

# **Examining Teacher Preparation: Does the Pathway Make a Difference?**

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## **Project Summary**

Policymakers at every level of government and the public understand that few issues are more important than improving the performance of America's K-12 students, especially those in urban, low-performing schools. Increasingly research supports common sense in identifying teachers as the most important contributor to improved student outcomes. Surprisingly, there is virtually no systematic, methodologically sound research that indicates the attributes of teacher preparation programs and pathways into teaching that improve student outcomes. (See Wilson, Floden and Ferrini-Mundy, 2001 for a review of this literature.)

This research addresses these important policy issues directly by examining the following research questions:

- Which teachers are most effective in improving student outcomes? What characterizes their preparation, pathways into teaching and qualifications to teach?
- How are the attributes of teachers and their pathway into teaching related to:
  - Who teaches where and why?
  - Who stays in teaching and why?
  - Who transfers, why and to which schools?
  - Who quits teaching and why?
- What is the cost effectiveness of various pathways into teaching?

This four-year project, begun in 2003, helps answer these questions by examining factors that influence (1) teacher career choices such as whether to enter teaching, whether to teach in difficult-to-staff schools, and how long to stay in teaching, and (2) teachers' contributions to student learning. The project pay particular attention to the influence of teacher preparation pathways, including the structure of these pathways, subject-specific teaching preparation, field experiences, preparation to work with learners, and preparation to teach in diverse and urban settings.

The research design extends and connects existing research on teacher preparation and teacher labor markets. The career choices of aspiring and practicing teachers are analyzed using models drawn from the labor market literature that incorporate both school preferences and teacher preferences, supplemented with statistical and descriptive analyses of interview data. Teachers' contributions to student learning is analyzed using value-added econometric models that incorporate attributes of teacher preparation pathways as independent variables, with appropriate attention to issues of selection bias and other statistical and data issues.

The project uses an extraordinary assemblage of data focused on New York City, the nation's largest school system, tailored to the questions at hand. The database includes (1) data describing career paths, qualifications, and characteristics of aspiring and practicing teachers, from the State and New York City education departments, the City University of New York, the

College Board, and other sources, (2) data on school environments, (3) surveys of participants in major teacher preparation pathways, (4) surveys of newly entering teachers, and (5) detailed data describing teacher preparation programs gathered from documents, and interviews, linked where appropriate to (6) student-level data from grade 3-5 citywide standardized mathematics and reading exams.

The intellectual merit of this research flows from its comprehensive view of teacher preparation and student learning, its focus on the attributes of teacher preparation pathways, its focus on student learning as an important outcome, and its comprehensive data for New York City - a large school system, teacher preparation system, and labor market.

Broader impacts flow from the project's ability to examine questions of national importance with data from the nation's largest urban school system and largest teacher labor market. The project has developed with the collaboration and support from the highest education officials in New York State and New York City, and from the dean of teacher education in the City University of New York. The results of this research will be valuable to state policymakers, urban school systems, schools of education, teacher organizations, researchers, and others. Many groups have expressed tremendous interest in and support for the project. We are particularly grateful to the City University of New York, the New York State Education Department, Carnegie Corporation of New York, and the Spencer Foundation, and the National Science Foundation for providing financial support needed to make this project possible.

## **Project Description**

### ***Introduction***

Demographic changes and new policies are increasing the need for high quality elementary and secondary school teachers. In New York City, for example, roughly 40 percent of all current teachers could retire over the next five years, while policy initiatives such as class size reduction increase demand. New standards for high achievement by all students require new teachers to be more skilled than in the past. Fulfilling the need for skilled teachers is particularly difficult in low-performing schools with high proportions of poor and non-white students, where teacher qualifications are substantially worse than in better-performing urban and suburban schools (see for example, Lankford, Loeb and Wyckoff, 2002).

This is an issue for teaching in general, but is acute for some subjects such as math, science and special education. For example, 32 percent of public school teachers in New York State who took the mathematics "content specialty test" now required for certification failed at least once, whereas only 16 percent failed the elementary, English, or social studies content tests. Failure rates for biology, chemistry, earth science and physics all were above 26 percent. The problem is worse in urban areas – in New York City the failure rate was 48 percent for mathematics and above 40 percent for most sciences. For many years, New York City has resorted to hiring many uncertified teachers and assigning teachers to teach out of field to meet its teaching needs. As the demand for high-quality teachers increases, disparities in teacher qualifications will only worsen; schools with better working conditions and higher salaries will bid away the better qualified teachers from already difficult-to-staff schools. These forces will strain the ability of teacher preparation programs to produce enough highly qualified teachers generally, but particularly in difficult-to-staff subjects, adding to the difficulties schools now face to attract and retain these teachers.

Recent research documents the importance of teachers to student achievement (Rivkin, Hanushek, and Kain, 2000; Sanders and Horn, 1994; and Sanders and Rivers, 1996). Many

factors may contribute to teacher effectiveness, including teachers' verbal and mathematical ability and subject-matter preparation (Ehrenberg and Brewer, 1995; Monk, 1994). Professional education can contribute to teachers' effectiveness throughout their careers (National Research Council, 2001; Brown and Borko, 1992; Garet et al., 2001; Loucks-Horsley and Matsumoto, 1999; Monk, 1994). Schools also can influence teacher effectiveness through resources, induction and professional development, professional and social community, and organization. Components of teachers' pre-service education that influence effectiveness may include program structure, subject-specific teaching preparation, field experiences, preparation to work with learners, and preparation for diversity and urban settings. However, little is understood about the links between pre-service education and teacher effectiveness and how these links are affected by interactions between the attributes of teachers and students.

The large research literature on teacher preparation provides insights into how specific aspects of preparation may affect teacher beliefs, knowledge, and practices.<sup>1</sup> However, much of the research is limited in scope, focuses on inputs rather than outcomes, uses data only loosely connected to concepts examined, or employs case study methodologies from which it is difficult to determine causal relationships or generalize to other populations. As a result, little discussion about effective teacher preparation is based on methodologically sound research. This is especially true for preparing teachers for urban settings (AERA Panel on Teacher Education, in progress; Carnegie Forum on Education and the Economy, 1986; Holmes, 1986; Goodlad, 1990).

In their review of research on teacher education, Wilson, Floden, and Ferrini-Mundy (2002) call for large-scale studies to evaluate the effects of components of teacher preparation programs. Our proposed research addresses each of four key goals they identified for future research, summarized below:

- Studies should compare practices across institutions to identify effective practice.
- Studies should examine the relationship between specific components of teacher preparation programs such as clinical experiences, and specific outcomes such as student achievement.
- Research should include measures that are sensitive to program content and quality.
- Research should have a longitudinal component and examine impacts over time

### ***This Research***

The goal of this project is to understand better how teacher preparation policies and practices affect the supply, retention, and effectiveness of K-12 teachers in difficult-to-staff urban schools. By systematically examining pathways into teaching, we analyze how the pathway characteristics affect quality of the teaching workforce, and math and reading outcomes for students. This work focuses on the New York City (NYC) public school system and traditional and alternative teacher preparation pathways that prepare teachers taking entry positions in NYC schools.

**Research Questions.** We address two main research questions: (1) What influences the career choices and paths teachers? and (2) What influences teachers' contributions to student outcomes? The broader set of research questions are:

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<sup>1</sup> For a very useful summary of the teacher preparation literature, see Wilson, Floden and Ferrini-Mundy (2001). For other relevant work see Ball and Cohen (1999), Carnegie Forum on Education and the Economy (1986), Darling-Hammond (2000), Darling-Hammond and McLaughlin (1999), Feiman-Nemser (1983, 1990), Goodlad (1990), and Holmes Group (1986).

**1. What influences the career choices and paths of teachers?**

**a. Who enters which pathway and why?**

- i. What are the attributes of teachers entering each teacher preparation pathway? Examples: age, gender, prior education (years, institutions, majors and college transcripts when available), prior careers, experience in urban settings, experience with children, and SAT scores.
- ii. How do entrants select among pathways?
- iii. How do pathways select among candidates?

**b. What kind of preparation do participants in different pathways receive?**

- i. How were programs structured?
- ii. What kinds of subject-specific preparation were provided?
- iii. What kinds of field experiences?
- iv. What kinds of preparation to work with learners?
- v. What kinds of preparation to work with diversity in urban settings?

**c. Who enters which teaching job and why?**

- i. In what schools do teachers with different attributes and different preparation find their first job, e.g., Schools Under Registration Review, high-poverty, and low-performing schools?
- ii. When choice is available, what jobs do teachers choose to accept?
- iii. What influences teachers' perceptions of "better" jobs?
- iv. What characteristics of pathways affect the matching of teachers to jobs (e.g. pathway-school links or pathway characteristics that affect teachers' perceptions of better jobs)?
- v. What are the attributes of schools and teachers where teachers are teaching out of field?
- vi. What attributes of preparation programs are linked to out-of-field teaching?

**d. Who chooses to stay in the same school, who chooses to transfer, and why?**

- i. Who stays in their original placement and what factors account for their remaining?
- ii. Who transfers; how does this differ by teachers' attributes and teacher preparation; and what accounts for transfers?
- iii. To where do teachers transfer and what factors are relevant?

**e. Who chooses to continue teaching, who chooses to leave teaching, and why?**

- i. Which teachers remain and how does this differ by pathway into teaching, teacher attributes, and school attributes?
- ii. Which teachers choose to leave teaching? How does this differ by pathway into teaching?
- iii. Which attributes of schools most strongly affect teacher quit behavior?
- iv. What do teachers do when they leave New York City schools?

**2. What influences teachers' contributions to student learning?**

- a. What attributes of teachers influence student math and reading outcomes and the practices teachers employ for teaching math and reading?
- b. What attributes of school context influence student math and reading outcomes and the practices teachers employ for teaching math and reading?
- c. What characteristics of pathways influence student math and reading outcomes and the practices teachers employ for teaching math and reading?

*Interactions:*

- d. How do teacher attributes and school context interact to influence student math and reading outcomes and the practices teachers employ for teaching math and reading?
- e. How do characteristics of pathways interact with teacher characteristics to influence student math and reading outcomes and the practices teachers employ for teaching math and reading?
- f. How do characteristics of pathways interact with school context to influence student math and reading outcomes and the practices teachers employ for teaching math and reading?

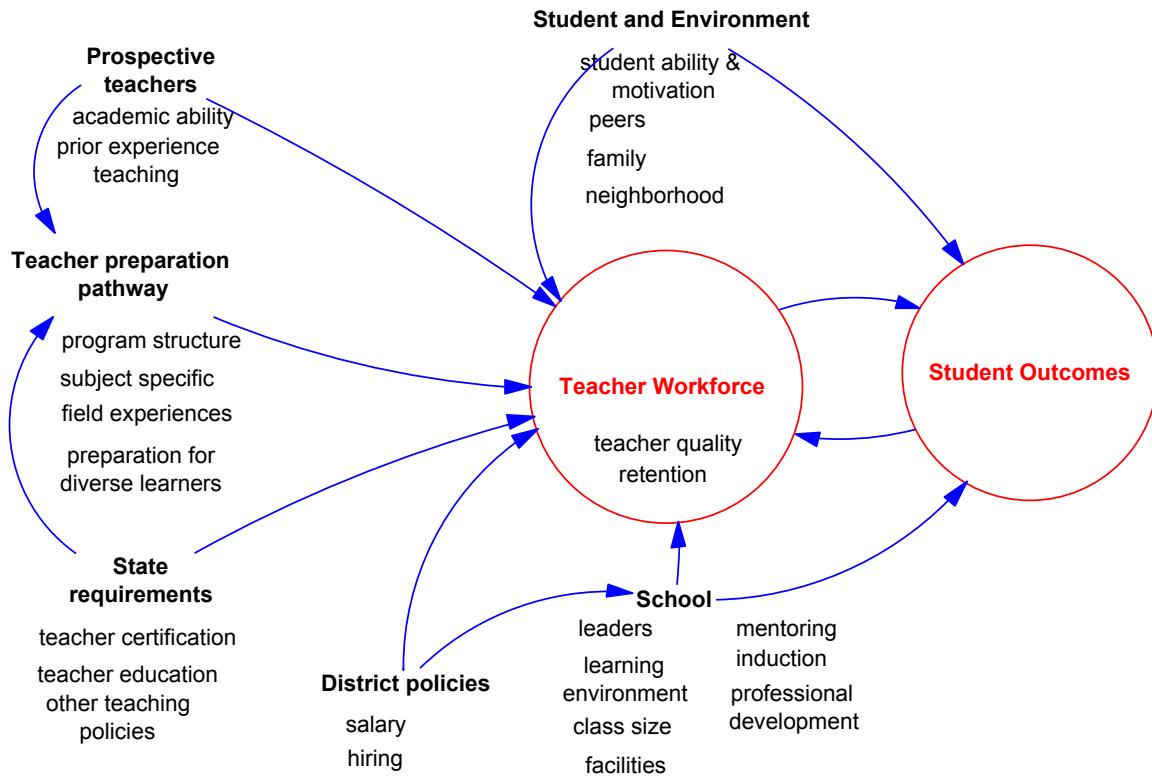
**Conceptual Model.** Education is a complex process. Student outcomes are influenced directly by the teacher workforce, by other school inputs, and by external factors such as student background and environment. Meanwhile, the teacher workforce is influenced by many institutional factors such as state and district policies, by teacher preparation pathways, and even by student performance. Figure 1 summarizes key elements of this process, with arrows reflecting conceptual causal relationships.

Education is also a difficult process to model. Multiple objectives, interdependencies, non-random selection, variable conceptualization and measurement problems, as well as complex institutional, political and familial arrangements all make this a daunting proposition. The model presented below provides only a limited sense of these complexities. For example, research dating to the Coleman Report (Coleman, 1966) indicates that student outcomes result from a variety of factors including ability and motivation of the student, the influence of peers, family and other environmental effects, plus a host of school variables that go beyond just the quality of teaching. Teaching quality itself is a function of many influences, and is determined importantly by the labor market for teachers.

We are unaware of any research that embeds teacher preparation in the larger context of teacher labor markets and production of student outcomes, similar to the conceptual model above. Yet, these relationships can best be understood by examining the entire system within which they occur over time. Thus, the proposed research follows individuals who prepare for teaching in NYC public schools, examining their preparation, initial job search and placement, early teaching years, retention, and contribution to student achievement. This research focuses heavily on collection of detailed primary and secondary data and construction of alternative models tailored to address the research questions above.

We propose to model conceptually and empirically how teacher characteristics affect the selection of preparation pathways, how teacher characteristics influence student outcomes, how pathways influence the matching of teachers to schools, and how teachers and schools together influence student outcomes. There may be important interactions among these variables. For example, if characteristics of a particular pathway attract teachers with strong subject matter training, we would not want to confound the impact of these teacher characteristics with the effect of one or more pathway features. Similarly, if some pathways funnel program participants into schools whose students have lower average math or reading growth, we would not want to confuse the effect of the pathway with the effect of the schools. Much of our work focuses on distinguishing these selection effects from the contribution of pathway features to teacher effectiveness.

**Figure 1: Teacher Preparation Paths and Outcomes for Teachers and Students**



In addition to distinguishing teacher characteristics and school context from pathway effects, we consider interactions between pathway features and teacher characteristics and between pathway features and school context. Some pathway attributes may be particularly effective for some teaching candidates but not for others. For example, strong field experience may be most helpful for program participants with little experience in schools or working with urban children. Similarly, some pathway attributes may be particularly effective for teaching in some schools but not in others. Many selection and interaction issues can be mitigated by data collection and model development.

**Data.** This project relies on a wide array of data sources:

- individual-level administrative data characterizing aspiring and practicing teachers;
- individual-level administrative data on career histories of practicing teachers;
- individual-level administrative data on test scores of elementary math and reading students;
- survey data on the background, course and clinical experiences, career aspirations , and characteristics of teacher preparation program participants;
- surveys of a similar nature for first and second-year teachers to examine teaching experiences and the school learning environment;
- survey of principals to understand the school learning environment;
- administrative and interview data describing teacher preparation programs; and
- administrative and other data characterizing the schools in which teachers teach.

All of these data sources are linked at the individual teacher level; survey data on program participants and new teachers are linked to administrative data on their teaching careers and to descriptive information on preparation programs; student test scores are linked to the teachers who taught them; and so on.

### Administrative data

Much of our analysis relies on administrative data characterizing prospective teachers, current teachers and their students, providing rich detail on qualifications and career paths of prospective teachers and value-added math and reading achievement scores of students they teach. Data providers include the City University of New York (CUNY), the New York City Department of Education (NYCDOE), the New York State Education Department (NYSED), and the College Board (CB). Most of this data is in hand, with the remainder committed and being prepared.

These databases are extraordinarily broad and deep. They begin in many cases at the point an aspiring teacher prepares for college, follows that individual through a college career, through the teacher certification process, and into the first several years of that person's New York City teaching career. For example, for the period of our study the databases includes:

- virtually all high school graduates who have taken Scholastic Aptitude Tests (SATs);
- virtually all individuals who have participated in teacher preparation programs at CUNY;
- virtually all individuals who have taken teacher certification exams;
- virtually all individuals who have applied for teacher certification in New York; and
- virtually all individuals who taught public school in New York City and elsewhere in the State

Table 1 summarizes the components of the database.

The proposed research relies heavily on grades 3 through 5 student mathematics and reading achievement tests in the analysis of how test-score gains are related to teacher characteristics and other explanatory variables. We do so because we believe these tests provide good information about student achievement and because student tests are becoming a common metric of student, teacher and school performance. Given the underlying structure of the tests employed in the NYC public schools and the way they are administered, the tests provide a very good basis for examining the effects of teacher preparation pathways on the outcomes of students. Recent papers by Ballou (2002) and Kane and Staiger (2001) raise concerns about how achievement tests are being used in accountability systems. Sanders (2003) and Rogosa (2002) argue that some of these concerns are overstated, mischaracterized, or can be addressed through proper design of accountability systems. Given the focus of our analysis, measurement error inherent in test scores and associated gain scores need to be taken into account but do not create a comparable problem. Our goal is not to measure the value added by individual teachers and schools, but rather how value-added measures are affected by attributes of teacher-preparation programs. Statistically, this requires far less precision in the value-added measures than that required for an accountability system.

**Table 1: Teacher Workforce Database**

	<i>Personnel data</i>	<i>Certification and exam data</i>	<i>CUNY data</i>	<i>NYC Department of Education data</i>	<i>College Board data</i>	<i>School and district data</i>
<i>UNIVERSE:</i>	All public school professionals	All individuals taking exams	All individuals who attended a CUNY campus	All individuals who (a) subsequently pursued teaching, or (b) were students linked to NYC teachers who taught them	All NY high school students	All public schools and districts
<i>ELEMENTS:</i>	<ul style="list-style-type: none"> <li>- salary</li> <li>- course subject and grade</li> <li>- class size</li> <li>- experience</li> <li>- years of education and degree</li> <li>- age</li> <li>- gender</li> </ul>	<ul style="list-style-type: none"> <li>- scores on each taking of NTE and NYSTCE</li> <li>- institution of undergrad &amp; grad degrees</li> <li>- degrees earned</li> <li>- zipcode of residence when certified</li> <li>- race</li> </ul>	<ul style="list-style-type: none"> <li>- high school</li> <li>- high school GPA</li> <li>- age, ethnicity, race, gender</li> <li>- campuses attended &amp; transfer status</li> <li>- degrees attained, college GPA</li> <li>- major and minors - education program indicators</li> <li>- courses taken, grades earned</li> <li>- language proficiency</li> <li>- SKAT and other exam scores</li> <li>- disability status</li> </ul>	<ul style="list-style-type: none"> <li>- individual student value added test scores linked to teacher ID</li> <li>- demographic information</li> <li>- high-school course taking &amp; performance</li> </ul>	<ul style="list-style-type: none"> <li>-SAT scores</li> <li>-high school ID</li> <li>-HS courses taken</li> <li>-HS GPA</li> <li>-HS rank</li> <li>-college interests</li> <li>-AP coursework</li> <li>-race, ethnicity</li> <li>-highest education of mother, father</li> <li>-family income</li> </ul>	<ul style="list-style-type: none"> <li>- enrollment by race,</li> <li>- student poverty</li> <li>- LEP</li> <li>- student test results</li> <li>- dropout rates</li> <li>- district wealth</li> <li>- district salary schedule</li> <li>- support staff and aides</li> <li>- expenditures by type</li> </ul>
<i>STATUS:</i>	Base data	Cleaned and merged to base	Being merged to base	Being merged to base	Cleaned and merged to base	Cleaned and merged to base
<i>TIME PERIOD:</i>	1970 to 2006	1985 to 2006	1998 to 2006	2000 to 2006	1980-2000	1970 to 2006
<i>SOURCE:</i>	NYSED	NYSED	CUNY	NYCDOE	College Board	NYSED

### Pathway data

Administrative data do not provide the necessary information to fully characterize teacher preparation programs. For this we collect our own data from the programs within the 20 largest traditional undergraduate and graduate teacher education institutions serving New York City, which produce about 65 percent of all new teachers entering NYC public schools. We also gather information for the main NYC alternate certification routes: the New York Teaching Fellows program, Teach for America, and the Teaching Opportunities Program.

Our strategy is to collect data on program characteristics from multiple sources and to triangulate information from these data sources. Program documents such as course bulletins and time schedules, syllabi, assignments, and accreditation material where available provide much of the basic data on programs and their characteristics, while interviews and participant surveys provide a richer picture of the experiences provided by different pathways. We have two waves of data collection around programs, allowing us to return to sites to collect additional information as necessary.

Examples of key data elements for each of five key program characteristics are listed below:

- **Program structure:** Information on admissions (requirements for entry, recruitment, selection process); program characteristics (undergraduate or graduate, length, cohort based, size); faculty characteristics (full time, percent with doctorates, experience, demographics); student characteristics; mission; fidelity to mission; and follow-up or induction programs that support new teachers as they enter the classroom.
- **Subject-specific preparation:** Required courses; syllabi and assignments from courses on the teaching of math and reading for elementary school teachers and on the teaching of math and science for high school teachers; background of the faculty teaching these courses. In alternate routes, we examine the amount of time spent on preparation for teaching math and reading and opportunities for learning to teach math and reading that might be offered at the school site (e.g. professional development opportunities).
- **Field experiences:** Length and number of field experiences, where they fall in the program, which schools are used, how many schools are used, whether student goals are considered in the assignment of cooperating teachers, how cooperating teachers are recruited and whether they continue from year to year, whether cooperating teachers are compensated, how the supervisor and the cooperating teacher interact, how supervision is organized, whether there are early field experiences (such as observations in classroom) and of what type.
- **Preparation to work with learners:** Available and required coursework in child development and learning; opportunities for program participants to investigate student learning, such as following cases of individual students; how courses in development and learning are linked to field experiences.
- **Preparation to work with diversity and urban settings:** Coursework on diversity, kinds of diversity the courses address, and whether these are likely to be the types of diversity that teachers experience in New York City classrooms; identify opportunities that participants have to learn about the communities in which they are working; information on the tools participants are given to work specifically with English language learners and with special needs students.

### Survey data

We conduct four sets of surveys. The first survey, given in the spring and summer of 2004 to students graduating from traditional and alternative certification pathways, focuses on the

characteristics of participants, how and why they selected their pathways, and their experiences in the pathways. A copy of the survey is available at [www.teacherpolicyresearch.org](http://www.teacherpolicyresearch.org).

The participant background information we collect includes: their parents' educational attainment, the high school they graduated from, what college they have or will graduate from, their major, their subject matter preparation, whether they have taught, whether they have worked with urban youth, etc. To assess selection into the program we ask the participants to which programs they applied and to which they were accepted. To supplement the information collected through our visits to the program, we ask participants about their experiences. For example, we are interested in knowing the opportunities program participants had to learn techniques for teaching reading. Additionally, we ask questions about field experiences and preparation to work with learners and to work with diversity. For example, we determine whether participants had the opportunity to teach reading, whether their cooperating teacher was a reading specialist and whether they received useful feedback on their teaching.

The second set of surveys follow the participants into schools and classrooms. We survey participants in the spring of 2005 to see whether they chose to teach and, if so, why? Other questions address the nature of their job search, how and why they chose the teaching job they did, their teaching assignments and their experiences in the school. We also ask about the methods and practices they use and their feelings of efficacy. While this participant sample makes up a large proportion of all entering teachers, we clearly miss many teachers who entered through different pathways. As a result, we supplement this sample with a large sample of first year New York City teachers who entered by other pathways. We collect information about their pathways into teaching, which also is used to assess the impact of program features on student math and reading growth, teaching practices, the matching of teachers to schools and retention.

The third set of surveys, given in the spring of 2005, ask principals to describe school characteristics. We are particularly interested in mentoring, induction and professional development programs but also ask about hiring practices, professional community, resources, assignment of students to classes, curriculum, and other school factors.

The final survey follows teachers into their second year of teaching (Spring 2006), and provides information on whether the teacher left or transferred and, if so, why. We again ask them about the techniques and practices they use in their teaching and their feelings of efficacy. We are also interested in how they utilize resources that are available to them and whether they take a leadership role in their school.

**Methods.** Many difficulties encountered in past teacher preparation research resulted from data that were either broad but thin in details about preparation or school context, or rich in detail but limited to a few case studies. Our project collects data that is both extensive (dozens of teacher preparation programs and thousands of teachers) and rich (detailed analysis of each program and longitudinal surveys of teachers). While we employ qualitative methods in some aspects of our research and use interviews and document collection as data sources, we rely primarily on quantitative analyses.

We use multiple empirical strategies to address the hierarchical nature of nested decisions. One approach is to estimate (1) multinomial logit models of the probability of pathway choice; (2) logit models of whether program participants enter teaching; (3) multinomial logit models of the probability of entering schools with differing characteristics supplemented by simulated method of moments estimates of a matching model concerned with the allocation of teachers to jobs

(Boyd, Lankford, Loeb and Wyckoff, 2003a); (4) logit models that examine out-of-field teaching; (5) competing risks hazard models of the decision to stay, transfer or quit; and (6) regression models predicting student test-score gains in math and reading. Throughout we employ descriptive and qualitative analyses of each of these decisions.

We combine these quantitative analyses with qualitative studies:

- Surveys and interviews with key informants provide insight into how participants are matched with programs, and teachers with schools.
- For example, how do programs select schools for field experiences? How does this selection process reflect the goals of the program?
- We use program documents and interviews to develop a richer portrait of how elementary teachers are prepared to teach math and reading in different programs and pathways. Are there common approaches used across programs?
- How, and in what ways, do programs link clinical field experiences to courses on teaching math and reading?

We are able to incorporate some but not all of this information in our quantitative analyses. We also use the qualitative analysis to explore why some programs are able to implement their program goals effectively and others are not. The qualitative approach is better suited for understanding why the programs operate in the way they do, and provides more information about the features of different components of teacher education. The quantitative analysis focuses on the causal effect of program attributes on student and teacher labor market outcomes.

### *Addressing selection bias*

Identifying the separate effects of individuals' attributes, characteristics of the schools in which they teach, and attributes of teacher preparation programs are a major empirical challenge. For example, in assessing how program attributes affect student learning, problems arise if attributes of program participants or the schools in which they teach (1) directly affect student learning, (2) vary systematically across the education programs being evaluated, and (3) cannot be included as variables in the statistical analysis because of data limitations. In the presence of such unobserved factors, inappropriate statistical methods can result in false or misleading conclusions about effects of program attributes. This is the "selection" problem common to non-experimental program evaluations. In non-experimental studies, researchers often employ data that are easily obtained but limited in scope, leading to major selection problems. Even though statistical methods deserve attention, it is very important to understand that selection problems result from data deficiencies. As Heckman, Lalonde and Smith (1999, p. 1867) argue, "[t]oo much emphasis has been placed on formulating alternative econometric methods for correcting for selection bias and too little given to the quality of the underlying data. Although it is expensive, obtaining better data is the only way to solve the evaluation problem in a convincing way." Collection and use of exceptionally rich data is central to our strategy for identifying separately how attributes of teacher preparation programs affect teacher and student outcomes.

Where warranted, we employ statistical techniques for dealing with selection drawn from the non-experimental literature on program evaluation. Available techniques include before-after estimators that compare outcomes for individuals before and after treatments are received, difference-in-difference estimators that extend the first approach, and cross-section estimators that compare outcomes of individuals who do and do not receive a treatment of interest. Our analysis draws largely upon the cross-sectional methods since outcome measures for most participants, such as how well their students learned, are available only for the post-program period. Three cross-sectional methods are common: (1) the method of matching, (2) the

instrumental variables approach, and (3) classic econometric models of selection.<sup>2</sup> The evaluation literature makes clear that there is no single best approach. Which method is most appropriate depends upon the questions being asked, the underlying structure of pertinent processes and the available data.<sup>3</sup>

### Selection into teacher preparation programs

We have data on many important characteristics of aspiring teachers that could influence outcomes and also influence selection into teacher preparation programs. Including these variables in our analysis should mitigate several potential selection problems. For example, our data include measures of high school academic background (e.g., GPA, class rank, SAT scores, and possibly some information on courses taken), measures of college academic career prior to entering teacher preparation (e.g., undergraduate major, GPA, class rank), and scores on the Liberal Arts and Sciences Test (LAST) general knowledge certification exam.<sup>4</sup> Our survey of program participants collects additional background information (e.g., age, race/ethnicity, parents' education, marital status, income, undergraduate institution and major, and experience working with children in general and low-income urban children in particular).

We also use statistical techniques that deal with selection effects, collecting additional information as appropriate. For example, we gather information relevant to individuals' decisions about which teacher preparation programs to apply to and attend, and relevant to admissions decisions. Individuals' geographic proximity to the programs, income, and other financial resources may affect which programs individuals attend but have no direct effect on the outcome measures of interest, helping us deal with remaining problems of selection into programs.<sup>5</sup> Our data collection in the programs also provides information on admission and recruitment policies that can prove useful in better understanding and accounting for the selection. Using an alternative approach, we also use the method of matching, which employs conditioning variables to identify comparison groups of individuals in different preparation programs who can reasonably be assumed to have the same distribution of unobserved variables. One promising approach following the logic in the matching framework employed by Dale and Krueger (1998) may prove to be especially useful. If individuals base application decisions and program officers base admission decisions partially upon individuals' attributes that they both observe but that researchers do not observe, dummy variables indicating the institutions to which individuals applied and where they were admitted can be used in the analysis of outcomes to "absorb the effects" of these unobserved factors. We also explore other matching approaches and the related instrumental variables (IV) approach. In general, in modeling selection issues we plan to exploit information concerning the structure of individuals' and educational institutions' decisions regarding where individuals apply, where they are accepted, and the teacher preparation institutions they attend.

### Selection into teaching jobs

We manage potential problems associated with selection into teaching jobs using similar approaches. First, we collect supplemental data that capture pertinent school (job) attributes that otherwise would be unobserved. Second, we learn as much as possible about the process

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<sup>2</sup> This categorization of approaches is drawn from Heckman, Lalonde and Smith (1999).

<sup>3</sup> Again, see Heckman, Lalonde and Smith (1999) for an extensive discussion of related points.

<sup>4</sup> For scores on the LAST exam to be useful in isolating the effects of teacher education programs from other characteristics of individuals, such scores would need to reflect the latter rather than the former. Exam scores would not be useful for this purpose if experiences in teacher education programs affected the LAST scores, say as a result of coaching.

<sup>5</sup> Dale and Krueger (1998) demonstrate the usefulness of such information in correcting for self selection in the analysis of the payoff to students from attending more-selective colleges.

by which teachers are assigned to schools and collect data that allow us to model better how teachers and schools are matched. Third, we employ alternative estimation strategies.

Our administrative data provide a wide range of school and student-body characteristics. To supplement this, we include questions regarding school environment in the surveys of teachers and principals. Furthermore, we explore the use of proxies for unobserved school attributes. We also believe that we can use information on institutional features regarding teacher assignment to schools to reduce the extent of the selection problem. To the extent individuals seek specific jobs or are offered multiple positions, we can employ that information in an analysis similar to the framework for selection into teacher preparation programs outlined above. Within the two-stage approach, we employ proximity of schools to where individuals live in modeling job choice. In other research we have found geographic proximity to be very important in explaining teachers' rankings of alternative schools (Boyd, Lankford, Loeb and Wyckoff, 2003b).

Finally, when individuals prepared in different programs teach in the same schools and other attributes of these individuals can be taken into account, it is possible to use within-school comparisons of student outcomes to make inferences about teacher preparation. For example, in a model of gains in student achievement this approach would include fixed effects for the schools in which individuals teach, the full range of teachers' attributes, and the variables characterizing the teacher preparation programs.

### **Relationship of Data to Research Questions.**

The table below shows the data sources to be used in the different analyses.

**Table 2: Research Questions and Data Sources**

<b>Research Questions</b>	<b>Sample to be Employed</b>	<b>Years Examined</b>	<b>Data Sources</b>
Choice of pathway	All prospective NYC teachers	1985-2006	NYSED teacher and schools; College Board
		2003-2006	Pathway analysis; participant, teacher and principal surveys; NYSED teacher and school; NYCDOE student; CUNY and SUNY prospective teacher; College Board.
Teacher preparation	All prospective NYC teachers	1985-2005	NYSED teacher and school; College Board
		2003-2005	Pathway analysis: participant, teacher and principal surveys; NYSED teacher and school data; NYCDOE student data; CUNY and SUNY prospective teacher data; College Board.
Teacher job placement (school and courses) and retention	All NYC teachers	1985-2005	NYSED teacher and school data; College Board
		2003-2005	Pathway analysis; participant, teacher and principal surveys; NYSED teacher and school; NYCDOE student; CUNY and SUNY prospective teacher; College Board.
Value added student achievement	All NYC grades 3-5 entering math and reading teachers	2003-2005	NYCDOE student and teacher; pathway analysis; participant, teacher and principal surveys; NYSED teacher and school; CUNY and SUNY prospective teacher; College Board.

### ***Significance of this Research***

#### **Intellectual Merit**

Three aspects of this research separate it from other studies. First, it identifies particular attributes of teacher preparation that are important both for increasing teacher effectiveness in the classroom and for increasing the supply of teachers to difficult-to-staff schools. These

questions are analyzed employing a large and rich set of longitudinal data, many components of which are tailored to these research questions. Second, it focuses on student learning as an important educational outcome. Finally, it includes all major pathways supplying teachers to the largest urban school district in the nation. If only a few programs had been considered, or if they had not all operated in the same market, the research would not be able to examine the interaction of pathways. Given this linkage, it can address questions such as, "Does one pathway draw teachers that would otherwise have gone through other pathways or does it draw individuals who otherwise would not have gone into teaching?" The research thus provides a methodologically sound foundation for understanding attributes of teacher preparation programs across an entire system that affect student outcomes and teacher retention.

The project addresses four major research recommendations made in the Wilson, Floden, and Ferrini-Mundy (2002) review mentioned earlier:

- ***Studies should compare practices across institutions:*** The research employs a detailed analysis of 75 different teacher preparation programs at 20 different major teacher education institutions, and includes both traditional pathways to teaching and alternate pathways. The survey of first-year teachers allows comparison across all routes by which teachers enter NYC public schools.
- ***Studies should examine relationships between specific attributes of teacher preparation and specific outcomes:*** Our analysis includes a detailed description of the policies and practices of teacher preparation programs and our models include explanatory variables characterizing teacher preparation. Because we examine a range of preparation programs within an urban area with a range of schools and students, we are able to analyze the interaction between type of preparation and type of students to examine whether certain preparation attributes are better suited to certain types of students, or to preparation for teaching in different kinds of schools.
- ***Studies should employ outcome measures that are sensitive to program quality and content:*** We have extensive information on program content through our analysis of program documents, interviews, observations, and survey data. We evaluate the characteristics and qualities of these program components. We also link features of program content (e.g. characteristics of preparation for teaching math) to related outcomes (e.g. success in teaching math).
- ***Studies should have a longitudinal component:*** The study gathers information regarding the experiences and careers of participants over a three-year period. Program participants in the base year are followed and surveyed for two succeeding years. We are able to examine their career decisions and their evaluation of how their preparation has served them as their careers begin. If warranted, we could extend the study to follow these individuals beyond the proposed three-year period. This longitudinal analysis provides a much stronger methodological foundation for assessing the effect of preparation on teachers' careers and student outcomes than cross sectional analysis.

## **Broader Impact**

The project addresses questions of national importance and immediate policy relevance, yielding broad impacts well beyond the community of education researchers. Colleges and universities that prepare teachers have specific guidance on what practices and policies are most effective. School districts have valuable recruitment and retention information on the

effects of preparation pathways on retention and performance of teachers. The research informs policy discussions on the role of alternative certification. State policy makers are better able to assess how policies governing teacher preparation programs and teacher credentialing can improve student outcomes while minimizing deterrent effects. The project provides particularly useful information on the role of teacher preparation and other factors in the most difficult to staff schools - those composed almost entirely of non-white poor students, whose outcomes have lagged substantially behind their peers.

For these reasons the research has strong support from key policymakers in New York. The proposal grew out of discussions with, and substantial input from, Nick Michelli, University Dean of Education, City University of New York, Joyce Coppin and Lori Mei of the NYC public schools, Deputy Commissioners Johanna Duncan-Potier and Jim Kadamus of the NYS Education Department, and their staffs. Since then New York State Education Department Commissioner Mills and New York City Chancellor Klein have offered active support and have pledged to assist in providing the needed data. Deans of the 20 teacher-preparation institutions that supply the greatest number of new teachers to the NYC public schools each year have agreed to participate in the research project. As schools every where confront the issues of how best improve student learning the research has implications for policy and practice across the nation.

### **Outside Advisors**

The project has both a technical advisory panel and a policy advisory board. The technical advisory panel is composed of: Carla Asher, CUNY; Vicki Bernstein, NYCDOE; Marilyn Cochran-Smith, Boston College; David Cohen, University of Michigan; Ronald Ehrenberg, Cornell University; Robert Floden, Michigan State University; Lori Mei, NYCDOE; Richard Murnane, Harvard University; Anna Maria Villegasa, Rutgers University. The policy advisory board includes representatives from CUNY, the NYCDOE, and the NYSED, meets regularly with the project team to review progress to date, address pending issues, and inform upcoming tasks. We view this communication as vital to the success of the project.

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