importance of being an instructional leader and coach in building school staff capacity. The respondents in one program noted that being part of that program helped them understand school leadership in an urban setting; the importance of critical thinking; how to impact organizational change; and how to develop a learning organization built on collaboration, skill sets, communication, and shared instructional practices. Four respondents in another program said that they applied systems analysis or organizational diagnosis as a practice that they learned in the program.

The interview respondents also mentioned applying practices related to involving others in decision making, using protocols, supporting teachers, addressing organizational leadership, teamwork, and having difficult conversations with adults. Additional applied program learning mentioned by the respondents included developing a strong school climate or working conditions, being a reflective principal, and focusing on the instructional leadership role. One interview respondent remarked, "I guess I adopted a lot of practices I had not been exposed to before."

Most Useful and Least Useful Aspects of the Programs

The majority of the respondents in two of the five programs had a difficult time identifying one most useful aspect of the training program. These respondents mentioned more than one useful aspect of the training, with the rationale that all program components were "interrelated" and "equally necessary and vital to my development." One respondent said, "[T]he coaching, residency, and coursework were mutually reinforcing in a way that any of the specific elements on their own wouldn't be. I do think that this is a case where the sum is greater than the value of its parts." Across the five programs, the respondents most frequently mentioned the following as the most useful aspects of their programs:

- Internship or residency
- Mentoring
- Coaching
- Focus on instructional leadership
- Reflections on the realities of the job of principal
- Cohort model and networking
- Role-playing and simulation exercises

Across the five programs, the respondents had a difficult time identifying the least useful aspects of their program. Many respondents opted not to provide an answer when asked about the least useful program aspects. One respondent remarked, "I honestly can't think of anything negative to say about the program. I can't rank anything as least because every project that I did was valuable." Of the respondents who did provide a response, those in three programs commented that one or two of the courses they took were not particularly useful. Course topics mentioned that were considered of little use included school finance, high-performing operational systems, research proposals, school law and policy, and psychology.

Most Useful and Least Useful Aspects of Support From the Districts

Interview data about the most useful aspects of support from the district were mixed across the five programs. Although the respondents praised one district for its extensive support, some respondents from another district declined to comment, saying that the support was so minimal that there was little to comment on regarding the most useful aspect.

The respondents from four districts mentioned coaching support as valuable, whereas some participants from the fifth program mentioned that direct support from a district executive director or network staff was valuable. Some respondents from one program also expressed that district meetings afforded opportunities to interact with other principals, which is helpful. Several respondents mentioned that district professional development offerings on subjects such as budgeting and transferring funds, student information systems, or technology were useful. Additional district support mentioned as useful included operational and budgetary support, flexibility in the selection of a coach, district support specific to school needs, and support in helping principals understand district structure. The respondents in one district described the usefulness of their district convening of like-minded principals or principals that have similar schools into what one respondent to be "critical friends."

Regarding least useful district-based supports, several respondents said the district made their job more difficult when they pulled them off campus for training or professional development. Principals from two different programs said their district too frequently takes a "one-size-fits-all" approach to supporting principals and schools, and principals would benefit from more differentiated support especially because regions within the district have multiple schools and could not differentiate. In one program, several respondents mentioned that visits or support from local superintendents were the least useful aspect of support.

Model for Inexperienced Principals

The model for the inexperienced principals analysis (RQ3) can be represented as follows:

$$y_{igst}=\beta_0+X1_{igst}\,\beta_1+X2_{st}\,\beta_2+$$
$$\beta_3\,(year>2011)_t*(cohort=1)_s+\beta_4\,*treatment_s*(year>2011)_t*(cohort=1)_s+$$
$$\beta_5\,(year>2012)_t*(cohort=2)_s+\beta_6\,*treatment_s*(year>2012)_t*(cohort=2)_s+$$
$$\beta_7\,(year>2013)_t*(cohort=3)_s+\beta_8\,*treatment_s*(year>2013)_t*(cohort=3)_s+$$
$$\beta_9\,(year>2014)_t*(cohort=4)_s+\beta_{10}\,*treatment_s*(year>2014)_t*(cohort=4)_s+$$
$$\gamma_g+\varphi_g*year_t+u_s+\tau_s*year_t+\varepsilon_{igst} \qquad \text{(F-1)}$$

The models were estimated separately by district and subject (reading/ELA and mathematics) and assumed achievement *y* of student *i* in grade *g* in school s during year *t* as a function of individual student-level ($X1_{igst}$) and time-varying ($X2_{st}$) school-level covariates. These covariates differed across districts depending on availability. Table F-1 shows the specific covariates for each district. The coefficient β_3 represents the average change in achievement in schools that received an inexperienced principal who was not trained by one of the selected programs in 2011–12, following the arrival of that new principal. The sum of the coefficients β_3 and β_4 represents the change in average achievement among students in schools that received an inexperienced principal from one of the selected programs in 2011–12. The coefficients β_5 through β_{10} represent the analogous effects for the other three cohorts (2012–13, 2013–14, and 2014–15) of inexperienced principals. The coefficients β_4, β_6, β_8, and β_{10}, which represent average differences in effectiveness between treatment and comparison principals in the same cohort, are the parameters of interest.

Table F-1. Covariates Included in the Statistical Models for Each District

Model Covariates	Models F-1 to F-3 (Inexperienced Principals)				Models F-4 and F-5	Models F-8 and F-9 (All Principals)			
	District								
	A	B	C	D	E	A	B	C	D
Student is African American.	X	X	X	X	X				
Student is Asian American.	X	X	X	X	X				
Student is Hispanic.	X	X	X	X	X				
Student is White.	X	X	X	X	X				
Student belongs to another ethnic group.	X	X	X	X	X				
(The most frequent of the five ethnicity categories is omitted.)									
Student's ethnicity is missing.				X	X				
Student is female.	X			X					
Gender is missing.				X					
Student is an ELL.	X	X	X	X	X	X	X	X	X
Student is disabled (SWD).	X	X	X	X	X	X	X	X	X
Student is eligible for free or reduced-price meals.		X	X	X	X		X	X	X
Indicator for free or reduced-price meals status is missing.		X			X		X		
Grade indicators	X	X	X	X	X	X	X	X	X
Percentage of students who are African American	X	X	X	X	X	X	X	X	X
Percentage of students who are Asian American	X	X	X	X	X	X	X	X	X
Percentage of students who are Hispanic	X	X	X	X	X	X	X	X	X
Percentage of students who are White	X	X	X	X	X	X	X	X	X
Percentage of students with other ethnicity	X	X	X	X	X	X	X	X	X
(The most frequent of these five ethnicity categories is omitted.)									
Percentage of students with missing ethnicity				X	X				X
Percentage of students who are female	X					X			
Percentage of students who are ELLs	X	X	X	X	X	X	X	X	X
Percentage of students who are SWDs	X	X	X	X	X	X	X	X	X
Percentage of students who are eligible for free or reduced-price meals	X	X	X	X	X	X	X	X	X
Percentage of students with a missing free or reduced-price meals status		X			X		X		
Percentage of students in Grade 4	X	X	X	X	X	X	X	X	X
Percentage of students in Grade 5	X	X	X	X	X	X	X	X	X
Percentage of students in Grade 6			X	X	X	X	X	X	X
Percentage of students in Grade 7			X	X	X	X	X	X	X
Percentage of students in Grade 8			X	X	X	X		X	X
(Percentage of Students in Grade 3 is the omitted category.)									
Grade-specific linear time trends	X	X	X	X	X				
Student changed schools between last year and this year, interacted with grade indicators.						X	X	X	X
Student was retained in the same grade.						X	X	X	X
Student has skipped a grade.						X	X	X	X
Principal's first year of experience						X	X	X	X
Principal's second year of experience						X	X	X	X
Principal's third year of experience						X	X	X	X
Principal's fourth year of experience						X	X	X	X
Principal's fifth year of experience						X	X	X	X
Principal's experience is missing						X		X	X
(Principal has more than 5 years of experience is the omitted category.)									
School fixed effects (excluded from Model 3)	X	X	X	X	X	X	X	X	X
School-specific linear trends	X	X	X	X	X				
Year fixed effects						X	X	X	X
Student fixed effects						X	X	X	X

The models included grade-level fixed effects (γ_g) and grade-level trends ($\varphi_g * year_t$) to account for the possibility that grade-specific levels and trends in student achievement among the schools included in the study differed from the overall levels and trends in student achievement within each grade in the district. In addition, the models included school fixed effects (u_s) to account for time-invariant differences in achievement between schools and school-specific (fixed) linear time trends ($\tau_s * year_t$) to account for differential trends in achievement among schools. Standard errors (ε_{igst}) are clustered within each school-by-year cell.

To obtain an overall estimate of the relative effectiveness of principals from selected programs across all cohorts, we estimated a simpler version of the model that estimates overall post and treatment times post effects across all cohorts of schools, which is presented in Equation F-2.

$$y_{igst} = \beta_0 + X1_{igst}\,\beta_1 + X2_{st}\,\beta_2 + \beta_3\ post_{st} + \beta_4 * treatment_s * post_{st} + \gamma_g + \varphi_g * year_t + u_s + \tau_s * year_t + \varepsilon_{igst} \quad \text{(F-2)}$$

In this model, the post indicator equals 1 in years following the arrival of an inexperienced principal at the school and 0 otherwise, and the binary treatment variable indicates that the principal who arrives in the post period was trained by one of the selected programs. The other model parameters are the same as in Equation F-1, and the standard errors are clustered at the school-by-year level.

Matching

Table F-2 through Table F-5 present baseline test scores of schools receiving principals from selected programs (treatment schools) and comparison schools for Districts A, B, C, and D. To calculate the averages and *SDs* presented in these tables, we first calculated the average normalized student test score in each district, school, year, and subject. A simple average of these school-level averages was then presented for each district, cohort, and group (treatment or comparison). The *SDs* presented here are the *SDs* among schools, not among students. Because of the small number of potential comparison matches in Districts A, B, and C, the comparison schools included in the analyses for these districts do not match as closely to the treatment schools as the comparison schools included in the analysis for District D.

In District A, the absolute value of the difference between the average test scores in treatment schools and average test scores in comparison schools ranged from 0.47 to 0.74 for the cohort of schools that received inexperienced principals in 2011–12, from 0.06 to 0.29 in the 2012–13 cohort, and from 0.01 to 0.12 in the 2013–14 cohort (see Table F-2). Treatment schools in the 2011–12 and 2013–14 cohorts tended to have higher baseline test scores in District A, whereas in the 2012–13 cohort, the comparison schools tended to have higher baseline test scores in District A. Because only one treatment school was in the 2012–13 cohort in District A, the *SDs* of average test scores for that school were not reported.

In District B, the absolute value of the difference between the average test scores in treatment schools and average test scores in comparison schools ranged from 0.01 to 0.35 in mathematics and from 0.01 to 0.19 in reading (see Table F-3). In some years, cohorts, and subjects, the average baseline scores were higher in treatment schools, whereas in others, the average baseline scores were higher in comparison schools. Because only one treatment school was in the 2012–13 cohort in District B, the *SDs* of average test scores for that school were not reported.

In District C, the absolute value of the difference between the average test scores in treatment schools and the average test scores in comparison schools ranged from 0.04 to 0.36 in mathematics and from 0.01 to 0.41 in reading (see Table F-4). In most years, cohorts, and subjects, the average baseline scores were lower in the treatment schools than in the comparison schools.

In District D, the absolute values of the differences between the average test scores in treatment schools and the average test scores in comparison schools were smaller than in other districts, ranging from 0.01 to 0.14 (see Table F-5). The baseline achievement of schools that received inexperienced principals in 2011–12 was lower in schools that received principals from one of the selected programs. The average difference in achievement between the treatment and comparison schools also was larger for the 2011–12 cohort than for the other cohorts. The baseline achievement of schools that received inexperienced principals in 2012–13 or 2013–14 was higher in schools that received principals from one of the selected programs, although the differences were small, in all but one case less than 0.05 *SD*.

Table F-2. Baseline Test Score Comparison (School-Level): District A

Year	Cohort = 2011–12				Cohort = 2012–13				Cohort = 2013–14			
	Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Comp.a	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.
2008–09	-0.184	0.29	-0.193	0.382	0.186	-0.140	0.187	-0.076	0.502	0.092	0.454	0.055
	(.154)	(.556)	(.138)	(.314)	(.016)	N/A	(.011)	N/A	(.068)	(.909)	(.007)	(.911)
2009–10	-0.278	0.339	-0.287	0.454	0.098	-0.179	0.13	-0.088	0.386	0.171	0.355	0.121
	(0.160)	(.559)	(.062)	(.343)	(.211)	N/A	(.072)	N/A	(.039)	(.687)	(.005)	(.871)
2010–11	-0.221	0.362	-0.141	0.46	0.057	-0.098	0.048	-0.032	0.373	0.155	0.410	0.116
	(.073)	(.468)	(.321)	(.279)	(.144)	N/A	(.003)	N/A	(.065)	(.589)	(.006)	(.760)
2011–12	Post				0.059	0.073	0.048	0.231	0.416	0.027	0.356	0.053
					(.312)	N/A	(.159)	N/A	(.040)	(.640)	(.128)	(.727)
2012–13					Post				0.342	0.026	0.276	0.065
									(.201)	(.734)	(.152)	(.709)
2013-14									Post			
2014-15												

Note. Scores were first averaged up to the school level within each year; a simple average across comparison and treatment schools was then calculated for each cohort and year. SDs are reported in parentheses. Comp. = comparison schools; Treat. = treatment schools; N/A indicates the SDs cannot be calculated (because the cell represents only one school).

Table F-3. Baseline Test Score Comparison (School Level): District B

Year	Cohort = 2012–13				Cohort = 2013–14				Cohort = 2014–15			
	Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.
2008–09	0.222	0.523	0.114	0.043	-0.388	-0.206	-0.370	-0.260	-0.231	-0.113	-0.295	-0.105
	(.099)	N/A	(.113)	N/A	(.147)	(.412)	(.173)	(.240)	(.177)	(.198)	(.079)	(.244)
2009–10	0.127	0.372	0.039	0.049	-0.215	-0.192	-0.369	-0.225	-0.143	-0.176	-0.244	-0.145
	(.063)	N/A	(.086)	N/A	(.179)	(.204)	(.195)	(.257)	(.114)	(.071)	(.162)	(.091)
2010–11	0.086	0.278	0.092	0.014	-0.212	-0.255	-0.396	-0.456	-0.017	-0.155	-0.218	-0.357
	(.078)	N/A	(.18)	N/A	(.187)	(.335)	(.116)	(.204)	(.065)	(.060)	(.179)	(.018)
2011–12	0.098	0.444	0.045	-0.137	-0.195	0.100	-0.359	-0.268	-0.167	-0.192	-0.224	-0.264
	(.153)	N/A	(.149)	N/A	(.146)	(.257)	(.122)	(.034)	(.069)	(.212)	(.185)	(.134)
2012–13	Post				-0.259	0.080	-0.414	-0.303	-0.215	-0.225	-0.235	-0.331
					(.180)	(.103)	(.173)	(.097)	(.133)	(.032)	(.162)	(.062)
2013–14					Post				-0.112	-0.154	-0.271	-0.247
									(.071)	(.310)	(.129)	(.158)
2014-15									Post			

Note. Scores were first averaged up to the school level within each year; a simple average across comparison and treatment schools was then calculated for each cohort and year. SDs are reported in parentheses.
Comp. = comparison schools; Treat. = treatment schools; N/A indicates the SDs cannot be calculated (because the cell represents only one school).

Table F-4. Baseline Test Score Comparison (School Level): District C

Year	Cohort = 2011–12				Cohort = 2012–13				Cohort = 2013–14				Cohort = 2014–15			
	Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.
2008–09	0.075	-0.226	-0.024	-0.227	0.280	-0.049	0.320	-0.055	0.079	0.034	0.050	0.081	-0.071	-0.277	-0.055	-0.122
	(.354)	(.200)	(.370)	(.122)	(.343)	(.441)	(.370)	(.524)	(.545)	(.252)	(.491)	(.236)	(.297)	(.196)	(.262)	(.103)
2009–10	-0.029	-0.225	-0.059	-0.237	0.228	-0.067	0.288	-0.043	0.075	-0.016	0.097	0.039	-0.081	-0.23	-0.018	-0.108
	(.209)	(.046)	(.294)	(.072)	(.429)	(.411)	(.342)	(.498)	(.539)	(.212)	(.435)	(.258)	(.253)	(.084)	(.192)	(.084)
2010–11	-0.009	-0.099	-0.033	-0.152	0.239	-0.055	0.319	-0.092	0.031	-0.048	0.050	0.037	-0.16	-0.211	-0.107	-0.154
	(.263)	(.136)	(.324)	(.120)	(.411)	(.344)	(.362)	(.386)	(.556)	(.250)	(.460)	(.306)	(.365)	(.134)	(.342)	(.066)
2011–12	Post				0.252	-0.111	0.296	-0.043	0.037	-0.134	0.040	0.002	-0.159	-0.054	-0.026	-0.118
					(.454)	(.313)	(.334)	(.336)	(.512)	(.222)	(.431)	(.295)	(.323)	(.188)	(.278)	(.167)
2012–13					Post				0.035	-0.075	0.024	-0.002	-0.104	-0.056	-0.055	-0.063
									(.533)	(.187)	(.443)	(.220)	(.273)	(.289)	(.296)	(.035)
2013–14									Post				-0.142	-0.178	-0.057	-0.127
													(.206)	(.137)	(.222)	(.090)
2014-15													Post			

Note. Scores were first averaged up to the school level within each year; a simple average across comparison and treatment schools was then calculated for each cohort and year. SDs are reported in parentheses.
Comp. = comparison schools; Treat. = treatment schools.

Table F-5. Baseline Test Score Comparison (School Level): District D

Year	Cohort = 2011–12				Cohort = 2012–13				Cohort = 2013–14			
	Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.	Comp.	Treat.
2008–09	0.057	-0.030	0.027	-0.084	-0.018	-0.001	-0.026	0.006	0.015	0.041	0.008	0.033
	(.527)	(.369)	(.402)	(.338)	(.380)	(.403)	(.364)	(.342)	(.650)	(.336)	(.529)	(.407)
2009–10	0.020	-0.073	0.008	-0.091	-0.022	-0.013	-0.049	-0.036	0.068	0.096	0.041	0.074
	(.544)	(0.390)	(.412)	(.335)	(.359)	(.453)	(.324)	(.301)	(.580)	(.382)	(.464)	(.364)
2010–11	-0.036	-0.180	-0.035	-0.173	-0.026	0.019	-0.047	-0.007	0.121	0.149	0.106	0.113
	(.555)	(.532)	(.416)	(.384)	(.417)	(.417)	(.405)	(.344)	(.567)	(.448)	(.508)	(.410)
2011–12	Post				-0.070	-0.050	-0.098	-0.059	0.047	0.080	0.113	0.135
					(.429)	(.431)	(.437)	(.361)	(.620)	(.412)	(.573)	(.412)
2012–13					Post				0.052	0.117	0.091	0.099
									(.602)	(.491)	(.621)	(.486)
2014-15									Post			

Note. Scores were first averaged up to the school level within each year; a simple average across comparison and treatment schools was then calculated for each cohort and year. SDs are reported in parentheses.

Comp. = comparison schools; Treat. = treatment schools.

Empirical Model—Variation in Effectiveness Among Principals

In addition to examining average effects, to explore heterogeneity in effectiveness among inexperienced principals (RQ3a), we also estimated a separate post effect for each inexperienced principal who started at a school during the 2011–12, 2012–13, 2013–14, or 2014–15 school years, as follows:

$$y_{igst} = \beta_0 + X1_{igst}\,\beta_1 + X2_{st}\,\beta_2 + \beta_3 * (cohort=1)_s + \ldots + \beta_6 * (cohort=4)_s + \beta_7 * (cohort=1)_s * (ever\ treated)_s + \ldots + \beta_{10} * (cohort=4)_s * (ever\ treated)_s + \beta_{11} * (cohort=1)_s * year_t + \ldots + \beta_{14} * (cohort=4)_s * year_t + \beta_{15} * (cohort=1)_s * (ever\ treated)_s * year_t + \ldots + \beta_{18} * (cohort=4)_s * (ever\ treated)_s * year_t + \gamma_g + \varphi_g * year_t + \mu_s + \theta_s * post_{st} + \delta_{st} + \varepsilon_{igst} \quad \text{(F-3)}$$

These mixed models were estimated separately by district and subject and assumed achievement y of student i in grade g in school s during year t as a function of individual student-level $(X1_{igst})$ and school-level $(X2_{st})$ covariates, which differ across districts depending on availability (see Table F-1). The models included grade-level fixed effects (γ_g) and grade-level trends $(\varphi_g * year_t)$ to account for the possibility that grade-specific levels and trends in student achievement among the schools included in the study differed from the overall levels and trends in student achievement within each grade in the district.

The models included cohort fixed effects and fixed trends (for the four cohorts defined previously) to account for the possibility that achievement levels and trends in schools experiencing principal turnover in any year between 2011–12 and 2014–15 might be different, on average, from levels and achievement trends of schools in a district experiencing principal turnover in other years. In addition, the models interacted these cohort fixed effects and trends with time-invariant binary variables (ever treated), indicating that the school received a principal from one of the selected programs. These interacted terms were included to allow for fixed differences in average levels and trends in student achievement between schools where principals from selected programs were placed and all other schools within each cohort. The models also allowed achievement at a school to shift up or down following the arrival of a new principal.

Finally, these models estimated a random effect (μ_s) for each school and a school-specific random coefficient (θ_s) on the *post* indictor—the binary variable that equals 1 during the years following the arrival of an inexperienced principal, which differs across cohorts, and 0 otherwise. The empirical Bayes estimates of these school-specific random coefficients on the *post* indicator represent our estimates of the contributions of individual inexperienced principals to student achievement. These estimates were assumed to be distributed with a mean of 0 and a variance of t ; for this research question, we were primarily interested in the variance of t. These school-specific random coefficients were estimates of the regression-adjusted change in average student achievement following the arrival of the new, inexperienced principal. The models also included school-by-year (δ_{st}) random effects to account for the covariance of test scores among students attending the same school during the same year.

Empirical Model—District E

The model describing the change in student achievement following the placement of each cohort of inexperienced principals in District E can be described as follows:

$$y_{igst} = \beta_0 + X1_{igst}\,\beta_1 + X2_{st}\,\beta_2 + \beta_3\,(year>2011)_t * (cohort=1)_s + \beta_4\,(year>2012)_t * (cohort=2)_s + \beta_5\,(year>2013)_t * (cohort=3)_s + \beta_6\,(year>2014)_t * (cohort=4)_s + \gamma_g + \varphi_g * year_t + u_s + \tau_s * year_t + \varepsilon_{igst} \quad \text{(F-4)}$$

The model was estimated separately by subject (reading/ELA and mathematics) and assumed achievement y of student i in grade g in school s during year t as a function of individual student-level ($X1_{igst}$) and time-varying ($X2_{st}$) school-level covariates. Table F-1 shows the specific covariates included for each district. The coefficient β_3 represents the average change in achievement in schools that received an inexperienced principal from one of the selected programs in 2011–12, following the arrival of that new principal; the coefficient β_4 represents the average change in achievement in schools that received an inexperienced principal from one of the selected programs in 2012–13, following the arrival of that new principal; and so on. The model included grade-level fixed effects (γ_g) and grade-level trends ($\varphi_g * year_t$) to allow for the possibility that grade-specific levels and trends in student achievement among District E where principals from one of the selected programs were placed differed from the overall levels and trends in student achievement within each grade in the district. In addition, the models included school fixed effects (u_s) to account for time-invariant differences in achievement between schools, and school-specific (fixed) linear time trends ($\tau_s * year_t$) to account for differential trends in achievement among schools. Standard errors are clustered within each school-by-year cell.

To obtain an estimate of the average change in student achievement at a school across all cohorts following the placement of an inexperienced principal from one of the selected programs in District E, we estimated a simpler version of the model that estimated an overall post effect across all cohorts of schools (Equation F-5).

$$y_{igst} = \beta_0 + X1_{igst}\,\beta_1 + X2_{st}\,\beta_2 + \beta_3 post_{st} + \gamma_g + \varphi_g * year_t + u_s + \tau_s * year_t + \varepsilon_{igst} \quad \text{(F-5)}$$

In this model, the post indicator equals 1 in years following the arrival of an inexperienced principal at the school and 0 otherwise. The other model parameters are the same as in Equation F-4, and the standard errors are clustered at the school-by-year level.

Empirical Model—All Principals

The exposure models, which were run separately by subject and district, can be represented as follows:

$$y_{igst} = \beta_0 + X1_{igst}\,\beta_1 + X2_{st}\,\beta_2 + \beta_3 * exposure1_{ist} + \beta_4 * exposure2_{igst} + \beta_5 * exposure3plus_{igst} + u_s + \gamma_g + \mu_i + \varepsilon_{ist} \quad \text{(F-8)}$$

Achievement y of student i in grade g in school s during year t was modeled as a function of time-varying student characteristics ($X1_{igst}$), the characteristics of students attending the same grade and school as the student ($X2_{st}$), and time-invariant average differences in student achievement between schools (u_s), grades (γ_g), and students (μ_i). Standard errors are clustered by school and year. The models were implemented in Stata using the *felsdvreg* (fixed effects, least-squares, dummy variable regression) command (Cornelissen, 2008).

The coefficients of interest are β_3, β_4, and β_5, which are the effect of having attended a school led by a treatment principal for one or more years, the additional effect of having attended a school led by a treatment principal for two or more years, and the additional effect of having attended a school led by a treatment principal for three or more years. We assumed that the effect of the treatment principal would be persistent. For example, if a student's achievement increased because of attending a school led by a treatment principal, then that increase in achievement would be permanent, even if the student did not attend a school led by a treatment principal in the subsequent year. Table F-6 is an example of how the *exposure* variables would be coded for a hypothetical student.

Table F-6. Coding of Exposure Variables for a Student Attending a School Led by a Principal From One of the Selected Programs During the 2008–09 Through 2014–15 School Years

	School Year					
	2008–09	2009–10	2010–11	2011–12	2013–14	2014–15
Current school led by treatment principal?	No	No	Yes	Yes	Yes	Yes
exposure1	0	0	1	1	1	1
exposure2	0	0	0	1	1	1
exposure3_plus	0	0	0	0	1	1

The tenure models, which were run separately by subject and district, can be represented as follows:

$$y_{igst} = \beta_0 + X1_{igst}\,\beta_1 + X2_{st}\,\beta_2 + \beta_3 * tenure1_{st} + \beta_4 * tenure2_{st} + \beta_5 * tenure\_miss_{st} + \beta_6 * treatment_{st} * tenure1_{st} + \beta_7 * treatment_{st} * tenure2_{st} + \beta_8 * treatment_{st} * tenure3_{st} + u_s + \gamma_g + \mu_i + \varepsilon_{ist} \quad \text{(F-9)}$$

Achievement y of student i in grade g in school s during year t was modeled as a function of time-varying student characteristics ($X1_{igst}$), the characteristics of students attending the same grade and school as the student ($X2_{st}$), and time-invariant average differences in student achievement between schools (u_s), grades (γ_g), and students (μ_i). Standard errors are clustered by school and year.

Student achievement was allowed to vary according to the number of years the principal had led the school. Specifically, we included binary variables for the principal's first year of tenure, the principal's second year tenure, and to indicate that principal tenure information was missing. Principals serving for three or more years at a school are the reference category.

We also interacted principal tenure indicators with a binary variable indicating that a principal was from one of the selected programs. Estimates of β_6 represent the contribution of treatment principals in their first year at a school to student achievement (relative to all other principals in their first year of tenure), estimates of β_7 represent the contribution of treatment principals in their second year at a school to student achievement (relative to all other principals in their second year of tenure), and estimates of β_8 represent the contribution of treatment principals with more than 2 years of tenure at a school to student achievement (relative to all other principals with more than 2 years of tenure). Because we were not missing tenure data for any principals from one of the selected programs, a term interacting $tenure\_miss_{st}$ and $treatment_{st}$ was not included in the model. Table F-7 presents two examples of how the tenure variables would be coded for a hypothetical student.

Table F-7. Coding of Tenure Variables for Two Hypothetical Students

	School Year					
	2008–09	2009–10	2010–11	2011–12	2013–14	2014–15
Example 1						
Current school led by treatment principal?	No	No	No	Yes	Yes	Yes
Year of principal tenure	6th	7th	8th	1st	2nd	3rd
tenure1	0	0	0	1	0	0
tenure2	0	0	0	0	1	0
*treatment * tenure1*	0	0	0	1	0	0
*treatment * tenure2*	0	0	0	0	1	0
*treatment * tenure3*	0	0	0	0	0	1
Example 2						
Current school led by treatment principal?	No	No	No	No	No	No
Year of principal tenure	1st	2nd	1st	2nd	3rd	4th
tenure1	1	0	1	0	0	0
tenure2	0	1	0	1	0	0
*treatment * tenure1*	0	0	0	0	0	0
*treatment * tenure2*	0	0	0	0	0	0
*treatment * tenure3*	0	0	0	0	0	0

Students and Schools Included in the Analysis of Inexperienced Principals

District A Demographics

Table G-1. Principal Experience in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District A

Year	Years of Experience as Principal							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2008–09	0	0	5	2	0	3	1	11
2009–10	3	0	0	4	1	2	1	11
2010–11	0	4	0	0	3	3	1	11
2011–12	4	0	4	0	0	3	0	11
2012–13	3	4	0	3	0	1	0	11
2013–14	4	3	4	0	0	0	0	11
2014–15	0	4	3	4	0	0	0	11

Table G-2. Number of Students With Mathematics or Reading Test Scores and Average Normalized Mathematics and Reading Test Scores in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District A

Year	Number of Students		Number of Mathematics Scores		Number of Reading Scores		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	3,506	0	3,504	0	3,490	0	0.151	N/A	0.147	N/A
2009–10	3,432	0	3,429	0	3,418	0	0.165	N/A	0.153	N/A
2010–11	3,538	0	3,538	0	3,519	0	0.165	N/A	0.168	N/A
2011–12	2,732	754	2,732	754	2,725	752	0.095	0.422	0.077	0.512
2012–13	2,294	1,053	2,294	1,053	2,287	1,051	0.044	0.375	0.055	0.405
2013–14	1,744	1,913	1,743	1,912	1,740	1,902	0.073	0.275	0.069	0.293
2014–15	1,551	1,947	1,551	1,947	1,551	1,947	0.060	0.323	0.047	0.355

Table G-3. Ethnicity of Students in Schools in Scores in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District A

Year	Percentage Asian American		Percentage African American		Percentage Hispanic		Percentage White		Percentage Other Ethnic Group	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	5.5%	N/A	34.2%	N/A	12.3%	N/A	41.1%	N/A	6.9%	N/A
2009–10	5.4%	N/A	33.9%	N/A	13.0%	N/A	41.6%	N/A	6.2%	N/A
2010–11	5.9%	N/A	33.6%	N/A	13.1%	N/A	42.4%	N/A	5.1%	N/A
2011–12	5.2%	11.9%	36.6%	17.1%	15.3%	7.4%	38.1%	60.3%	4.7%	3.2%
2012–13	3.7%	13.3%	33.7%	27.5%	17.4%	6.1%	40.5%	50.0%	4.6%	3.1%
2013–14	4.1%	11.6%	33.1%	30.2%	20.3%	8.8%	38.6%	46.5%	3.8%	2.9%
2014–15	4.4%	12.4%	32.9%	31.0%	23.2%	9.0%	36.9%	45.4%	2.6%	2.1%

Table G-4. Other Characteristics of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District A

Year	Percentage Female		Percentage ELL		Percentage SWD		Percentage Low Income	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	49.0%	N/A	9.4%	N/A	12.1%	N/A	Not Available	
2009–10	49.4%	N/A	11.0%	N/A	11.0%	N/A		
2010–11	48.5%	N/A	12.9%	N/A	10.1%	N/A		
2011–12	48.4%	49.7%	12.9%	8.9%	9.1%	7.2%		
2012–13	48.8%	48.1%	12.9%	6.1%	8.8%	5.3%		
2013–14	49.5%	49.1%	12.5%	7.0%	8.0%	6.5%		
2014–15	49.9%	49.1%	13.0%	7.1%	10.6%	8.8%		

Table G-5. Enrolled Grade of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District A

Year	Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	35.1%	N/A	32.9%	N/A	32.0%	N/A	Excluded		Excluded		Excluded	
2009–10	34.7%	N/A	32.5%	N/A	32.8%	N/A						
2010–11	34.1%	N/A	33.2%	N/A	32.8%	N/A						
2011–12	34.0%	33.8%	33.6%	34.6%	32.5%	31.6%						
2012–13	31.9%	32.1%	34.5%	34.8%	33.6%	33.1%						
2013–14	32.9%	35.8%	32.9%	32.0%	34.2%	32.2%						
2014–15	34.9%	33.4%	34.4%	34.9%	30.8%	31.7%						

District B Demographics

Table G-6. Number of Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District B

Year	Cohort 2012		Cohort 2013		Cohort 2014		Cohort 2015		Total Number of Schools	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	0	0	6	0	9	0	7	0	22	0
2009–10	0	0	6	0	9	0	7	0	22	0
2010–11	0	0	6	0	9	0	7	0	22	0
2011–12	0	0	6	0	9	0	7	0	22	0
2012–13	0	0	5	1	9	0	7	0	21	1
2013–14	0	0	5	1	7	2	7	0	19	3
2014–15	0	0	5	1	7	2	5	2	17	5

Table G-7. Principal Experience in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District B

Year	Years of Experience as Principal							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2008–09	3	4	7	0	2	5	1	22
2009–10	2	2	5	6	0	6	1	22
2010–11	3	3	1	4	5	6	0	22
2011–12	4	2	3	0	5	8	0	22
2012–13	7	2	1	3	0	7	2	22
2013–14	9	6	0	0	1	6	0	22
2014–15	7	9	6	0	0	0	0	22

Table G-8. Number of Students With Mathematics or Reading Test Scores and Average Normalized Mathematics and Reading Test Scores in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District B

Year	Number of Students		Number of Mathematics Scores		Number of Reading Scores		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	4,825	0	4,805	0	3,801	0	-0.135	N/A	-0.196	N/A
2009–10	4,876	0	4,861	0	3,218	0	-0.102	N/A	-0.219	N/A
2010–11	4,855	0	4,840	0	2,723	0	-0.083	N/A	-0.237	N/A
2011–12	4,878	0	4,810	0	2,732	0	-0.080	N/A	-0.223	N/A
2012–13	4,554	130	4,514	130	2,702	55	-0.162	-0.016	-0.263	-0.127
2013–14	4,210	523	4,171	521	2,398	302	-0.146	-0.202	-0.238	-0.359
2014–15	3,710	1,078	3,691	1,070	2,280	450	-0.145	-0.147	-0.244	-0.262

Table G-9. Ethnicity of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District B

Year	Percentage Asian American		Percentage African American		Percentage Hispanic		Percentage White		Percentage Other Ethnic Group	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	0.8%	N/A	27.8%	N/A	69.5%	N/A	0.6%	N/A	1.3%	N/A
2009–10	0.5%	N/A	27.0%	N/A	70.4%	N/A	0.6%	N/A	1.5%	N/A
2010–11	0.4%	N/A	25.8%	N/A	71.8%	N/A	0.6%	N/A	1.4%	N/A
2011–12	0.9%	N/A	26.2%	N/A	71.4%	N/A	0.6%	N/A	0.9%	N/A
2012–13	1.0%	0.0%	26.0%	10.0%	71.9%	84.6%	0.5%	3.1%	0.6%	2.3%
2013–14	0.9%	0.2%	25.2%	31.7%	72.6%	64.1%	0.6%	2.7%	0.7%	1.3%
2014–15	1.0%	0.2%	28.9%	19.1%	68.2%	78.6%	1.1%	1.6%	0.8%	0.6%

Table G-10. Other Characteristics of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District B

Year	Percentage Female		Percentage ELL		Percentage SWD		Percentage Low Income[a]		Percentage Income Status Missing	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	Not Available		43.9%	N/A	9.1%	N/A	94.6%	N/A	0.0%	N/A
2009–10			47.1%	N/A	7.5%	N/A	96.0%	N/A	0.0%	N/A
2010–11			54.2%	N/A	4.4%	N/A	96.9%	N/A	0.0%	N/A
2011–12			54.6%	N/A	4.6%	N/A	97.2%	N/A	2.2%	N/A
2012–13			55.3%	64.6%	3.9%	8.5%	97.4%	98.5%	1.7%	1.5%
2013–14			55.5%	47.6%	3.7%	5.9%	96.6%	96.0%	2.1%	1.3%
2014–15			51.3%	63.5%	3.9%	5.2%	95.6%	95.4%	3.3%	3.4%

a Eligible for free or reduced-price meals. Students with missing information were coded as being not from low-income families.

Table G-11. Enrolled Grade of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District B

Year	Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	37.5%	N/A	31.5%	N/A	31.0%	N/A	Excluded		Excluded		Excluded	
2009–10	35.5%	N/A	33.7%	N/A	30.8%	N/A						
2010–11	33.7%	N/A	34.2%	N/A	32.2%	N/A						
2011–12	33.9%	N/A	32.2%	N/A	33.9%	N/A						
2012–13	34.7%	39.2%	33.5%	30.0%	31.8%	30.8%						
2013–14	35.0%	27.2%	33.1%	36.1%	31.9%	36.7%						
2014–15	34.7%	35.7%	33.6%	32.6%	31.8%	31.7%						

District C Demographics

Table G-12. Number of Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District C

Year	Cohort 2012		Cohort 2013		Cohort 2014		Cohort 2015		Schools	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	8	0	11	0	13	0	9	0	41	0
2009–10	8	0	11	0	13	0	9	0	41	0
2010–11	8	0	11	0	13	0	9	0	41	0
2011–12	5	3	11	0	13	0	9	0	38	3
2012–13	5	3	7	4	13	0	9	0	34	7
2013–14	5	3	7	4	9	4	9	0	30	11
2014–15	5	3	7	4	9	4	7	2	28	13

Table G-13. Principal Experience in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District C

Year	Years of Experience as Principal							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2008–09	3	4	5	2	8	19	0	41
2009–10	3	3	4	4	2	24	1	41
2010–11	2	4	3	3	3	24	2	41
2011–12	12	2	3	2	1	20	1	41
2012–13	12	12	2	3	1	11	0	41
2013–14	13	11	10	1	1	5	0	41
2014–15	9	13	11	8	0	0	0	41

Table G-14. Number of Students With Mathematics or Reading Test Scores and Average Normalized Mathematics and Reading Test Scores in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District C

Year	Number of Students		Number of Mathematics Scores		Number of Reading Scores		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	9,072	N/A	9,040	N/A	8,828	N/A	0.085	N/A	0.087	N/A
2009–10	9,444	N/A	9,418	N/A	9,242	N/A	0.055	N/A	0.081	N/A
2010–11	9,572	N/A	9,533	N/A	9,389	N/A	0.046	N/A	0.076	N/A
2011–12	9,051	640	9,023	637	8,854	635	0.046	-0.134	0.091	-0.094
2012–13	8,193	1,412	8,173	1,409	8,046	1,337	0.045	-0.076	0.081	-0.024
2013–14	7,486	2,230	7,461	2,227	7,310	2,096	0.042	-0.051	0.088	-0.009
2014–15	6,907	2,676	6,829	2,656	6,672	2,497	0.020	-0.035	0.039	-0.018

Table G-15. Ethnicity of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District C

Year	Percentage Asian American		Percentage African American		Percentage Hispanic		Percentage White		Percentage Other Ethnic Group	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	3.9%	N/A	14.3%	N/A	54.6%	N/A	20.6%	N/A	6.5%	N/A
2009–10	3.6%	N/A	13.2%	N/A	52.4%	N/A	21.4%	N/A	9.5%	N/A
2010–11	3.6%	N/A	13.0%	N/A	52.6%	N/A	21.0%	N/A	9.8%	N/A
2011–12	3.4%	3.4%	13.5%	2.3%	51.9%	79.5%	23.0%	8.3%	8.2%	6.4%
2012–13	3.2%	2.8%	14.4%	4.5%	52.1%	71.0%	23.3%	14.9%	6.9%	6.9%
2013–14	3.1%	2.5%	15.0%	5.7%	51.8%	67.7%	23.9%	18.0%	6.3%	6.1%
2014–15	2.8%	2.8%	15.1%	9.2%	51.4%	66.3%	25.5%	16.5%	5.1%	5.2%

Table G-16. Other Characteristics of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District C

Year	Percentage Female		Percentage ELL		Percentage SWD		Percentage Low Income[a]	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	Not Available		28.5%	N/A	14.8%	N/A	70.8%	N/A
2009–10			32.4%	N/A	12.4%	N/A	65.5%	N/A
2010–11			32.5%	N/A	12.3%	N/A	71.3%	N/A
2011–12			33.5%	38.9%	12.3%	14.8%	70.8%	90.6%
2012–13			34.2%	44.8%	11.9%	13.2%	71.3%	83.4%
2013–14			32.9%	38.3%	11.6%	12.0%	72.7%	79.1%
2014–15			29.0%	34.4%	11.6%	12.2%	72.1%	78.1%

a Eligible for free or reduced-price meals. Students with missing information were coded as being not from low-income families.

Table G-17. Enrolled Grade of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District C

Year	Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	24.8%	N/A	21.7%	N/A	22.0%	N/A	11.4%	N/A	10.2%	N/A	9.9%	N/A
2009–10	24.5%	N/A	23.4%	N/A	20.5%	N/A	12.4%	N/A	9.8%	N/A	9.5%	N/A
2010–11	23.8%	N/A	23.4%	N/A	22.3%	N/A	10.4%	N/A	10.7%	N/A	9.5%	N/A
2011–12	24.0%	17.3%	23.6%	17.0%	22.4%	13.4%	10.2%	17.5%	9.5%	15.8%	10.3%	18.9%
2012–13	23.4%	25.3%	23.3%	23.9%	22.5%	24.7%	10.6%	10.8%	10.0%	8.5%	10.1%	6.8%
2013–14	23.9%	29.1%	22.5%	25.0%	21.4%	26.2%	10.4%	8.9%	10.6%	5.7%	11.2%	5.1%
2014–15	23.0%	28.1%	23.0%	28.6%	21.8%	26.2%	11.3%	6.9%	10.1%	5.8%	10.8%	4.3%

District D Demographics

Table G-18. Number of Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District D

Year	Cohort 2012		Cohort 2013		Cohort 2014		Cohort 2015		Total Number of Schools	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	27	0	30	0	18	0	Not Available		75	0
2009–10	27	0	30	0	18	0			75	0
2010–11	27	0	30	0	18	0			75	0
2011–12	21	6	30	0	18	0			69	6
2012–13	21	6	23	7	18	0			62	13
2013–14	21	6	23	7	10	8			54	21
2014–15	21	6	23	7	10	8			54	21

Table G-19. Principal Experience in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District D

Year	Years of Experience as Principal						Total Number of Schools
	1	2	3	4	5	6 or More	
2008–09	6	9	4	9	8	39	75
2009–10	4	6	8	4	7	46	75
2010–11	2	4	6	8	3	52	75
2011–12	28	1	1	4	5	36	75
2012–13	32	27	1	1	2	12	75
2013–14	18	30	27	0	0	0	75
2014–15	0	18	30	27	0	0	75

Table G-20. Number of Students With Mathematics or ELA Test Scores and Average Normalized Mathematics and ELA Test Scores in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District D

Year	Number of Students		Number of Mathematics Scores		Number of ELA Scores		Average Normalized Mathematics Score		Average Normalized ELA Score	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	27,245	N/A	27,054	N/A	26,450	N/A	0.049	N/A	0.011	N/A
2009–10	28,448	N/A	28,345	N/A	27,584	N/A	0.031	N/A	0.000	N/A
2010–11	28,633	N/A	28,479	N/A	27,853	N/A	0.034	N/A	0.003	N/A
2011–12	26,012	2,239	25,895	2,227	25,513	2,171	0.021	-0.209	0.002	-0.239
2012–13	23,881	4,399	23,828	4,394	23,349	4,288	-0.004	-0.097	0.004	-0.102
2013–14	21,853	6,202	21,148	6,161	21,442	6,044	-0.012	0.011	-0.018	-0.013
2014–15	21,447	6,156	20,966	6,138	20,943	5,990	-0.007	-0.010	-0.020	-0.050

Table G-21. Ethnicity of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From Selected Programs for District D

Year	Percentage Asian American		Percentage African American		Percentage Hispanic		Percentage White		Percentage Other Ethnic Group		Percentage Ethnicity Missing	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	16.1%	N/A	27.5%	N/A	39.4%	N/A	14.2%	N/A	0.3%	N/A	2.5%	N/A
2009–10	16.3%	N/A	26.6%	N/A	38.7%	N/A	14.3%	N/A	0.3%	N/A	3.8%	N/A
2010–11	15.9%	N/A	25.5%	N/A	39.1%	N/A	14.3%	N/A	0.3%	N/A	4.8%	N/A
2011–12	15.6%	19.5%	23.0%	38.4%	40.2%	36.7%	15.4%	1.6%	0.4%	0.3%	5.4%	3.6%
2012–13	15.7%	20.3%	22.2%	29.1%	40.2%	40.2%	16.5%	5.6%	0.6%	0.3%	4.8%	4.4%
2013–14	15.7%	24.3%	21.8%	23.9%	41.1%	37.9%	16.7%	9.9%	1.0%	0.7%	3.8%	3.4%
2014–15	16.1%	26.3%	21.2%	21.8%	42.0%	38.8%	16.8%	9.9%	1.3%	1.1%	2.6%	2.1%

Table G-22. Other Characteristics of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District D

Year	Percentage Female		Percentage Gender Missing		Percentage ELL		Percentage SWD		Percentage Low Income[a]	
	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program
2008–09	48.9%	N/A	0.1%	N/A	15.3%	N/A	9.4%	N/A	63.5%	N/A
2009–10	48.6%	N/A	0.2%	N/A	14.9%	N/A	17.8%	N/A	85.3%	N/A
2010–11	48.9%	N/A	0.2%	N/A	15.8%	N/A	17.8%	N/A	86.0%	N/A
2011–12	49.0%	48.0%	0.2%	0.1%	14.2%	22.8%	18.8%	17.0%	83.9%	98.5%
2012–13	49.2%	47.9%	0.2%	0.1%	13.7%	17.8%	17.7%	16.8%	77.1%	84.1%
2013–14	49.3%	48.2%	0.2%	0.0%	11.2%	13.6%	21.0%	19.1%	76.4%	77.7%

a Eligible for free or reduced-price meals. Students with missing information were coded as being not from low-income families.

Table G-23. Enrolled Grade of Students in Schools in the Analysis of the Relative Impact of Inexperienced Principals From One of the Selected Programs for District D

Year	Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
	Other	Selected Program	Other	Selected Program	Selected Program	Other	Selected Program	Other	Selected Program	Other	Selected Program	Other
2008–09	17.7%	N/A	18.0%	N/A	18.0%	N/A	16.6%	N/A	15.6%	N/A	14.0%	N/A
2009–10	17.3%	N/A	18.1%	N/A	17.5%	N/A	15.6%	N/A	16.0%	N/A	15.5%	N/A
2010–11	17.0%	N/A	18.2%	N/A	17.7%	N/A	15.5%	N/A	15.5%	N/A	16.1%	N/A
2011–12	16.2%	30.6%	16.5%	31.4%	17.0%	30.0%	16.7%	2.7%	16.4%	2.8%	17.1%	2.5%
2012–13	15.9%	29.5%	16.5%	27.3%	15.3%	27.0%	17.5%	4.7%	17.6%	5.5%	17.3%	6.0%
2013–14	15.3%	25.0%	16.0%	28.9%	15.2%	26.3%	17.4%	5.9%	18.0%	6.5%	18.1%	7.4%
2014–15	15.5%	23.4%	15.7%	29.2%	15.4%	28.6%	17.1%	6.3%	17.9%	6.0%	18.4%	6.5%

Results—Changes in Student Achievement in District E

Demographics in District E

Only schools that received a principal from one of the selected programs were included in our analysis of District E. More than 5,000 students in Grades 3–8 with reading or mathematics scores were enrolled in these schools each year between 2008–09 and 2013–14, but the total number of students fell to about 4,800 in 2014–15 (Table G-24). Student test scores in these schools were very close to the district average from 2008–09 to 2012–13. In 2013–14, the average student test scores in these schools was about 0.02 SD below the district average in reading and about 0.06 SD below the district average in mathematics. In 2014–15, the average student test scores in these schools was about 0.20 SD below the district average in reading and about 0.23 SD below the district average in mathematics (Table G-24).

Table G-24. Number of Students With Mathematics or Reading Test Scores and Average Normalized Mathematics and Reading Test Scores in Schools in the District E Analysis

Year	Number of Students	Number of Mathematics Scores	Number of Reading Scores	Average Normalized Mathematics Score	Average Normalized Reading Score
2008–09	5,752	5,731	5,709	0.014	0.011
2009–10	5,659	5,653	5,619	-0.032	0.002
2010–11	5,470	5,462	5,454	-0.022	0.001
2011–12	5,437	5,431	5,414	0.008	0.007
2012–13	5,320	5,307	5,303	0.004	0.016
2013–14	5,092	5,081	5,042	-0.019	-0.064
2014–15	4,814	4,772	4,721	-0.195	-0.227

On average between 2008–09 and 2014–15, among students in District E schools where a principal from one of the selected programs was placed in 2011–12, 2012–13, 2013–14, or 2014–15, 45% of the students were Hispanic, 37% were African American, 11% were White, and 2% were Asian American (Table G-25). On average between 2008–09 and 2013–14, 12% of the students in these schools were ELLs, 13% were SWDs, and 76% were from low-income families (Table G-25). In 2014–15, almost 15% of the students were ELLs, 15% were SWDs, and nearly 84% were from low-income families. The increase in the share of students who were ELLs, SWDs, or from low-income families might explain some of the decrease in average test scores in these schools in 2014–15. On average between 2008–09 and 2014–15, among students in District E schools where a principal from one of the selected programs was placed in 2011–12, 2012–13, 2013–14, or 2014–15, 56% of the students were in Grades 3–5, 16% were in Grade 6, and 28% were in Grades 7 and 8 (Table G-26).

Table G-25. Characteristics of Students in Schools in the District E Analysis

Year	Percentage Asian American	Percentage African American	Percentage Hispanic	Percentage White	Percentage Other Ethnic Group	Percentage Ethnicity Missing	Percentage ELL	Percentage SWD	Percentage Low Income
2008–09	1.9%	38.1%	44.9%	10.9%	0.2%	4.0%	11.3%	13.0%	75.4%
2009–10	1.8%	37.1%	45.3%	10.5%	0.2%	5.1%	10.8%	13.1%	78.3%
2010–11	1.9%	36.3%	45.4%	10.7%	0.5%	5.2%	12.7%	13.1%	74.8%
2011–12	2.0%	36.2%	45.4%	11.2%	0.9%	4.3%	13.0%	13.5%	76.0%
2012–13	2.3%	36.2%	45.8%	11.4%	1.0%	3.3%	12.9%	13.7%	75.1%
2013–14	2.4%	37.8%	44.6%	11.5%	1.1%	2.6%	12.5%	14.2%	75.0%
2014–15	2.6%	37.8%	46.6%	10.7%	0.0%	2.3%	14.6%	15.1%	83.5%

Table G-26. Enrolled Grade of Students in Schools in the District E Analysis

Year	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
2008–09	18.7%	17.5%	17.6%	16.7%	14.2%	15.3%
2009–10	20.1%	17.8%	17.6%	16.4%	14.0%	14.0%
2010–11	19.3%	18.4%	17.8%	16.2%	14.1%	14.1%
2011–12	20.0%	18.3%	17.9%	15.9%	14.2%	13.8%
2012–13	18.9%	18.7%	18.0%	15.8%	14.5%	14.2%
2013–14	19.5%	18.6%	18.5%	15.8%	14.1%	13.5%
2014–15	20.3%	18.4%	18.0%	17.7%	13.5%	12.0%

All Principals Model Results

Students and Schools Included in the Analysis of All Principals

Table G-27. Years of Experience Among Principals Who Were Not Trained by One of the Selected Programs in the Analysis of All Principals for District A

Year	Years of Experience as Principal—Comparison Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	20	14	16	18	15	43	15	141
2010–11	14	22	11	13	15	51	13	139
2011–12	9	13	17	12	13	52	8	124
2012–13	14	8	14	14	13	52	8	123
2013–14	18	14	8	10	12	56	4	122
2014–15	23	16	12	9	9	52	2	123

Table G-28. Years of Experience Among Principals Who Were Trained by One of the Selected Programs in the Analysis of All Principals for District A

Year	Years of Experience as Principal—Treatment Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	0	0	0	0	0	0	0	0
2010–11	2	0	0	0	0	0	0	2
2011–12	5	3	0	0	0	0	0	8
2012–13	1	5	3	0	0	0	0	9
2013–14	2	1	5	3	0	0	0	11
2014–15	1	2	1	5	2	0	0	11

Table G-29. Students' Cumulative Number of Years Attending a School Led by a Principal Trained by One of the Selected Programs in the Analysis of All Principals for District A

Year	Number of Years of Exposure					Total Number of Students
	0	1	2	3	4	
2009–10	56,094	0	0	0	0	56,094
2010–11	56,900	422	0	0	0	57,322
2011–12	54,302	2,320	221	0	0	56,843
2012–13	51,335	2,061	1,329	93	0	54,818
2013–14	54,275	3,307	1,448	629	1	59,659
2014–15	53,544	4,814	1,982	894	79	61,234

Table G-30. Number of Students With Mathematics or Reading Test Scores and Average Normalized Mathematics and Reading Test Scores Among Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District A

Year	Number of Mathematics Scores		Number of Reading Scores		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	56,004	0	55,676	0	0.046	N/A	0.039	N/A
2010–11	56,813	420	56,417	417	0.052	-0.370	0.040	-0.391
2011–12	54,209	2,539	53,937	2,524	0.040	-0.146	0.035	-0.128
2012–13	51,225	3,481	51,008	3,462	0.036	-0.104	0.032	-0.088
2013–14	54,197	5,379	54,011	5,348	0.051	-0.075	0.042	-0.059
2014–15	53,512	7,766	53,506	7,766	0.034	0.055	0.025	0.071

Table G-31. Ethnicity of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District A

Year	Percentage Asian American		Percentage African American		Percentage Hispanic		Percentage White		Percentage Other Ethnic Group	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	4.4%	N/A	39.8%	N/A	15.8%	N/A	34.5%	N/A	5.5%	N/A
2010–11	4.6%	5.0%	39.8%	47.4%	16.4%	29.6%	33.9%	11.1%	5.2%	6.9%
2011–12	4.9%	6.0%	39.4%	38.4%	17.3%	24.8%	33.4%	25.9%	5.0%	4.8%
2012–13	4.8%	6.9%	38.8%	39.6%	18.3%	23.5%	33.3%	25.4%	4.9%	4.6%
2013–14	5.2%	7.5%	39.2%	38.9%	19.1%	23.0%	32.5%	27.1%	4.0%	3.6%
2014–15	5.3%	7.7%	39.6%	34.6%	21.3%	20.1%	30.6%	34.7%	3.2%	3.0%

Table G-32. Other Characteristics of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District A

Year	Percentage Female		Percentage ELL		Percentage SWD		Percentage Low Income	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	50.1%	N/A	13.7%	N/A	10.3%	N/A	Not Available	
2010–11	50.0%	46.2%	14.5%	28.4%	9.5%	9.7%		
2011–12	50.2%	49.2%	13.9%	22.2%	9.0%	7.8%		
2012–13	50.2%	48.3%	12.6%	17.5%	8.6%	7.1%		
2013–14	50.1%	49.0%	12.2%	15.2%	8.7%	7.1%		
2014–15	49.3%	48.8%	12.7%	12.1%	10.1%	8.8%		

Table G-33. Enrolled Grade of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District A

Year	Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	18.4%	N/A	17.7%	N/A	16.9%	N/A	16.0%	N/A	15.6%	N/A	15.4%	N/A
2010–11	18.0%	32.5%	17.5%	34.1%	17.0%	33.4%	16.0%	0.0%	15.9%	0.0%	15.5%	0.0%
2011–12	17.3%	31.4%	16.8%	32.6%	16.4%	31.4%	16.9%	4.5%	16.3%	0.0%	16.3%	0.0%
2012–13	15.8%	22.2%	17.1%	27.4%	16.6%	27.0%	16.3%	20.2%	17.3%	3.2%	16.9%	0.0%
2013–14	17.1%	24.1%	15.8%	21.9%	16.4%	24.0%	16.4%	15.9%	16.9%	12.2%	17.4%	1.8%
2014–15	18.1%	16.1%	16.6%	22.1%	15.2%	20.7%	16.1%	17.1%	16.5%	13.1%	17.4%	10.9%

Table G-34. Years of Experience Among Principals Who Were Trained by One of the Selected Programs in the Analysis of All Principals for District B

Year	Years of Experience as Principal—Treatment Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	0	0	0	0	0	0	0	0
2010–11	0	0	0	0	0	0	0	0
2011-12	0	0	0	0	0	0	0	0
2012–13	2	0	0	0	0	0	0	2
2013–14	2	2	0	0	0	0	0	4
2014–15	2	2	1	0	0	0	0	5

Table G-35. Years of Experience Among Principals Who Were Not Trained by One of the Selected Programs in the Analysis of All Principals for District B

Year	Years of Experience as Principal—Comparison Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	25	18	27	35	1	87	8	201
2010–11	34	18	15	24	27	74	13	205
2011–12	40	21	17	13	23	79	14	207
2012–13	37	24	18	16	8	86	18	207
2013–14	55	17	19	14	10	75	15	205
2014–15	47	38	15	16	11	62	20	209

Table G-36. Students' Cumulative Number of Years Attending a School Led by a Principal Trained by One of the Selected Programs in the Analysis of All Principals for District B

Year	Number of Years of Exposure				Total Number of Students
	0	1	2	3	
2009–10	53,973	0	0	0	53,973
2010–11	54,638	0	0	0	54,638
2011–12	54,967	0	0	0	54,967
2012–13	54,851	257	0	0	55,108
2013–14	54,656	629	127	0	55,412
2014–15	54,363	1,148	323	17	55,851

Table G-37. Number of Students With Mathematics or Reading Test Scores and Average Normalized Mathematics and Reading Test Scores Among Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District B

Year	Number of Mathematics Scores		Number of Reading Scores		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	53,708	0	43,643	0	0.001	N/A	0.000	N/A
2010–11	54,446	0	41,040	0	0.000	N/A	0.000	N/A
2011–12	54,156	0	41,373	0	0.001	N/A	-0.001	N/A
2012–13	54,119	257	41,583	175	-0.001	0.173	-0.001	0.113
2013–14	53,876	754	40,746	505	0.002	-0.092	0.002	-0.110
2014–15	53,629	1,479	40,490	831	0.003	-0.102	0.037	-0.109

Table G-38. Ethnicity of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District B

Year	Percentage Asian American		Percentage African American		Percentage Hispanic		Percentage White		Percentage Other Ethnic Group	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	0.7%	N/A	24.9%	N/A	68.5%	N/A	4.1%	N/A	1.9%	N/A
2010–11	0.6%	N/A	23.7%	N/A	70.0%	N/A	3.8%	N/A	1.8%	N/A
2011–12	1.1%	N/A	23.1%	N/A	70.3%	N/A	3.9%	N/A	1.7%	N/A
2012–13	1.0%	0.0%	22.4%	7.8%	71.1%	77.0%	4.0%	13.2%	1.4%	1.9%
2013–14	1.1%	0.4%	22.4%	24.5%	71.2%	66.8%	4.2%	7.0%	1.2%	1.3%
2014–15	1.2%	0.2%	22.4%	19.6%	71.0%	75.8%	4.4%	3.6%	1.0%	0.7%

Table G-39. Other Characteristics of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District B

Year	Percentage Female		Percentage ELL		Percentage SWD		Percentage Low Income		Percentage Income Status Missing	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	Not Available		36.6%	N/A	8.6%	N/A	90.9%	N/A	0.0%	N/A
2010–11			42.0%	N/A	4.9%	N/A	91.6%	N/A	0.0%	N/A
2011–12			45.7%	N/A	4.3%	N/A	92.0%	N/A	7.1%	N/A
2012–13			47.4%	45.1%	3.7%	7.4%	91.9%	83.3%	6.9%	15.6%
2013–14			48.3%	43.9%	3.4%	6.0%	91.0%	90.7%	6.1%	5.6%
2014–15			49.8%	57.3%	4.0%	5.0%	87.7%	93.2%	9.9%	4.8%

Table G-40. Enrolled Grade of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District B

Year	Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	23.3%	N/A	21.4%	N/A	19.7%	N/A	18.1%	N/A	17.5%	N/A	N/A	N/A
2010–11	22.4%	N/A	22.0%	N/A	20.6%	N/A	17.5%	N/A	17.5%	N/A	N/A	N/A
2011–12	21.7%	N/A	21.4%	N/A	21.4%	N/A	18.3%	N/A	17.2%	N/A	N/A	N/A
2012–13	21.6%	38.5%	20.9%	33.5%	20.1%	28.0%	19.5%	0.0%	17.9%	0.0%	N/A	N/A
2013–14	22.1%	25.5%	21.0%	33.9%	20.0%	33.3%	18.1%	7.3%	18.8%	0.0%	N/A	N/A
2014–15	22.3%	26.1%	21.3%	28.1%	20.1%	28.9%	18.2%	13.6%	18.1%	3.4%	N/A	N/A

Table G-41. Years of Experience Among Principals Who Were Not Trained by One of the Selected Programs in the Analysis of All Principals for District C

Year	Years of Experience as Principal—Comparison Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	6	9	13	9	5	47	6	95
2010–11	9	9	9	9	7	44	6	93
2011–12	15	8	5	8	6	41	14	97
2012–13	14	16	5	6	6	31	13	91
2013–14	13	14	13	3	5	30	12	90
2014–15	14	15	11	10	3	27	15	95

Table G-42. Years of Experience Among Principals Who Were Trained by One of the Selected Programs in the Analysis of All Principals for District C

Year	Years of Experience as Principal—Treatment Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	5	2	2	2	0	0	0	11
2010–11	3	5	2	2	2	0	0	14
2011–12	3	3	3	2	2	2	0	15
2012–13	5	4	5	3	2	4	0	23
2013–14	4	5	4	5	2	5	0	25
2014–15	4	5	5	4	5	3	0	26

Table G-43. Students' Cumulative Number of Years Attending a School Led by a Principal Trained by One of the Selected Programs in the Analysis of All Principals for District C

Year	Number of Years of Exposure							Total Number of Students
	0	1	2	3	4	5	6	
2009–10	26,365	1,981	657	0	0	0	0	29,003
2010–11	25,672	2,207	1,150	314	0	0	0	29,343
2011–12	25,299	2,452	1,356	702	47	0	0	29,809
2012–13	23,266	3,822	1,660	1,001	111	26	0	29,749
2013–14	22,751	3,759	2,350	1,281	150	54	1	30,141
2014–15	21,999	3,913	2,317	1,760	114	48	0	29,989

Table G-44. Number of Students With Mathematics or Reading Test Scores and Average Normalized Mathematics and Reading Test Scores Among Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District C

Year	Number of Mathematics Scores		Number of Reading Scores		Average Normalized Mathematics Score		Average Normalized Reading Score	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	25,423	3,474	24,896	3,270	-0.005	-0.009	-0.023	0.001
2010–11	24,603	4,622	24,181	4,403	-0.010	-0.027	-0.022	-0.009
2011–12	23,824	5,911	23,384	5,676	0.003	-0.017	-0.020	-0.048
2012–13	22,485	7,283	22,080	6,991	0.025	-0.069	0.001	-0.104
2013–14	22,313	7,922	21,713	7,617	0.034	-0.064	0.010	-0.091
2014–15	21,624	8,006	21,223	7,795	0.025	-0.169	0.025	-0.154

Table G-45. Ethnicity of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District C

Year	Percentage Asian American		Percentage African American		Percentage Hispanic		Percentage White		Percentage Other Ethnic Group	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	3.5%	2.0%	13.9%	11.2%	54.3%	61.8%	19.5%	17.1%	8.7%	7.9%
2010–11	3.7%	2.0%	13.6%	10.5%	54.3%	63.0%	19.1%	16.9%	9.4%	7.6%
2011–12	3.7%	2.2%	13.7%	9.4%	54.2%	65.1%	20.3%	17.0%	8.1%	6.5%
2012–13	3.8%	2.0%	13.8%	9.5%	52.8%	66.9%	22.6%	16.0%	7.1%	5.6%
2013–14	3.8%	2.1%	13.5%	9.6%	52.3%	65.9%	24.0%	17.1%	6.4%	5.3%
2014–15	3.7%	2.1%	13.7%	10.3%	51.3%	68.5%	25.8%	14.7%	5.5%	4.4%

Table G-46. Other Characteristics of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District C

Year	Percentage Female		Percentage ELL		Percentage SWD		Percentage Low Income	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	Not Available		31.4%	38.9%	12.4%	12.0%	63.5%	69.5%
2010–11			32.1%	38.4%	11.9%	12.2%	71.5%	74.6%
2011–12			33.6%	40.1%	12.4%	12.5%	72.1%	76.3%
2012–13			33.5%	42.2%	12.0%	12.7%	71.4%	79.3%
2013–14			33.6%	40.2%	11.4%	12.5%	68.7%	79.0%
2014–15			30.3%	37.1%	11.8%	13.1%	68.8%	81.1%

Table G-47. Enrolled Grade of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District C

Year	Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	18.7%	30.2%	17.7%	25.6%	17.1%	19.7%	15.6%	11.4%	15.3%	6.9%	15.7%	6.2%
2010–11	18.3%	28.6%	18.2%	25.1%	17.4%	20.5%	14.5%	12.3%	15.9%	8.5%	15.6%	5.0%
2011–12	18.7%	26.7%	18.3%	23.9%	18.0%	19.4%	14.2%	12.0%	14.7%	10.5%	16.1%	7.6%
2012–13	19.3%	23.6%	18.6%	23.5%	17.7%	21.3%	14.2%	12.5%	14.7%	9.9%	15.5%	9.2%
2013–14	21.0%	21.0%	19.2%	22.8%	17.7%	22.3%	13.0%	13.9%	14.3%	11.5%	14.8%	8.5%
2014–15	21.2%	18.8%	20.5%	21.4%	18.3%	22.4%	13.2%	14.9%	12.8%	12.0%	14.0%	10.5%

Table G-48. Years of Experience Among Principals Who Were Not Trained by One of the Selected Programs in the Analysis of All Principals for District D

Year	Years of Experience as Principal—Comparison Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	60	68	83	95	100	538	112	1,056
2010–11	73	63	73	82	84	564	132	1,071
2011–12	96	69	59	67	72	582	138	1,083
2012–13	101	100	70	59	54	583	160	1,127
2013–14	110	98	96	68	50	572	173	1,167
2014–15	Data Not Available							

Table G-49. Years of Experience Among Principals Who Were Trained by One of the Selected Programs in the Analysis of All Principals for District D

Year	Years of Experience as Principal—Treatment Principals							Total Number of Schools
	1	2	3	4	5	6 or More	Missing	
2009–10	27	31	21	38	35	28	0	180
2010–11	22	29	32	21	31	56	0	191
2011–12	13	19	33	29	18	80	0	192
2012–13	17	14	19	29	23	86	0	188
2013–14	14	16	13	16	25	99	0	183
2014-15	Data Not Available							

Table G-50. Students' Cumulative Number of Years Attending a School Led by a Principal Trained by One of the Selected Programs in the Analysis of All Principals for District D

Year	Number of Years of Exposure							Total Number of Students
	0	1	2	3	4	5	6	
2009–10	373,105	35,431	31,929	0	0	0	0	440,465
2010–11	365,571	37,343	25,144	15,888	0	0	0	443,946
2011–12	362,481	37,729	25,447	17,599	4,513	0	0	447,769
2012–13	363,329	34,524	26,635	20,275	3,489	2,110	0	450,362
2013–14	368,672	32,453	23,888	23,239	3,554	1,364	868	454,038
2014–15	Data Not Available							

Table G-51. Number of Students With Mathematics or ELA Test Scores and Average Normalized Mathematics and ELA Test Scores Among Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District D

Year	Number of Mathematics Scores		Number of ELA Scores		Average Normalized Mathematics Score		Average Normalized ELA Score	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	349,439	89,144	340,100	87,082	0.034	-0.142	0.051	-0.163
2010–11	346,748	94,573	339,777	93,266	0.048	-0.126	0.063	-0.140
2011–12	350,654	95,111	344,895	94,139	0.040	-0.138	0.057	-0.153
2012–13	358,137	91,166	352,087	90,183	0.036	-0.140	0.041	-0.158
2013–14	358,392	82,502	361,024	84,159	0.030	-0.127	0.033	-0.141
2014–15	Data Not Available							

Table G-52. Ethnicity of Students Exposed or Not Exposed to Principals Trained by One of the Selected Programs in the Analysis of All Principals for District D

Year	Percentage Asian American		Percentage African American		Percentage Hispanic		Percentage White		Percentage Other Ethnic Group		Percentage Ethnicity Missing	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	14.9%	11.2%	28.4%	36.2%	38.4%	40.4%	14.7%	8.4%	0.4%	0.3%	3.1%	3.5%
2010–11	15.1%	10.9%	27.6%	35.5%	38.6%	40.3%	14.7%	8.9%	0.3%	0.4%	3.7%	4.0%
2011–12	15.2%	10.9%	27.0%	34.8%	38.7%	40.0%	15.1%	9.7%	0.4%	0.4%	3.7%	4.2%
2012–13	15.4%	11.6%	26.6%	33.8%	39.0%	39.8%	15.2%	10.4%	0.6%	0.5%	3.3%	4.0%
2013–14	15.5%	12.4%	26.4%	32.4%	39.4%	40.0%	15.2%	11.0%	0.8%	0.7%	2.6%	3.6%
2014–15	Data Not Available											

Table G-53. Other Characteristics of Students Exposed or Not Exposed to Principals Trained by One of the Selected Program in the Analysis of All Principals for District D

Year	Percentage Female		Percentage Gender Missing		Percentage ELL		Percentage SWD		Percentage Low Income	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	48.8%	48.2%	0.2%	0.2%	13.9%	14.5%	17.3%	19.4%	84.3%	89.2%
2010–11	48.9%	48.4%	0.2%	0.2%	14.7%	14.7%	17.2%	19.8%	85.1%	89.6%
2011–12	48.8%	48.3%	0.2%	0.2%	13.9%	13.6%	17.7%	20.2%	83.5%	86.9%
2012–13	48.8%	48.2%	0.2%	0.2%	13.2%	12.6%	16.9%	19.0%	76.6%	78.7%
2013–14	48.8%	48.2%	0.2%	0.2%	10.8%	10.5%	19.8%	22.1%	75.2%	76.1%
2014–15	Data Not Available									

Table G-54. Enrolled Grade of Students Exposed or Not Exposed to Principals Trained by One of the Selected Program in the Analysis of All Principals for District D

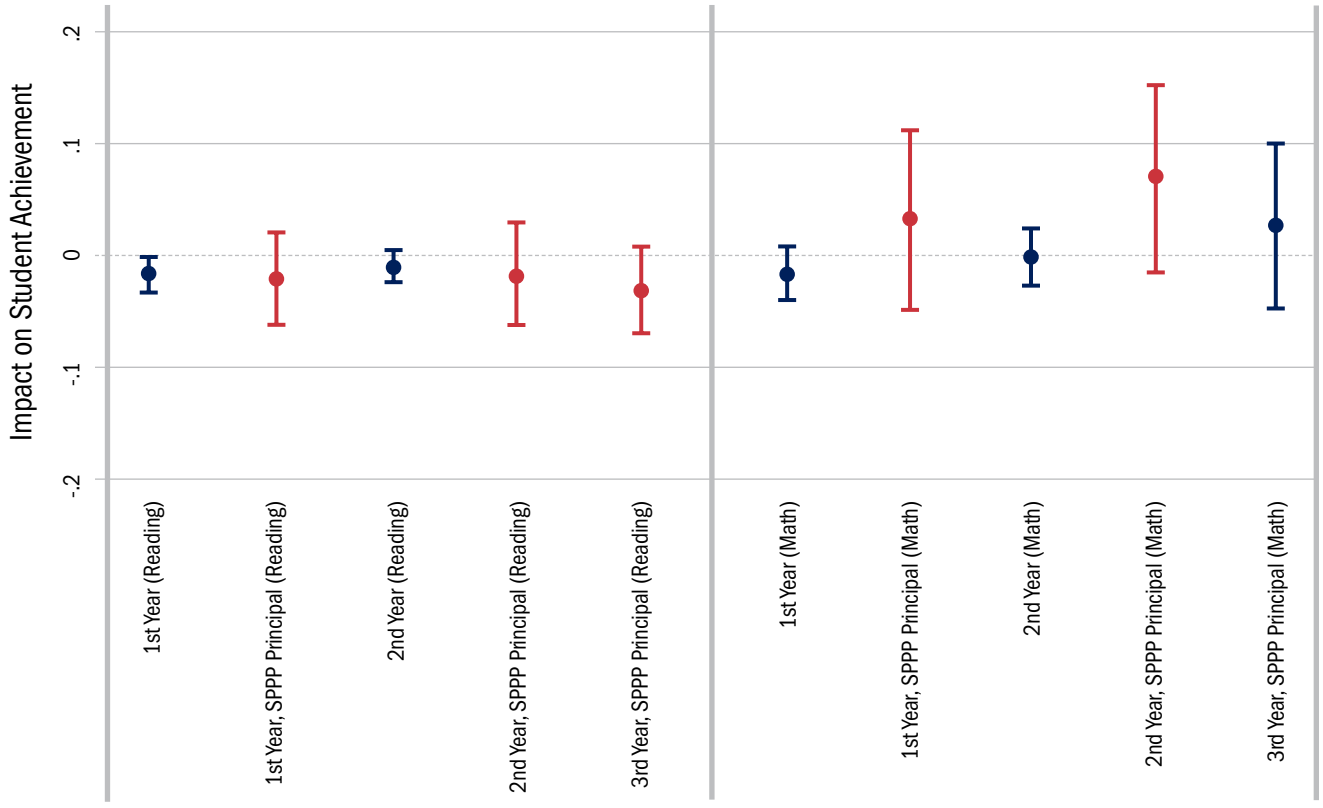
Year	Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed	Not Exposed	Exposed
2009–10	16.9%	16.5%	16.5%	18.4%	16.1%	17.9%	15.7%	18.9%	16.9%	14.6%	17.8%	13.7%
2010–11	18.0%	14.1%	16.9%	16.2%	16.6%	17.9%	15.6%	19.1%	15.9%	18.1%	17.1%	14.6%
2011–12	19.0%	11.4%	17.3%	14.4%	16.6%	16.7%	15.8%	20.1%	15.4%	19.2%	15.9%	18.2%
2012–13	19.0%	11.4%	18.0%	12.0%	16.8%	15.6%	15.6%	19.7%	15.4%	20.9%	15.1%	20.3%
2013–14	19.2%	10.5%	17.9%	12.5%	17.4%	13.3%	15.4%	20.1%	15.1%	21.1%	15.1%	22.5%
2014–15	Data Not Available											

Effects of All Principals on Student Achievement by District

District A

Reading and Mathematics. In District A, we found no evidence that students exposed to principals from one of the selected programs scored any higher or lower in reading or mathematics than they would have scored if they had not been exposed to a principal from one of the selected programs (see Table 15, Figure 15, and Figure 16). Similarly, we found no evidence that reading or mathematics achievement improved when students attended a school led by a principal from one of the selected programs, relative to reading and mathematics achievement among students who attended schools led by principals with similar years of tenure (see Table 16 and Figure G-1.).

Figure G-1. Impact of District A Principals on Student Achievement, by Tenure at School



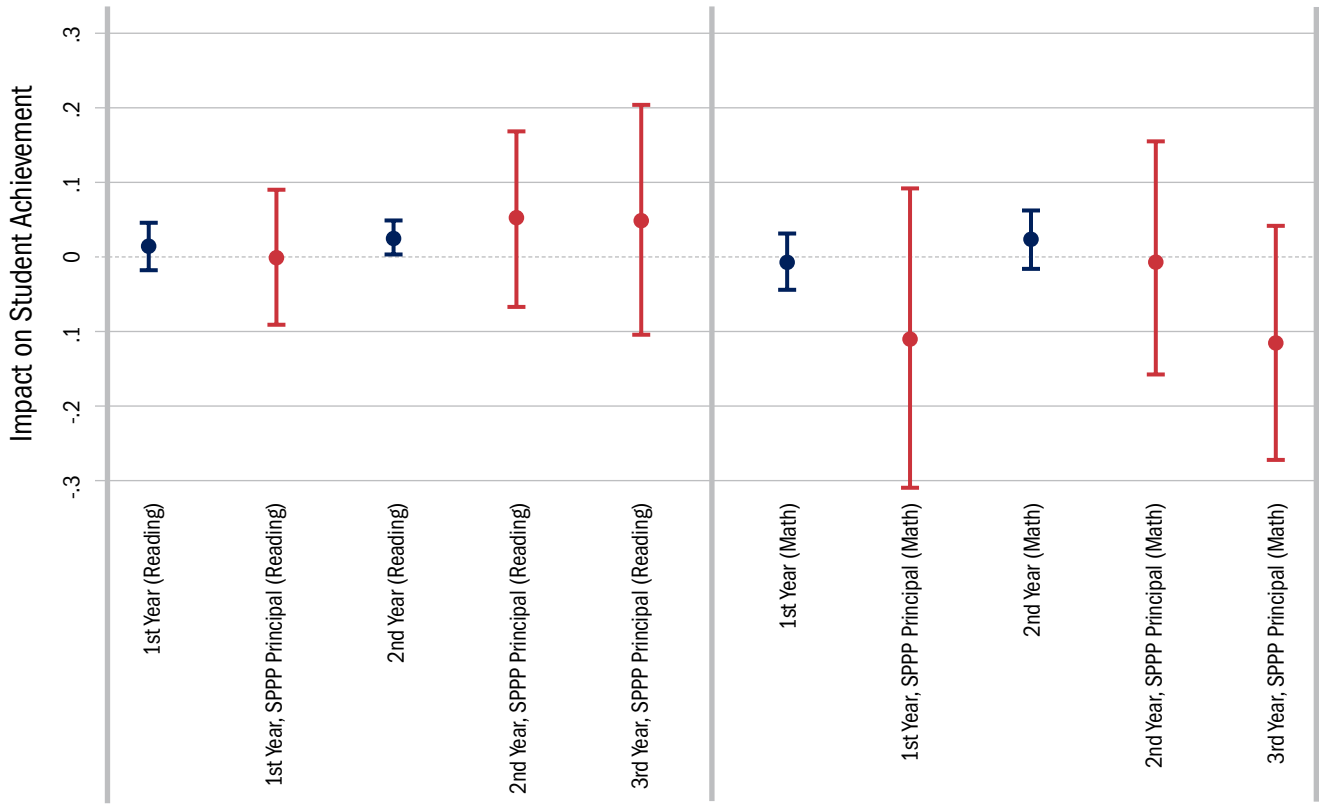
Average impact of principal, by tenure at school, on student achievement (in s.d. units) relative to principals with 3+ years of tenure at school. Bars represent 95% confidence intervals.
Note: SPPP = selected principal preparation program.

District B

Reading. In District B, where we observed only six principals from one of the selected programs, students exposed to principals from one of the selected programs for two or more years experienced a statistically significant 0.11 SD increase in reading achievement (see Table 15 and Figure 15). However, the reading achievement of District B students who attended a school led by a principal from one of the selected programs did not increase when compared with the reading achievement of District B schools led by principals with similar tenures (see Table 16 and Figure G-2). This seemingly incongruous result can be explained as follows. Our exposure models assumed that the impact of principals on student achievement was permanent, whereas our tenure models did not. If the relative effectiveness of principals from one of selected programs was not apparent until one or more years after the student had been exposed to a principal from one of the selected programs, one would expect to observe significant differences in the exposure model but not the tenure model.

Mathematics. In District B, we found no evidence that students exposed to principals from one of the selected programs scored any higher in mathematics than they would have scored if they had not been exposed to a principal from one of the selected programs (see Table 15 and Figure 16). Similarly, we saw no evidence that District B students who attended a school led by a principal from one of the selected programs experienced a change in mathematics achievement that differed from changes in mathematics achievement among other students in District B who attended a school led by a principal with the same years of tenure (see Table 16 and Figure G-2).

Figure G-2. Impact of District B Principals on Student Achievement, by Tenure at School



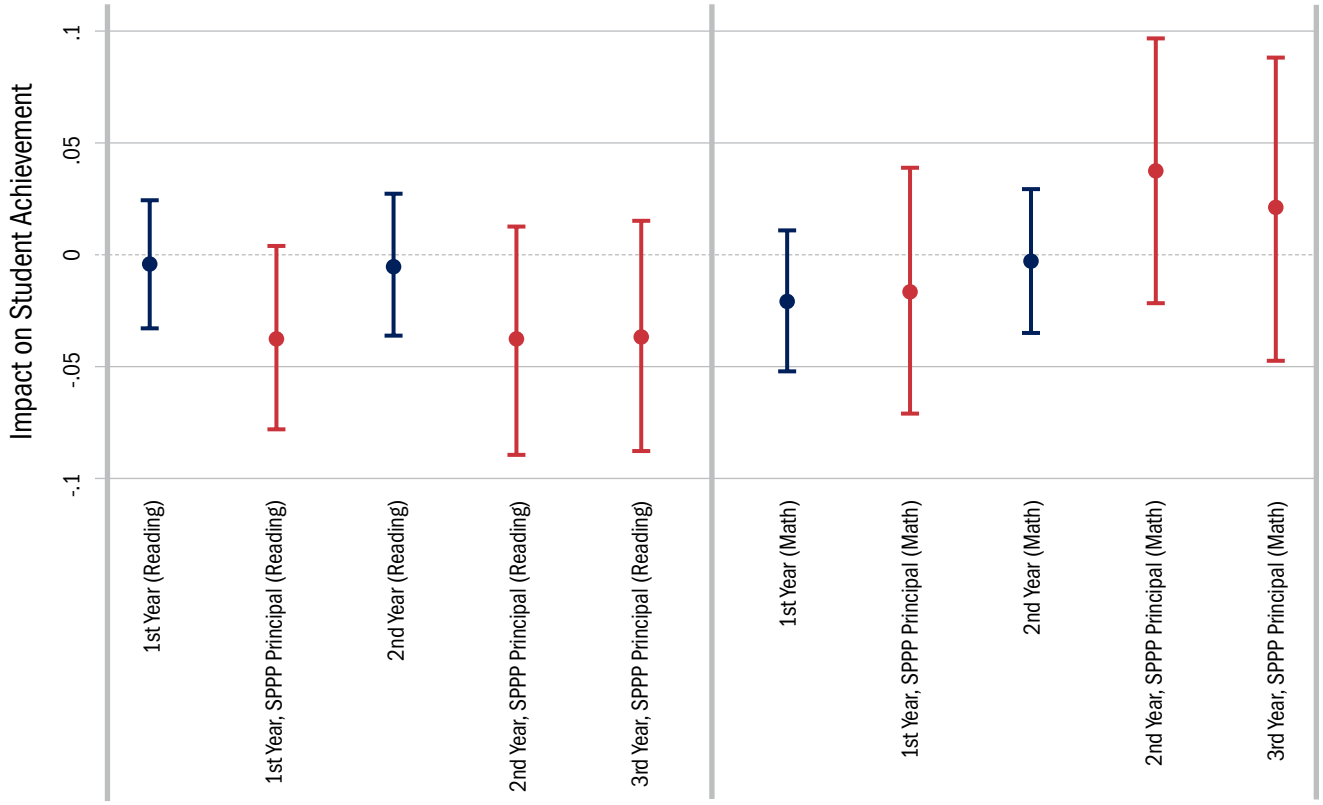
Average impact of principal, by tenure at school, on student achievement (in s.d. units) relative to principals with 3+ years of tenure at school. Bars represent 95% confidence intervals.
Note: SPPP = selected principal preparation program.

District C

Reading. In District C, we found no evidence that students exposed to principals from one of the selected programs scored any higher in reading than they would have scored if they had not been exposed to a principal from one of the selected programs (see Table 15 and Figure 15). Similarly, we found no evidence that reading achievement improved when students who attended a school led by a principal from one of the selected programs, relative to reading achievement among students who attended schools led by principals with similar years of tenure (see Table 16 and Figure G-3).

Mathematics. In District C, we found no evidence that students exposed to principals from one of the selected programs scored any higher in mathematics than they would have scored if they had not been exposed to a principal from one of the selected programs (see Table 15 and Figure 16). Similarly, we saw no evidence that District C students who attended a school led by a principal from one of the selected programs experienced a change in mathematics achievement that differed from changes in mathematics achievement among other students in District C who attended a school led by a principal with the same years of tenure (see Table 16 and Figure G-3).

Figure G-3. Impact of District C Principals on Student Achievement, by Tenure at School



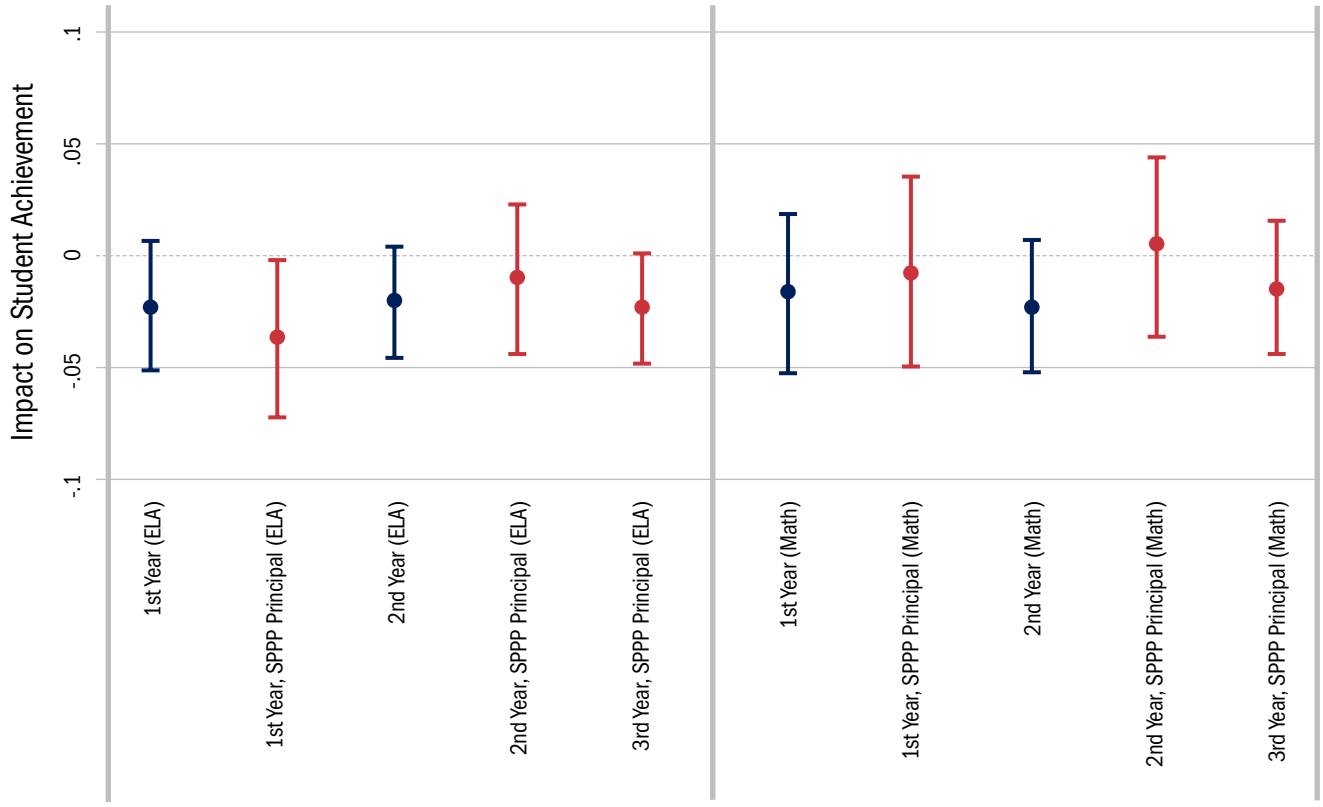
Average impact of principal, by tenure at school, on student achievement (in s.d. units) relative to principals with 3+ years of tenure at school. Bars represent 95% confidence intervals.
Note: SPPP = selected principal preparation program.

District D

ELA. In District D, we found evidence that students who were exposed to principals from one of the selected programs scored about 0.02 SD lower in ELA than they would have if they had not been exposed to a principal from one of the selected programs (see Table 15 and Figure G-4). However, although we found that students attending schools led by principals from selected programs who have two or more years of tenure experienced lower gains in ELA achievement than students in schools led by principals from other programs (see Table 16 and Figure G-4), the differences were not statistically significant. Taken together, these results suggested that District D principals from one of the selected programs may have been less effective at fostering ELA achievement than District D principals from other programs.

Mathematics. In District D, we found evidence that students who were exposed to principals from one of the selected programs scored about 0.03 SD lower in mathematics than they would have if they had not been exposed to a principal from one of the selected programs (see Table 15 and Figure 16). We found evidence that students fell even further behind in mathematics (about 0.025 SD) if they were exposed to a principal from one of the selected programs for three or more years. We found no evidence that students attending schools led by principals from one of the selected programs in their first, second, third, or greater than third year of tenure experienced larger or smaller gains in mathematics achievement than students attending schools led by principals from other programs with similar years of tenure (see Table 16 and Figure G-4). These mixed mathematics results for District D may be consistent if students attending schools led by principals from one of the selected programs experienced short-term (or no) gains in achievement in mathematics relative to their peers, yet ultimately fell behind their peers as a result of having attended a school led by a principal from one of the selected programs.

Figure G-4. Impact of District D Principals on Student Achievement, by Tenure at School



Average impact of principal, by tenure at school, on student achievement (in s.d. units) relative to principals with 3+ years of tenure at school. Bars represent 95% confidence intervals.
Note: SPPP = selected principal preparation program.