A Descriptive Analysis of New York's Science Teacher Labor Market, 1999 to 2009

Luke C. Miller
University of Virginia

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Abstract
Leveraging the wealth of detailed data on the teacher labor market in New York, this case study explored the preparation, certification, placement, and service of science teachers between 1999 and 2009. Just prior to this period, the state committed itself to the goal of having all first-year teachers entering the profession through formal preparation programs. New York ceased issuing temporary and emergency licenses, approved and expanded alternative preparation programs, and sought to eliminate the individual evaluation pathway into the state's teacher labor force. While not achieving its goal, substantial progress was made. The number of science teachers produced annually through approved in-state programs increased 74 percent. Of all science certificates issued to first-time applicants, the percent issued to individuals entering through formal preparation programs increased from 66 to 92 percent. The percent of all first-time science teachers hired during this period entering through a formal science preparation program increased from 37 to 78 percent. New York continued to struggle to retain its science teachers. After five years of teaching, 30 percent remain teaching science in the same school at which they began their careers, 18 percent had transferred schools to teach science, and 52 percent had exited science teaching.

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Teaching is a dynamic profession and teachers are under significant pressure to continually adapt to changing student needs, curriculum, instructional techniques, and societal expectations. For teachers to adapt successfully, they must have access to quality learning opportunities geared to where they are in their careers. The pressure felt by science teachers may be particularly acute given the emphasis placed on science as a key driver of economic growth and prosperity. Equipping science teachers with the knowledge and skills to be successful throughout their careers is essential.

Toward this goal, the National Research Council appointed the Committee on Strengthening Science Education through a Teacher Learning Continuum. The Committee commissioned this case study of the science teacher labor market in New York to provide a picture of one state's labor force at four key career stages: preparation, certification, initial placement, and early career service. Leveraging detailed administrative data on teachers and schools, this analysis answers the five questions the Committee posed:

1. How many science teachers are produced through approved traditional and alternative education programs?
2. How many individuals apply for first stage licenses in science and how many individuals are issued them?
3. How many first-year teachers accept science teaching positions?
4. What are the characteristics of schools do first-year teachers accept science teaching positions?
5. What is the transfer and attrition behavior of first-year science teachers during the first five years of their careers?

The analysis focuses on the 11-year period between the 1999-2000 and 2009-2010 school years. Results are disaggregated by pathway into teaching and by science subject.

New York is a large and diverse state from which much can be learned. While it is not representative of all other states, New York is not wholly dissimilar from other states. The state's teacher labor market is dominated to a meaningful degree by New York City as perhaps Los Angeles does in California, Houston in Texas, Chicago in Illinois, and Miami-Dade in Florida. There are also a substantial number of urban, suburban, and rural districts facing the same pressures as districts in many other states. New York has implemented serious reforms aimed at improving the overall quality of its teacher labor force in line with federal initiatives as well as efforts in other states. Finally, the wealth of detailed data available from New York to assess a set of science teacher labor market issues common to other states provide value to this case study.

This case study is organized into four sections. I begin with a review of the New York context focusing on state-specific reforms and a description of the current preparation options, the certificates available, and the structure of the science curriculum. In the second section, I summarize the data and measures analyzed. The presentation of the results in the third section is organized around each of the committee's five questions. The final section concludes.

The New York Context

New York's science teacher labor market during the 2000s was influenced by a variety of factors. A set of reform initiatives adopted by the Board of Regents in 1998 set in motion significant structural change that is still playing out.[1] The Highly Qualified Teacher provision of the *No Child Left Behind Act*, signed into law in January 2002, reinforced many of the Regent's initiatives. Finally, the severe economic contraction initiated by the subprime mortgage collapse in 2008 influenced both schools' hiring decisions and teachers' transfer and attrition behavior. Whereas the consequences of *NCLB* and subprime mortgage crisis are likely well known to the reader, a brief

[1] The New York State Board of Regents and The New York State Education Department (1998). *New York's Commitment: Teaching to Higher Standards*. Albany, NY: New York State Education Department.

review of the Regent's 1998 reform initiatives will provide essential contextual information for interpreting this case study's results.

In adopting higher standards for teacher preparation and certification, the Regents sought to support the new student performance standards and school accountability measures (including additional graduation requirements, more rigorous assessments, and school report cards) adopted several years earlier. A primary goal of the new teacher standards was to have by December 2004 all prospective teachers required to complete a formal preparation program thereby eliminating the Individual Evaluation pathway (transcript review). To achieve this goal, new recruitment strategies were proposed, additional requirements were placed on preparation programs, all preparation programs were reviewed and reregistered, and regulations for alternative preparation programs were adopted with the first program approved on July 14, 2000. Significant changes to the certification system included ceasing the issuance of temporary and emergency licenses effective September 2003 and replacing the Provisional Certificate, the first-stage license, with the Initial Certificate and the lifetime valid Permanent Certificate, the second-stage license, with the renewable Professional Certificate valid for five years effective February 2, 2004. Although New York has made significant strides, the original deadline of December 2004 for requiring all prospective teachers complete a formal preparation program has been pushed back several times and is currently May 1, 2014.

Preparation, Certificates, and Science Curriculum

There are currently 114 traditional preparation programs and 24 alternative preparation programs. All alternative programs are partnerships between institutions of higher education and school districts and are concentrated in the New York City vicinity. Roughly two-thirds of alternative programs are located in New York City or the surrounding communities compared to about two-fifths of traditional programs.

There are two types of alternative programs. Traditional B programs target individuals who hold a baccalaureate degree in a major in the subject area in which they seek to teach. Participants must complete a 200-hour introductory component, including at least 40 hours of field experience, and pass two certification exams prior to entering the classroom as the teacher of record. Fifteen of the 20 programs offer science preparation. Over 95 percent of alternative program participants complete Traditional B programs. The remaining complete Traditional C programs designed for individuals who have previously earned a graduate academic or graduate professional degree. Participants in these intensive programs are eligible to teach after roughly four hours of training in the identification and reporting of child abuse and school violence prevention and intervention as well as pass two certification exams. Each of the three types of preparation programs qualifies individuals for different entry level teaching certificates.

Teaching certificates in New York are defined by type, grade level, and subject area. The three types of entry level certificates are the Initial Certificate (formerly the Provisional Certificate), the Transitional B Certificate, and the Traditional C Certificate. The Initial Certificate is valid for five years at which time the teacher must meet the eligibility requirements to advance to the Professional Certificate (formerly the Permanent Certificate). Both the Transitional B and Transitional C Certificates are issued to individuals enrolled in approved alternative preparation programs. Each is valid for three years while the individual is enrolled in an approved alternative program. The Transitional B Certificate leads to the Initial Certificate. Transitional C Certificate leads to a Professional Certificate. These certificates are assigned to one of five overlapping grade levels: early childhood (birth to grade two), childhood (grades 1 to 6), middle childhood (grades 5 to 9), adolescent (grades 7 to 12), or all grades (pre-kindergarten to grade 12). New York's science certificates are issued for the middle childhood or adolescent grade levels in five subject areas: biology, chemistry, earth science, and physics plus general science as an extension.

Every science class taught in New York is linked to the state course catalog. Elementary science is taught to the childhood grades. At the middle childhood grades, courses are clustered in life, physical, earth, and other (integrated) science. Adolescent science courses are grouped into biology (including anatomy and physiology, botany, marine biology, and environmental science), chemistry (including forensics), physics, earth science (including astronomy, geology, oceanography), and other science courses.

Data

Data analyzed are collected annually by the New York State Education Department. They capture the full population of individuals prepared and/or seeking certification to become teachers as well as all individuals accepting positions as public school teachers. Information on individuals is pulled from annual Higher Education Act (HEA) Title II reports, TEACH system certificate records, and annual *Personnel Master Files* of teaching assignments. Characteristics of the schools in which they teach are gleaned from the annual *Institutional Master Files* and the school report cards. I augment these data with the National Center for Education Statistic's *Common Core of Data* to fill in missing values in the state data. The data cover the period between 1999 and 2009. (Throughout the report I refer to school years using the fall of the year, e.g., 1999 for 1999-2000.)

The five research questions asked by the Committee each target one of four stages in the process of becoming a public school teacher: preparation, certification, placement, and service. I identify a separate population of teachers for each of the four stages as follows:

- Preparation (research question 1): all individuals completing an in-state approved traditional preparation program in middle childhood or adolescent science plus all individuals receiving a certificate to teach middle childhood or adolescent science through participation in an in-state approved alternative preparation program between 1999 and 2009;

- Certification (research question 2): all individuals requesting an Initial (or Provisional), Transitional B, or Transitional C certificate in middle childhood or adolescent science between 1999 and 2009;
- Placement (research questions 3 and 4): all first-year teachers accepting teaching positions in any subject area in any New York state public school between 1999 and 2009 (with first-year science teachers identified); and,
- Service (research questions 5): all members of the first-year science teacher cohorts of 2003 through 2008 assigned to science courses in their first year, following them over the subsequent five years.

The preparation population is identified from the annual reports required by the HEA of individuals completing one of New York's traditional education preparation programs and individuals being issued a Traditional B or C certificate. For the purposes of this analysis, science teachers complete either a traditional or an alternative preparation program. Individuals observed in the data completing both types of programs are assigned to the program completed first.[2] Within a program type, individuals may complete programs in more than one grade level and science subject (e.g., middle childhood and adolescent biology, adolescent biology and general science, etc.).

The TEACH system records are used to identify the certification population. They cover all individuals requesting a certificate and indicate the type, grade level, and subject of the request and if it was issued or denied. Only individuals requesting an Initial, Transitional B, or Transitional C certificate during the first year an individual appears in the data for *any* New York certificate are included. This excludes requests from a teacher requesting an Initial Certificate in adolescent biology

[2] For example, it is possible for an individual to complete a traditional program in adolescent chemistry and then complete an alternative preparation program in middle childhood biology. Individuals remaining a teacher after completing an alternative program are expected to appear twice: first for their Transitional B or Transitional C certificate and then in the HEA data as a completer of the program at the institution of higher education partnering with their district.

after teaching mathematics for three years. The certificate population focuses on individuals' first-time first-stage certificate requests. All requests made during that first year are analyzed.

Finally, culling first-year teachers from the *Personnel Master Files* establishes the placement population. These files list the subjects and grade levels each teacher teaches and the school at which they teach. Any first-year teacher teaching at least one science course at any grade level is identified as a first-year science teacher. This includes individuals who may also teach other subjects in addition to science. Linking these files across years permits the tracking of teachers over their career within the state's public school system, creating the service population.

An alternative approach would have been to identify cohorts of teachers and follow individuals through the four stages from preparation to service. The primary strength of this approach is that it allows for an analysis of transitions from one stage to another while placing increasing demands on the data. Given the research questions' focus on individual stages rather than transitions, I opt against the cohort approach, avoiding the increased demands it places on the data. Care should therefore be taken when drawing inferences about transitions from the analysis presented here.

Two concepts weave together the analysis of various stages: preparation pathway and science subject area. New York recognizes four pathways into teaching: completion of an approved in-state traditional or alternative preparation programs, compliance with interstate reciprocity agreements, and individual evaluation. The certification data indicates each applicant's preparation pathway. Science subjects are defined either by the certificate requested or subject taught. Teachers have one pathway into science teaching but may be certified in and/or teach more than one science subject.

Results

Before turning to the results, the numbering of the tables and figures needs to be explained. An effort was made to harmonize the analysis of the science teacher labor market in New York with that also requested in Florida. Tables numbered sequentially from 1 to 13 are shared between the two case studies and are designed to facilitate direct comparison. They present similar statistics based on similar data analyzed in a similar manner. Also to permit comparisons, I present all statistics involving preparation pathway over two different periods: the full period from 1999 to 2009 and the shorter period from 1999 to 2005 covered by the Florida data. Tables unique to the New York analysis are numbered sequentially with the "NY" prefix. All figured are numbered identically to the tables on which they are based (e.g., Figure 1 displays statistics from Table 1, Figure NY3 displays statistics from Table NY3, etc.).

The size of the student population is one of the many factors influencing a state's demand for science teachers. (See table 1 and figure 1.) Over the period between 1999 and 2009, the high school population has increased 10 percent from roughly 781 thousand to 862 thousand students. All else constant, a growing high school student population is expected to lead to increased demand for high school science teachers. The middle school population increased 6 percent over the first half of the period from almost 620 thousand in 1999 to almost 658 thousand in 2003 before decreasing 7 percent to 609 thousand in 2009. Given these fluctuations, the demand for middle school science teachers was likely more volatile than that for high school science teachers all else equal.

TABLE 1. Annual statewide membership in grades 6-8 and 9-12, 1999 to 2009

School Year	Grades 6-8	Grades 9-12
1999	619,865	781,154
2000	631,667	782,358
2001	650,458	788,711
2002	656,790	803,157
2003	657,778	821,149
2004	650,121	844,501
2005	636,049	850,757
2006	618,564	854,196
2007	604,055	852,012
2008	591,152	839,775
2009	609,023	861,927

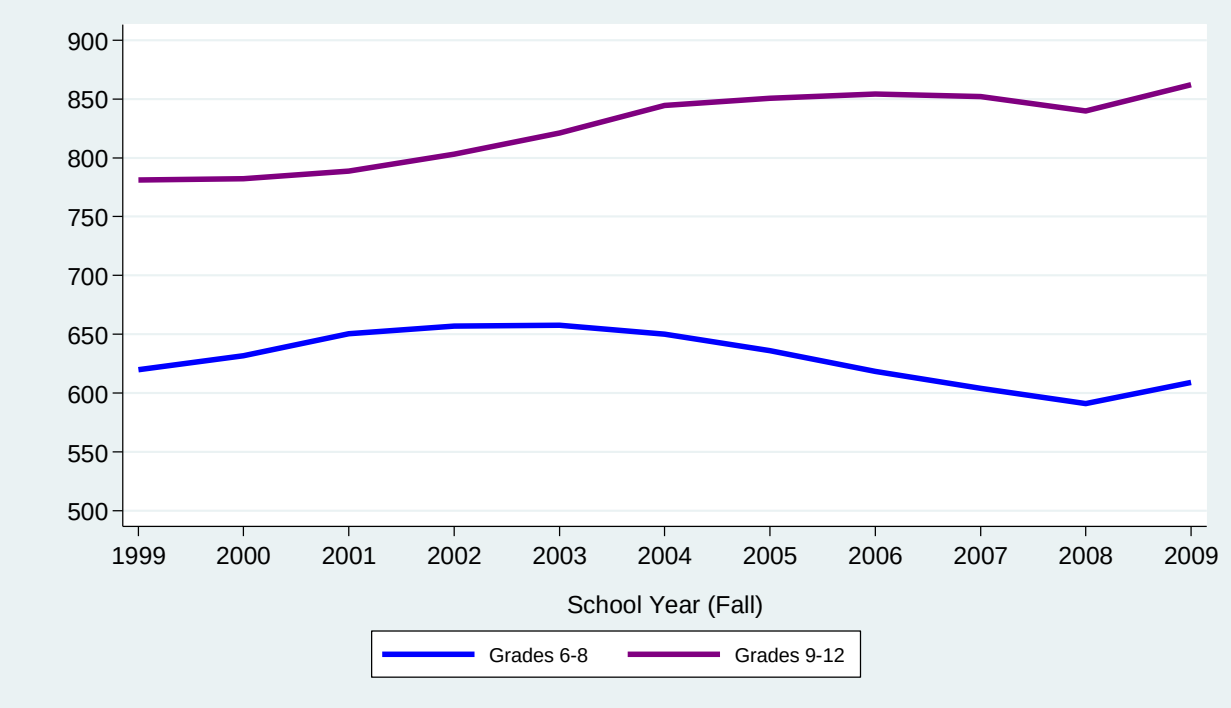

FIGURE 1. Annual statewide membership in grades 6-8 and 9-12, 1999 to 2009

Preparation

How many science teachers are produced through approved traditional and alternative education programs?

The first stage in becoming a teacher is preparation. Between 1999 and 2009, 9,635 individuals completed an approved in-state science teacher preparation program (table NY1). Eighty-four percent (8,073) completed a traditional program with the remaining 16 percent (1,562) completing an alternative program. The number of science teachers produced annually increased 74 percent from 567 in 1999 to 984 in 2009 with both types of programs expanding. By 2009, alternatively prepared science teachers accounted for almost 20 percent of adolescent science teachers and 35 percent of middle childhood science teachers (figure NY3).

Middle childhood science is less popular among the traditional than alternative program completers (7 versus 11 percent) while adolescent science programs are more common (95 versus 90 percent). Middle childhood science programs however experienced larger growth during the period (250 versus 73 percent) owing in large part to the increased focus on middle childhood science following the Regents 1998 reform initiative (table NY2).

Biology is by far the most popular subject at both the middle childhood and adolescent levels (52 and 66 percent, respectively) and among both traditional and alternative program completers (66 and 62 percent, respectively) (table NY3). Chemistry and physics are substantially less common with earth science even less so. Since the certificate changes taking effect in February 2004, the number of general science program completers decreased substantially (table NY2).

TABLE NY1. Number of science teachers produced through approved in-state traditional and alternative preparation programs by grade level and year, 1999 to 2009

Year	Middle Childhood		Adolescent		Combined		Total
	Traditional	Alternative	Traditional	Alternative	Traditional	Alternative	
1999	34	0	536	0	567	0	567
2000	51	0	639	8	690	8	698
2001	45	0	658	35	703	35	738
2002	26	0	709	75	735	75	810
2003	47	0	808	193	842	193	1,035
2004	127	2	657	168	757	169	926
2005	49	8	749	175	770	179	949
Subtotal	379	10	4,756	654	5,064	659	5,723
2006	34	21	754	247	765	268	1,033
2007	46	54	697	139	708	192	900
2008	48	40	725	214	745	250	995
2009	79	40	771	156	791	193	984
Total	586	165	7,703	1,410	8,073	1,562	9,635

TABLE NY2. Number of science teachers produced through approved in-state preparation programs by grade level and subject and year, 1999 to 2009

Preparation Pathway	Total	Biology	Chemistry	Physics	Earth Science	General Science
			Middle Childhood			
1999	34	5	1	0	0	33
2000	51	10	0	0	3	45
2001	45	16	0	0	0	42
2002	26	7	0	0	1	24
2003	47	13	5	0	1	30
2004	129	84	16	4	13	13
2005	57	42	8	0	4	3
2006	55	34	10	3	4	4
2007	100	64	14	1	18	3
2008	88	44	10	4	30	0
2009	119	74	27	3	14	1
Total	751	393	91	15	88	198
			Adolescent			
1999	536	379	86	24	81	147
2000	647	459	105	38	90	208
2001	693	518	98	31	88	215
2002	784	546	126	47	111	268
2003	1,001	638	151	57	159	206

(cont.)

TABLE NY2. Number of science teachers produced through approved in-state preparation programs by grade level and subject and year, 1999 to 2009 (cont.)

Preparation Pathway	Total	Biology	Chemistry	Physics	Earth Science	General Science
2004	825	532	101	43	133	59
2005	924	565	125	59	143	82
2006	1,001	684	133	42	131	46
2007	836	550	107	56	118	24
2008	939	596	173	46	132	45
2009	927	571	159	58	135	77
Total	9,113	6,038	1,364	501	1,321	1,377
			Combined			
1999	567	384	87	24	81	180
2000	698	469	105	38	93	253
2001	738	534	98	31	88	257
2002	810	553	126	47	112	292
2003	1,035	643	151	57	160	236
2004	926	596	114	47	146	72
2005	949	579	129	59	147	85
2006	1,033	703	140	44	133	50
2007	900	586	118	56	133	27
2008	995	615	180	50	161	45
2009	984	610	177	58	148	77
Total	9,635	6,272	1,425	511	1,402	1,574

Notes: Sums across subjects within year and across grade level within subject do not equal totals because individuals can complete more than one program within a pathway and most general science programs are combined with another subject (e.g., biology with a general science extension).

TABLE NY3. Science teachers produced through approved in-state traditional and alternative preparation programs by grade level and subject, 1999 to 2009

Preparation Pathway	Total	Biology	Chemistry	Physics	Earth Science	General Science
			Middle Childhood (1999 to 2009)			
Traditional	586	301	70	13	38	198
Alternative	165	92	21	2	50	0
Total	751	393	91	15	88	198
			Adolescent (1999 to 2009)			
Traditional	7,703	5,145	1,123	497	1,150	1,308
Alternative	1,410	893	241	4	171	69
Total	9,113	6,038	1,364	501	1,321	1,377
			Combined (1999 to 2009)			
Traditional	8,073	5,299	1,163	505	1,182	1,505
Alternative	1,562	973	262	6	220	69
Total	9,635	6,272	1,425	511	1,402	1,574
			Middle Childhood (1999 to 2005)			
Traditional	379	169	29	4	21	190
Alternative	10	8	1	0	1	0
Total	389	177	30	4	22	190
			Adolescent (1999 to 2005)			
Traditional	4,756	3,234	684	295	718	1,116
Alternative	654	403	108	4	87	69
Total	5,410	3,637	792	299	805	1,185
			Combined (1999 to 2005)			
Traditional	5,064	3,352	701	299	739	1,306
Alternative	659	406	109	4	88	69
Total	5,723	3,758	810	303	827	1,375

Notes: Sums across subjects within route and sums across grade level within subject do not equal totals because individuals can complete more than one program within a pathway and most general science programs are combined with another subject (e.g., biology with a general science extension).

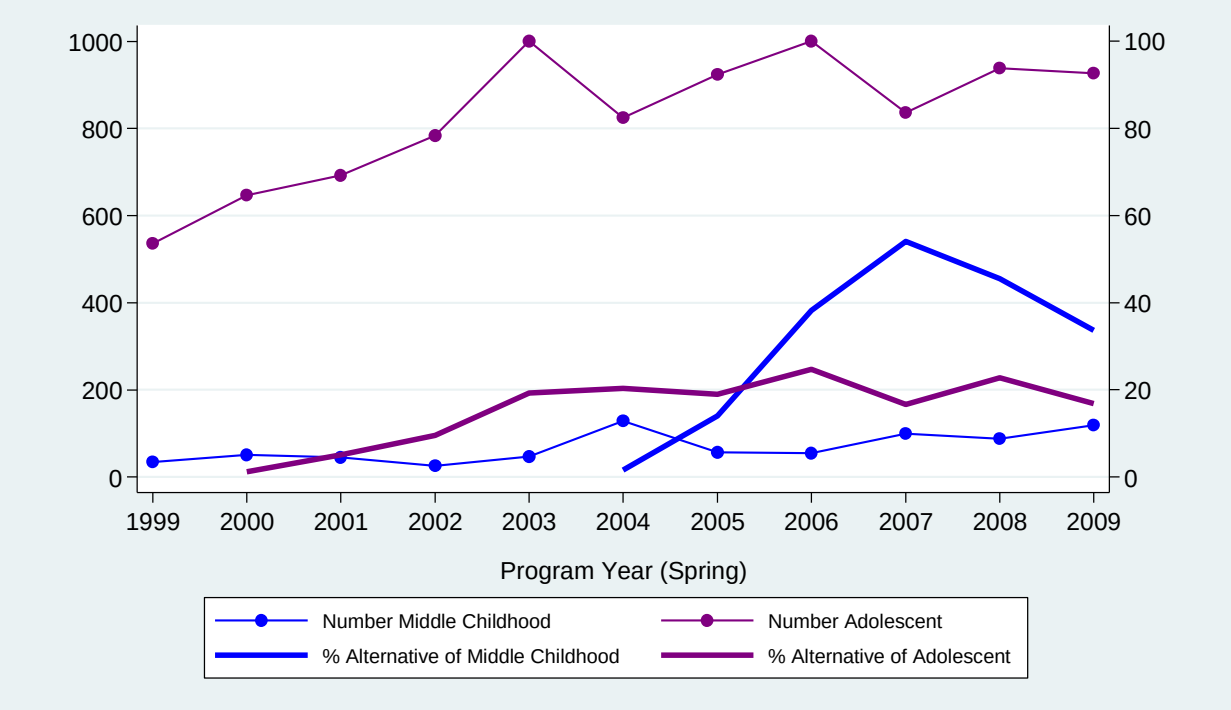

FIGURE NY3. Number of science teacher produced through approved in-state preparation programs and percent from alternative preparation programs by year, 1999 to 2009

Certification

How many individuals apply for first stage licenses in science and how many individuals are issued them?

The second stage of becoming a teacher is certification. Over the eleven years, there were 17,014 science requests made by 13,507 first-time applicants (table 2). Seventy-seven percent (13,058 requests) were approved and issued to 78 percent of applicants (10,486). Applicants from traditional programs accounted for the largest share of requests (7,804 or 46 percent). Requests from prospective teachers through the individual evaluation pathway accounted for 33 percent, the second largest share. The annual number of requests increased 22 percent with a very large 87 percent increase between 1999 and 2003, the last year temporary/emergency certificates were issued, and the year before the requirements for the new Initial and Professional certificates were

implemented. (Anyone receiving a Provisional certificate before this change would continue to be eligible for the lifetime Permanent certificate.)

New York made meaningful progress towards its goal of having all new teachers complete a formal preparation program. As can be seen in figure 2A, the number of requests from the individual evaluation pathway decreased dramatically following the elimination of temporary/emergency certificates in September 2003 and the initial deadline of December 2004 for eliminating this pathway. At the same time, the number of requests through the in-state traditional and alternative programs increased as did requests under interstate reciprocity agreements which require new teachers to have completed a formal preparation program in the other jurisdiction.

Approval rates varied substantially across the pathways (table 2). Almost all requests through traditional preparation programs were approved (96 percent) and almost all individuals received at least one approval (98 percent). Approval rates were slightly lower for the alternative preparation programs (90 percent of requests and 91 percent of individuals). In contrast, a third of all requests through interstate reciprocity agreements were rejected (33 percent) and 22 percent of individuals had all their requests denied. Rejection rates were even higher within the individual evaluation pathway (51 percent of requests and 54 percent of individuals). These applicants likely expected to be rejected as the purpose of many requests was to find out exactly what additional requirements needed to be satisfied before being approved.

Requests for adolescent science certificates were more likely to be approved than middle childhood science requests (78 versus 64 percent) (table 3). In fact, the approval rate declined for middle childhood certificates from 79 percent in 1999 to 61 percent in 2009 and increased for adolescent science from 74 percent in 1999 to 78 percent in 2009.

Approval rates were rather consistent across subjects within both the traditional and alternative pathways (table 4). Requests through the traditional preparation pathway varied between

93 percent in chemistry to 97 percent in biology and earth science. Among alternative pathway requests the approval rate varied from 87 percent in chemistry to 93 percent in earth science. There was more variability in approval rates for both the interstate reciprocity and individual evaluation pathways. Only a third of requests for a certificate in physics through the individual evaluation pathway were approved versus 74 percent of requests for general science through the same pathway.

TABLE 2. Number of first-time science Initial Certificates requested and issued by preparation pathway and year, 1999 to 2009

Year	Requested					Issued				
	All Pathways	Trad	Alt	Inter Recip	Ind Eval	All Pathways	Trad	Alt	Inter Recip	Ind Eval
1999	1,281	596	0	48	637	948	585	0	41	322
2000	1,226	511	9	112	594	873	495	9	97	272
2001	1,361	602	38	128	593	978	586	34	96	262
2002	1,666	730	73	173	690	1,318	713	68	141	396
2003	2,393	868	170	250	1,105	2,012	832	158	196	826
2004	1,267	645	166	240	216	998	627	158	165	48
2005	1,368	641	181	225	321	1,042	612	173	161	96
Subtotal	10,562	4,593	637	1,176	4,156	8,169	4,450	600	897	2,222
2006	1,709	794	303	210	402	1,292	752	269	110	161
2007	1,590	783	240	222	345	1,210	751	198	134	127
2008	1,590	775	303	202	310	1,202	729	258	97	118
2009	1,563	859	228	142	334	1,185	810	215	70	90
Total	17,014	7,804	1,711	1,952	5,547	13,058	7,492	1,540	1,308	2,718

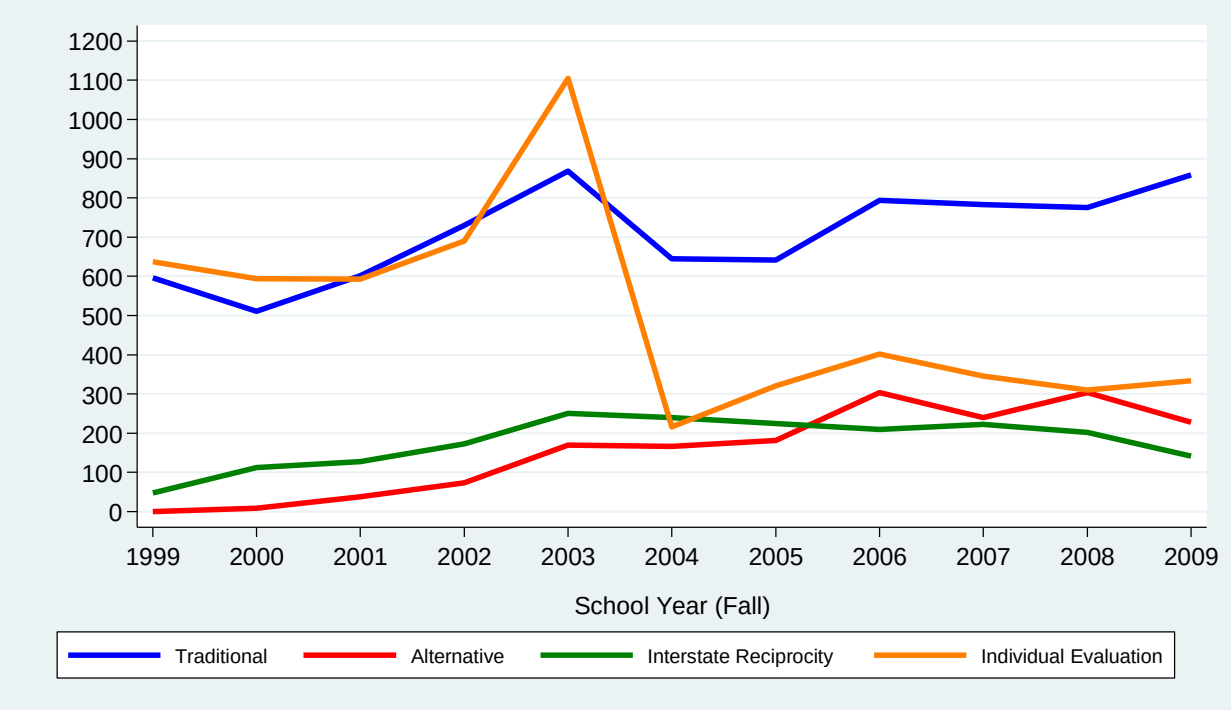

FIGURE 2A. Number of first-time science Initial Certificates requested by preparation pathway and year, 1999 to 2009

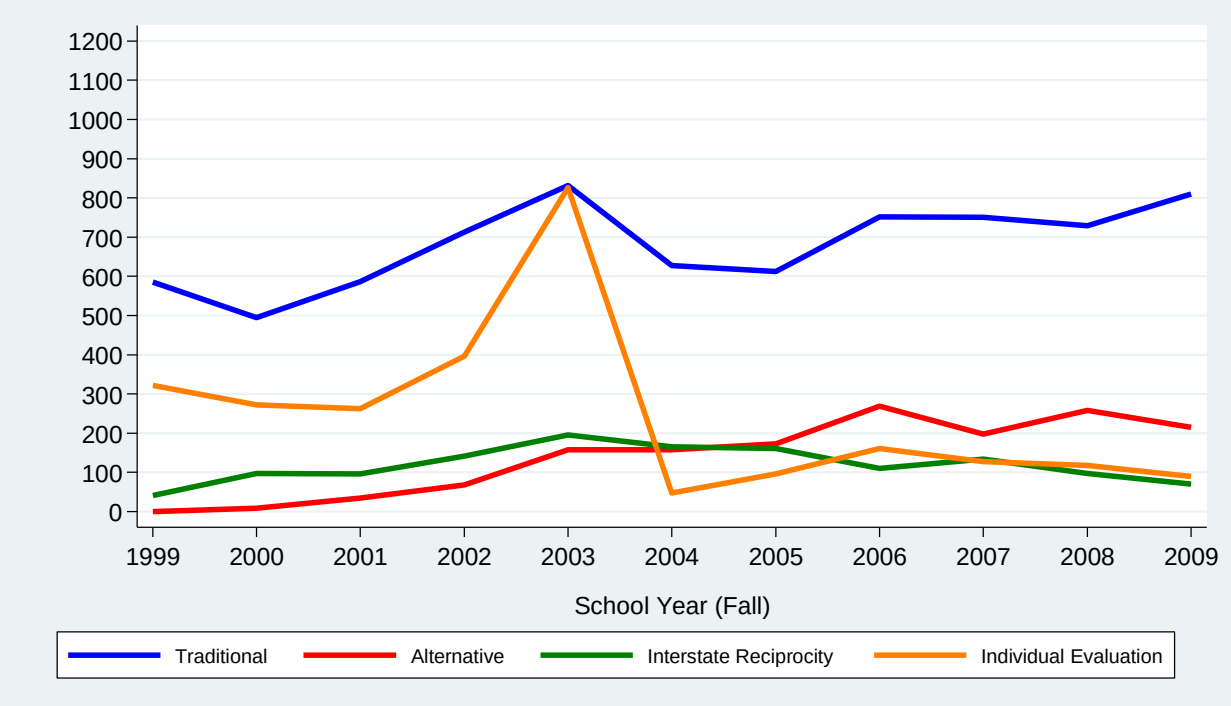

FIGURE 2B. Number of first-time science Initial Certificates issued by preparation pathway and year, 1999 to 2009

TABLE 3. Number of first-time science Initial Certificates requested and issued by grade level and subject, 1999 to 2009

Year	Total	Middle Childhood						Adolescent					
		Biology	Chemistry	Physics	Earth	General	Subtotal	Biology	Chemistry	Physics	Earth	General	Subtotal
						Requested							
1999	1,281	37	6	1	15	70	62	659	268	97	184	1081	1,219
2000	1,226	40	9	0	8	61	63	649	242	102	156	957	1,163
2001	1,361	55	7	2	6	74	77	733	273	96	164	928	1,284
2002	1,666	50	6	5	18	82	82	885	338	124	210	1327	1,584
2003	2,393	106	36	7	20	201	176	1,199	484	205	307	1959	2,217
2004	1,267	59	15	5	10	54	143	599	131	89	120	189	1,124
2005	1,368	78	13	5	17	29	142	580	189	90	156	211	1,226
2006	1,709	96	17	6	24	15	158	820	248	128	202	153	1,551
2007	1,590	118	26	8	40	19	211	763	230	110	158	118	1,379
2008	1,590	115	12	6	44	7	184	773	212	124	164	133	1,406
2009	1,563	101	20	5	40	8	174	688	238	113	194	156	1,389
Total	17,014	855	167	50	242	620	1,472	8,348	2,853	1,278	2,015	7,212	15,542
						Issued							
1999	948	29	5	0	12	63	49	495	193	59	141	1,001	899
2000	873	29	6	0	4	51	45	482	151	55	126	875	828
2001	978	46	3	0	3	72	58	561	172	46	123	850	920
2002	1,318	41	5	3	15	74	67	733	248	72	171	1,213	1,251
2003	2,012	89	27	4	16	189	141	1,043	390	151	270	1,868	1,871
2004	998	38	9	2	3	26	78	499	102	62	102	159	920
2005	1,042	40	6	4	6	20	76	471	125	68	127	175	966
2006	1,292	52	11	3	11	8	85	665	171	84	164	123	1,207
2007	1,210	85	16	2	22	14	139	618	161	73	124	95	1,071
2008	1,202	61	6	1	22	6	96	636	148	87	126	109	1,106
2009	1,185	70	14	3	19	1	107	535	159	90	157	137	1,078
Total	13,058	580	108	22	133	524	941	6,738	2,020	847	1,631	6,605	12,117

Notes: Sums of subjects do not equal total because most certificates for general science are combined with other subjects (e.g., adolescent biology with a general science extension).

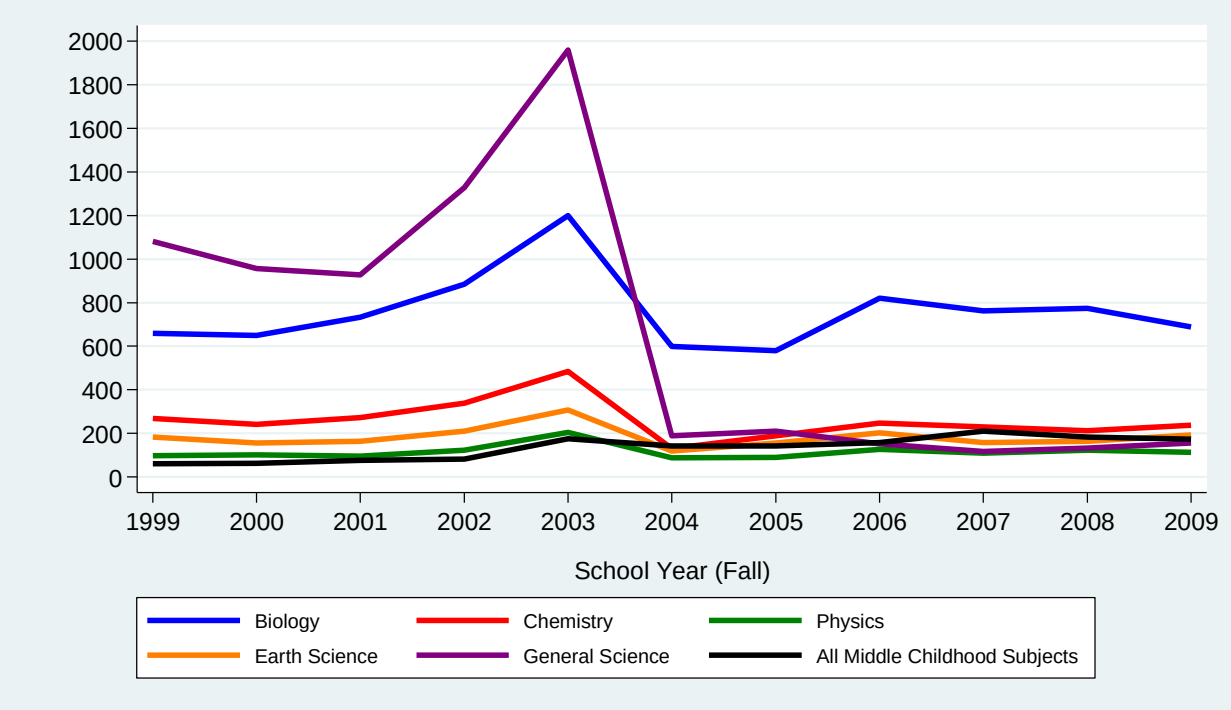

FIGURE 3A. Number of first-time science Initial Certificates requested by subject and year, 1999 to 2009

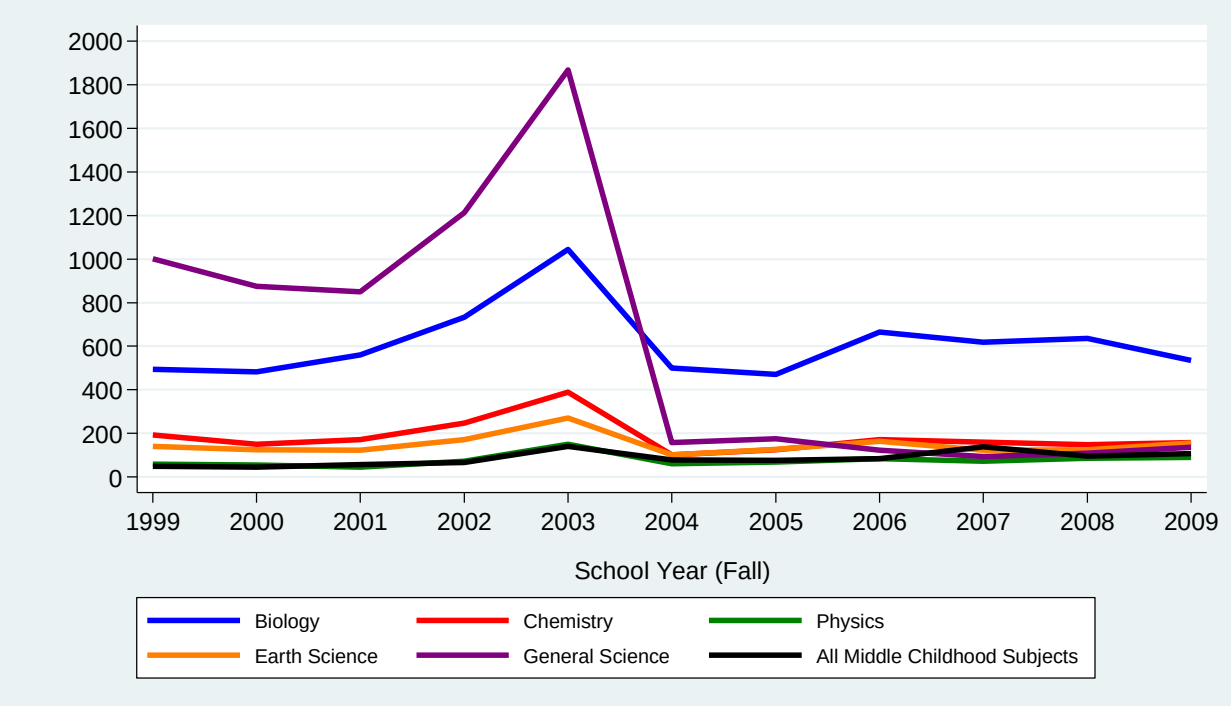

FIGURE 3B. Number of first-time science Initial Certificates issued by subject and year, 1999 to 2009

TABLE 4. Number of first-time science Initial Certificates requested and issued by grade level, subject and preparation pathway, 1999 to 2009

Year	Total	Middle Childhood						Adolescent					
		Biology	Chemistry	Physics	Earth	General	Subtotal	Biology	Chemistry	Physics	Earth	General	Subtotal
						Requested (1999 to 2009)							
Traditional	7,804	357	55	15	69	307	562	3,883	1,123	468	1,033	3,506	7,242
Alternative	1,711	123	27	3	53	0	206	930	266	120	177	120	1,505
Int. Recip.	1,952	82	20	7	30	63	177	989	342	170	173	645	1,775
Ind. Eval.	5,547	293	65	25	90	250	527	2,546	1,122	520	632	2,941	5,020
Total	17,014	855	167	50	242	620	1,472	8,348	2,853	1,278	2,015	7,212	15,542
						Issued (1999 to 2009)							
Traditional	7,492	336	52	14	63	296	525	3,792	1,044	446	1,007	3,416	6,967
Alternative	1,540	98	23	2	48	0	171	851	232	107	167	114	1,369
Int. Recip.	1,308	46	10	2	6	38	80	709	222	115	115	561	1,228
Ind. Eval.	2,718	100	23	4	16	190	165	1,386	522	179	342	2,514	2,553
Total	13,058	580	108	22	133	524	941	6,738	2,020	847	1,631	6,605	12,117
						Requested (1999 to 2005)							
Traditional	4,593	207	36	9	38	288	337	2,328	724	271	618	3,086	4,256
Alternative	637	9	1	0	3	0	13	375	101	55	81	120	624
Int. Recip.	1,176	37	5	4	8	58	87	611	217	83	102	620	1,089
Ind. Eval.	4,156	172	50	12	45	225	308	1,990	883	394	496	2,826	3,848
Total	10,562	425	92	25	94	571	745	5,304	1,925	803	1,297	6,652	9,817
						Issued (1999 to 2005)							
Traditional	4,450	197	35	8	37	282	323	2,277	680	256	606	3,046	4,127
Alternative	600	8	1	0	3	0	12	356	91	51	78	114	588
Int. Recip.	897	27	5	2	3	36	51	485	163	68	79	545	846
Ind. Eval.	2,222	80	20	3	16	177	128	1,166	447	138	297	2,436	2,094
Total	8,169	312	61	13	59	495	514	4,284	1,381	513	1,060	6,141	7,655

Notes: Sums of subjects do not equal total because most certificates for general science are combined with other subjects (e.g., adolescent biology with a general science extension).

Placement

How many first-year teachers accept science teaching positions?

The third stage of becoming a teacher is placement in a teaching position. Between 1999 and 2003, there were 9,188 teachers teaching at least one science course in the first year of their careers (table 5). (This is underestimated by about 470 teachers due to the lack of data from New York City in 2002.) First-year science teachers accounted for between 7 and 9 percent of all first-year teachers, excluding 2002. The share of science teachers not certified in science decreased from 32 percent in 1999 to 14 percent in 2009. The matching of teachers to science courses also improved as the share of first-year teachers certified in science yet not teaching any science courses decreased from 14 percent in 1999 to 7 percent in 2009. These improvements were not driven by a decreased demand for science teachers as they appeared years prior to the decline in hiring following the subprime mortgage crisis.

Fifty-two percent of these teachers completed an approved in-state preparation program (37 percent traditional, 15 percent alternative) with another 5 percent earning a science certificate through interstate reciprocity agreements (table 6). Again, the State's progress toward the elimination of the individual evaluation pathway is evidenced. Almost a third of first-year science teachers entered through this pathway between 1999 and 2002 versus 7 to 10 percent between 2005 and 2009. These teachers were primarily replaced by teachers from alternative preparation programs and to a lesser extent by teachers from traditional preparation programs and interstate reciprocity agreements (Figure 6). Of the 23 percent of teachers without a known pathway into science teaching, 12 percent had a temporary or emergency science certificate, 47 percent held a certificate for the Childhood grade level (grades 1-6) for which there are no science subject certificates, 26 percent held some other non-science certificate, and 15 percent were never observed in the certificate data.

Across the preparation pathways, the distribution of teachers among science subjects was fairly equal (table 9 and figure 9). Roughly 40 percent taught biological sciences, 20 percent taught physical sciences, and 36 percent taught middle school sciences. Teachers entering through the traditional program and individual evaluation pathways were slightly more likely to teach earth science than teachers from the alternative program and interstate reciprocity agreement pathways (20 versus 15 percent). Finally, teachers without a known science pathway were far more likely than other pathways to teach middle school science (60 percent) and elementary science (20 percent).

TABLE 5. Number of first-year teachers by science certification, subject taught, and year, 1999 to 2009

Year	All First-Year Teachers	Teaching One or More Science Courses		Not Teaching Any Science Courses	
		Certified in Science	No Science Certificate	Certified in Science	No Science Certificate
1999	10,180	573	269	95	9,243
2000	10,608	601	297	82	9,628
2001	11,338	706	365	102	10,165
2002	13,194	485	61	524	12,124
2003	12,060	714	206	104	11,036
2004	12,164	772	201	93	11,098
2005	11,846	657	203	65	10,921
2006	11,594	726	158	54	10,656
2007	12,073	743	160	58	11,112
2008	10,223	638	139	56	9,390
2009	5,708	443	71	32	5,162
Total	120,988	7,058	2,130	1,265	110,535

Notes: The number of science teachers in 2002 is underestimated due to lack of data from New York City. Most of these teachers are erroneously labeled not teaching any science courses because the imputation strategies used identified whether a teacher was teaching in 2002 in New York City but not what specific courses they taught.

TABLE 6. Number of first-year teachers assigned to science classes by pathway and year, 1999 to 2009

Year	Pathway					
	Traditional	Alternative	Interstate Reciprocity	Individual Evaluation	Unknown	Total
1999	290	0	18	265	269	842
2000	270	12	21	298	297	898
2001	312	34	26	334	365	1,071
2002	277	17	15	176	61	546
2003	300	129	50	235	206	920
2004	345	140	70	217	201	973
2005	327	178	69	83	203	860
Subtotal	2,121	510	269	1,608	1,602	6,110
2006	359	217	61	89	158	884
2007	362	228	64	89	160	903
2008	291	260	31	56	139	777
2009	227	159	17	40	71	514
Total	3,360	1,374	442	1,882	2,130	9,188

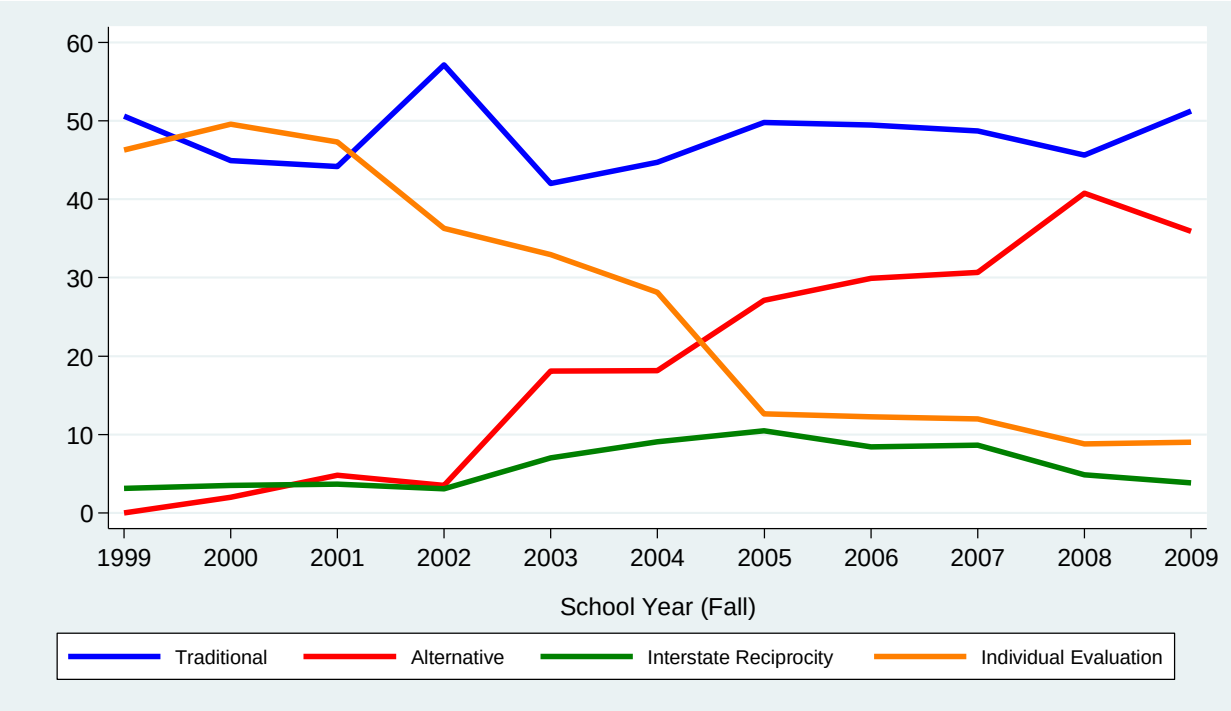

FIGURE 6. Pathway of first-year teachers assigned to science classes as a percentage of all first-year teachers assigned to science classes with known pathway, 1999 to 2009

Table 7. Annual number of first-year teachers certified in science by subject area certified, 1999 to 2009

Year	Total	Middle Childhood					Adolescent				
		Biology	Chemistry	Physics	Earth	General	Biology	Chemistry	Physics	Earth	General
1999	668	16	6	0	11	19	430	174	49	126	457
2000	683	27	4	1	4	25	449	150	49	116	442
2001	808	35	5	1	5	28	554	186	49	125	482
2002	1,009	34	5	0	8	28	644	233	81	162	588
2003	818	34	5	1	10	22	517	189	93	145	388
2004	865	49	16	3	11	48	545	169	83	149	310
2005	722	42	7	3	11	29	432	108	57	128	179
2006	780	38	8	3	11	13	466	132	56	130	128
2007	801	64	17	3	23	10	447	143	61	115	104
2008	694	51	13	0	21	10	400	113	52	102	85
2009	475	42	10	1	19	2	239	80	49	91	73
Total	8,323	432	96	16	134	234	5123	1677	679	1389	3236

Notes: Sums of subjects do not equal total because most certificates for general science are combined with other subjects (e.g., adolescent biology with a general science extension).

TABLE 8. Annual number of first-year teachers assigned to science classes by subject area taught, 1999 to 2009

Year	**Total**	Elementary	Life	Physical	Earth	Other Middle	Biology	Chemistry	Physics	Earth	Other High	Other
1999	842	146	89	151	93	82	267	115	49	140	12	79
2000	898	44	155	179	82	118	273	88	48	129	9	93
2001	1,071	48	167	172	86	152	353	150	59	149	19	116
2002	546	15	74	67	15	101	205	87	38	99	12	85
2003	920	25	129	122	76	109	303	137	58	160	24	95
2004	973	53	130	132	68	147	322	104	59	168	27	106
2005	860	38	118	110	61	133	297	94	52	127	18	76
2006	884	42	100	98	59	150	288	122	54	131	29	122
2007	903	36	78	76	54	180	292	119	63	136	31	124
2008	777	23	84	70	44	168	256	101	53	113	23	93
2009	514	15	56	24	31	105	158	86	52	101	8	39
Total	9,188	485	1,180	1,201	669	1,445	3,014	1,203	585	1,453	212	1,028

Notes: A teacher can teach in more than one subject.

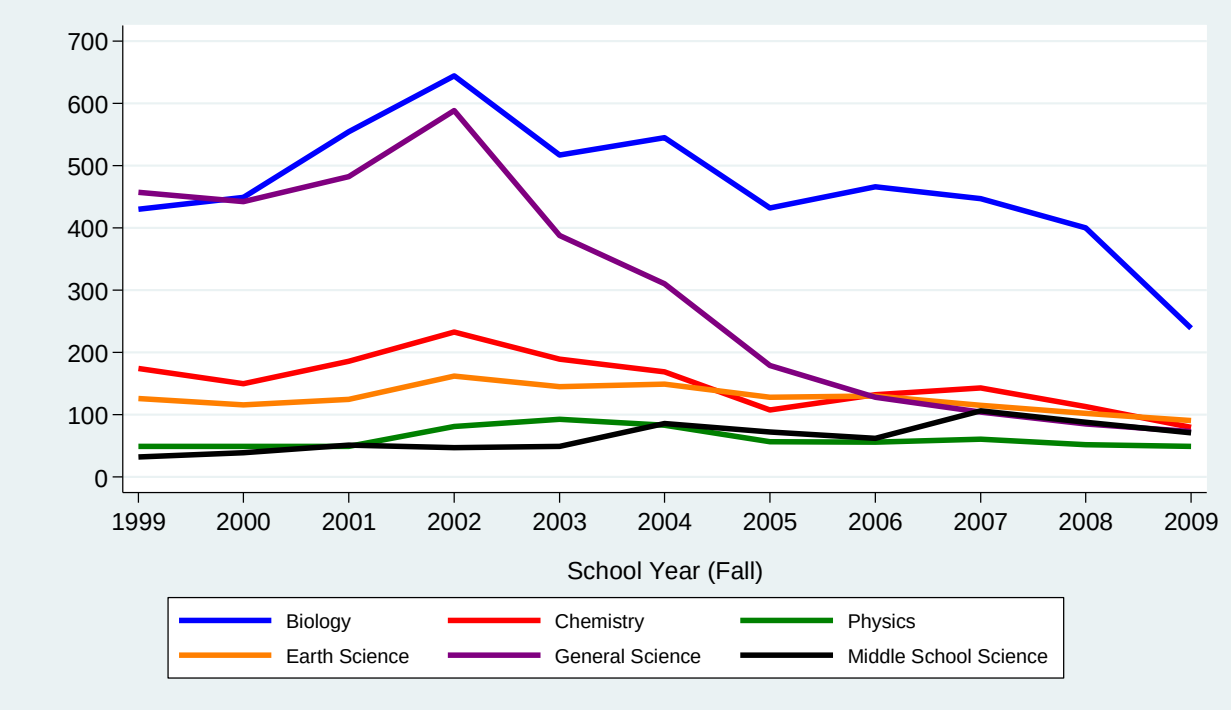

FIGURE 7. Annual number of first-year teachers certified in science by subject area certified, 1999 to 2009

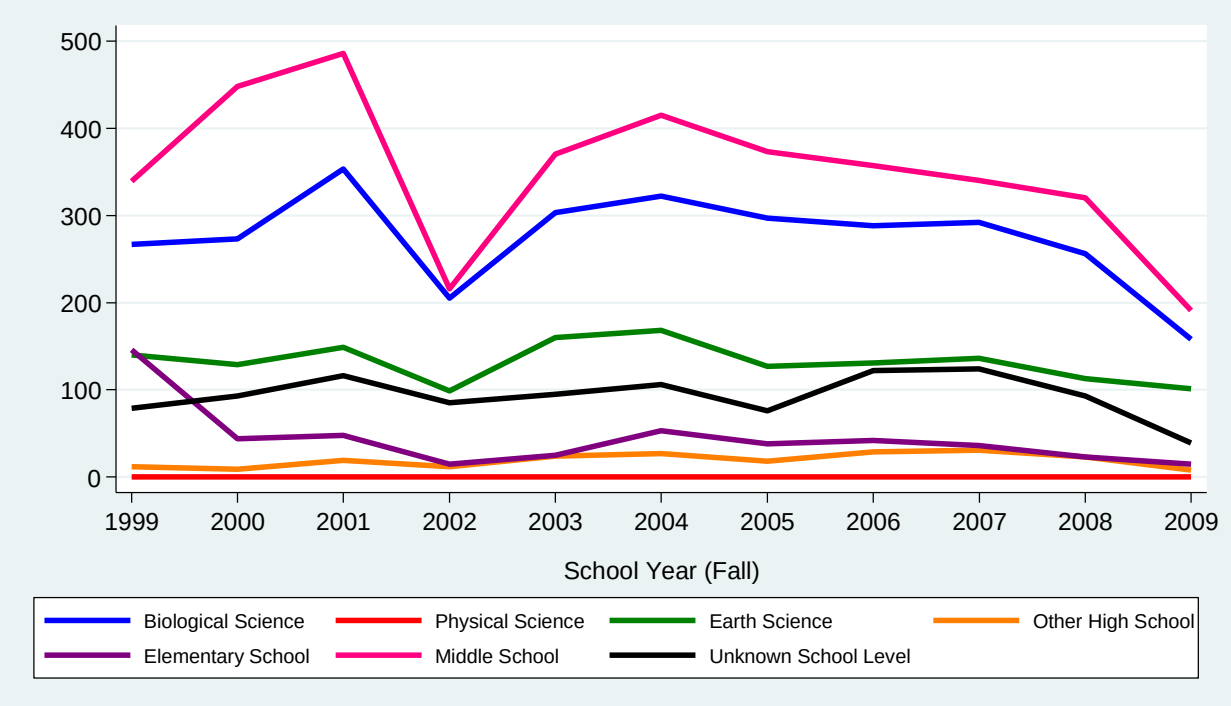

FIGURE 8. Annual number of first-year teachers assigned to science classes by subject area taught, 1999 to 2009

TABLE 9. First-year teachers assigned to science classes by subject area taught and by preparation pathway, 1999 to 2009

Preparation Pathway	Total	High School					Middle School Science	Elementary Science	Unknown Level
		Biology	Chemistry	Physics	Earth Science	Other			
					1999 to 2009				
Traditional	3,360	1,310	560	268	705	97	28	1,226	420
Alternative	1,374	529	197	88	197	31	5	517	162
Int. Recip.	442	186	55	34	66	14	4	141	61
Ind. Eval.	1,882	736	300	143	379	54	31	726	240
Unknown	2,130	253	91	52	106	16	417	1,245	145
Total	9,188	3,014	1,203	585	1,453	212	485	3,855	1,028
					1999 to 2005				
Traditional	510	198	69	31	76	14	2	206	54
Alternative	2,121	870	347	150	439	45	23	790	247
Int. Recip.	269	117	33	17	46	8	3	88	39
Ind. Eval.	1,608	627	251	128	325	43	31	625	209
Unknown	1,602	208	75	37	86	11	310	938	101
Total	6,110	2,020	775	363	972	121	369	2,647	650

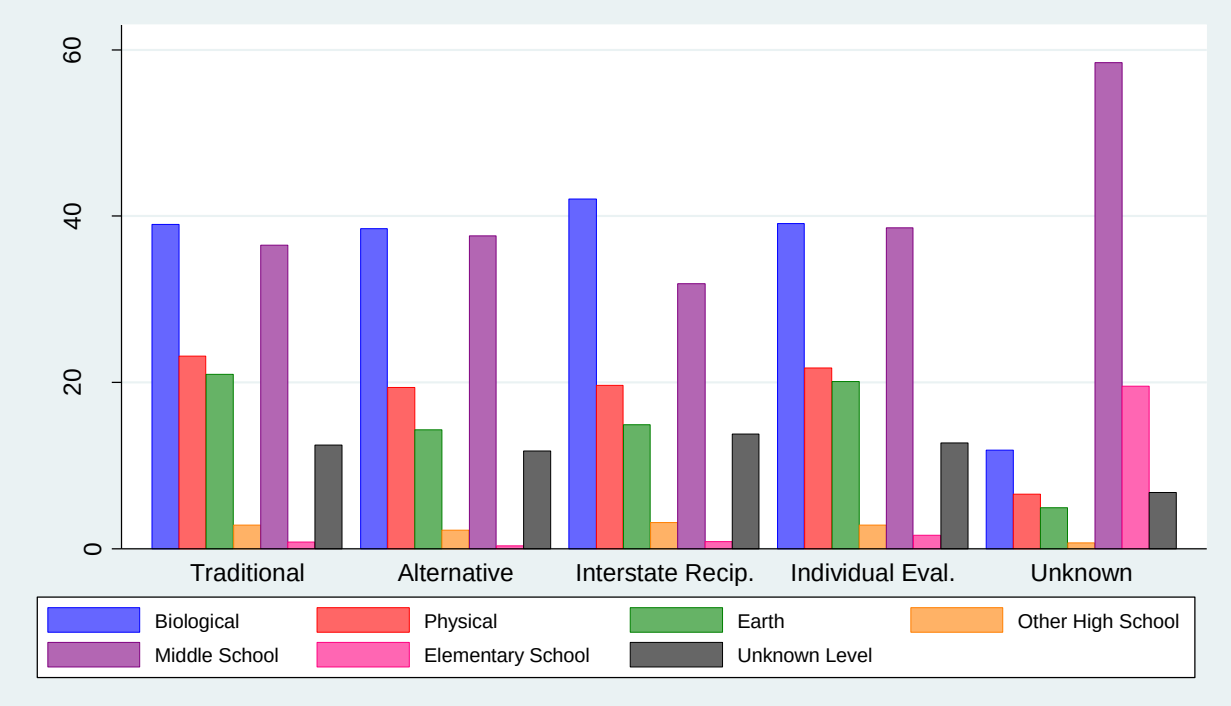

FIGURE 9. First-year teachers assigned to science courses by subject area taught and preparation pathway, 1999 to 2005

What are the characteristics of schools at which first-year teachers accept science teaching positions?

The placement of teachers in schools results from both teacher preferences over the jobs available and school preferences over the job applicants. All observed teacher-school matches reflect a combination of both sets of these preferences.

The characteristics of the schools in which teachers were placed changed substantially over time and differed between middle childhood and adolescent certified teachers. Whereas in the early years of the period teachers certified in science or teaching science were more likely to be placed in low poverty and low minority population schools, by the end of the period they were more likely to be placed in high poverty and high minority than low minority schools (table 10 and figures 10A-10D). Science teachers certified in adolescent science subjects were more likely to be placed in low poverty and low minority schools (table 11). Conversely, middle childhood teachers (other than those certified in general science) were more likely to be placed in high poverty and high minority schools. Science teachers not certified in science were roughly three times more likely to be placed in high poverty and high minority schools.

There were also marked differences in school characteristics across preparation pathway (table 12). As expected given the design of the programs, alternative pathway teachers were placed in schools with the highest poverty rates and highest minority percentages and were more likely than other teachers to be placed in schools that did not make AYP goals for ELA and mathematics performance or high school graduation rate. This was also due in part to the fact alternative pathway teachers were primarily placed in city districts which were more likely to sponsor alternative preparation programs. Comparing within school community type (city, suburb, town, and rural), the performance differences disappear but student characteristic differences remain.

TABLE 10. Distribution of first-year teachers certified in science and first-year teachers assigned to science classrooms by initial school percent free/reduced-price lunch and non-white, 1999 to 2009

Year	Certified in Science			Teaching a Science Course		
	0-30%	>30-70%	>70-100%	0-30%	>30-70%	>70-100%
	Percent eligible for free/reduced-price lunch					
1999	336	171	126	361	227	229
2000	385	197	75	437	280	154
2001	394	195	184	418	264	359
2002	376	160	138	367	141	17
2003	376	213	196	363	224	306
2004	326	209	249	329	224	332
2005	258	176	259	278	188	375
2006	264	185	301	285	203	370
2007	280	190	299	292	210	371
2008	187	178	297	187	193	372
2009	129	152	175	132	158	214
Total	3,311	2,026	2,299	3,449	2,312	3,099
	Percent non-white					
1999	346	81	206	369	116	332
2000	361	83	213	375	123	373
2001	407	102	264	419	146	476
2002	424	122	430	419	68	38
2003	373	99	313	361	117	415
2004	336	123	365	345	133	464
2005	250	91	352	260	106	475
2006	243	89	418	267	91	500
2007	272	96	401	285	113	475
2008	215	69	378	221	72	459
2009	164	51	241	165	61	278
Total	3,391	1,006	3,581	3,486	1,146	4,285

Notes: Totals do not match those in Table 5 due to missing data.

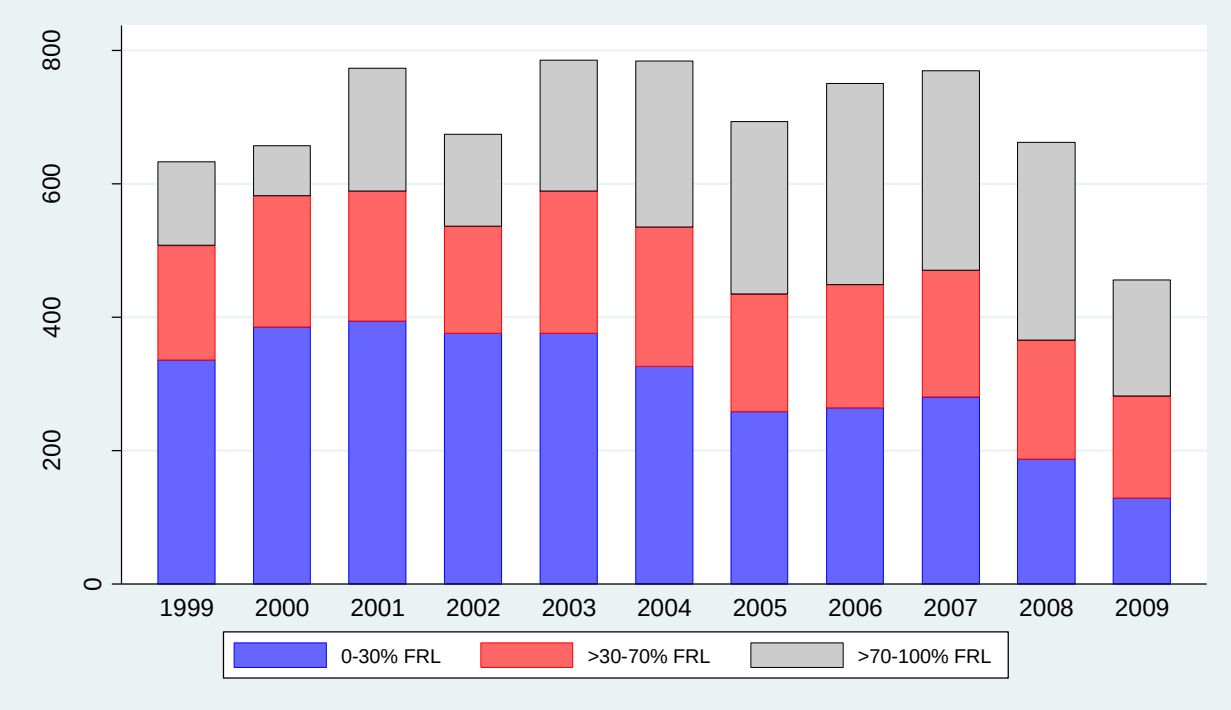

FIGURE 10A. Distribution of first-year teachers certified in science by initial school percent free/reduced-price lunch, 1999 to 2009

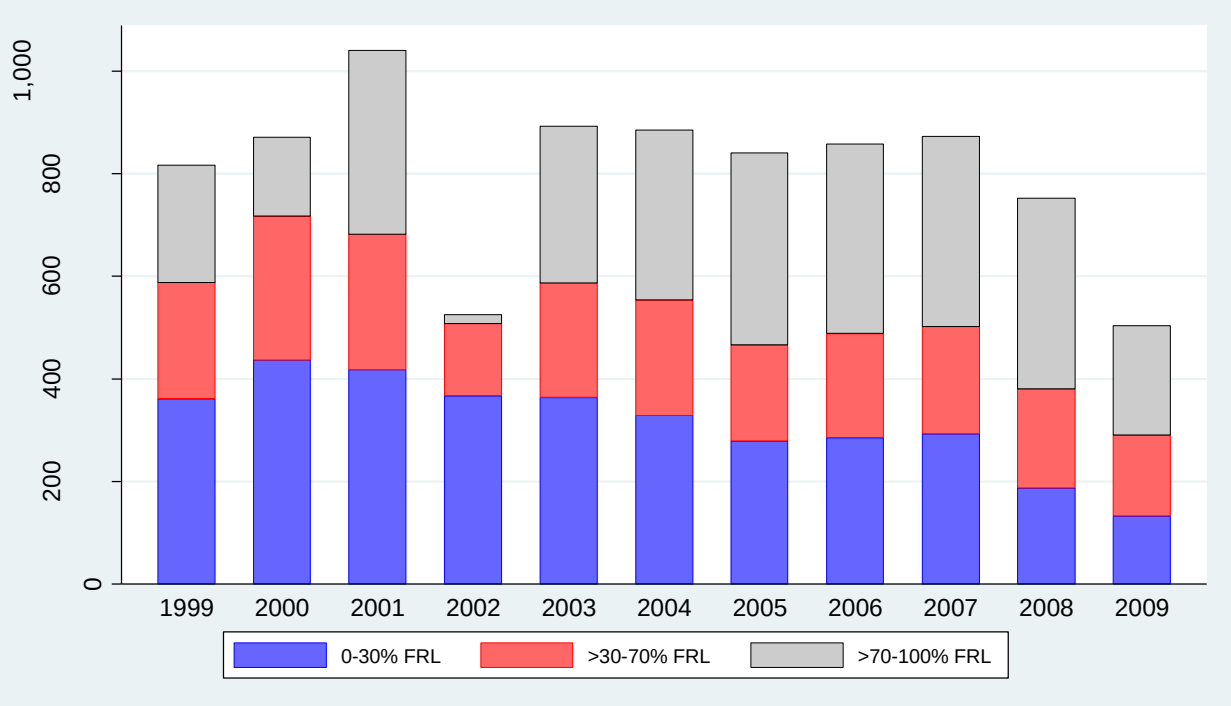

FIGURE 10B. Distribution of first-year teachers assigned to science classrooms by initial school percent free/reduced-price lunch, 1999 to 2009

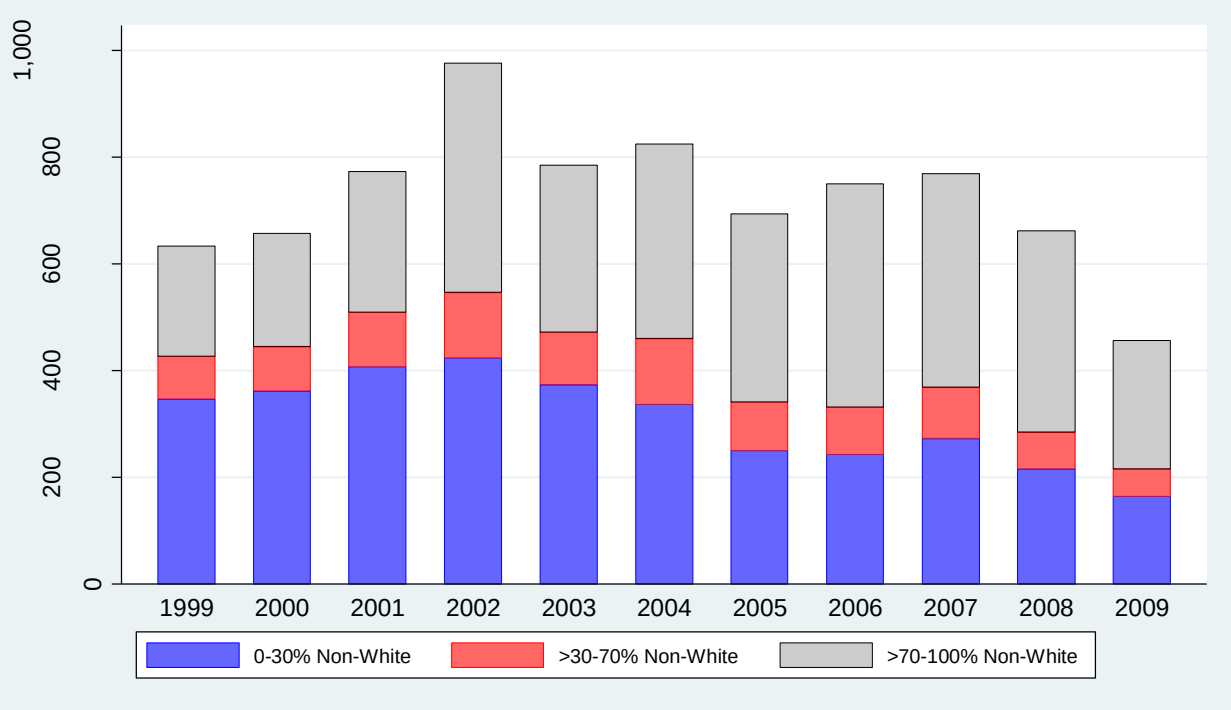

FIGURE 10C. Distribution of first-year teachers certified in science by initial school percent non-white, 1999 to 2009

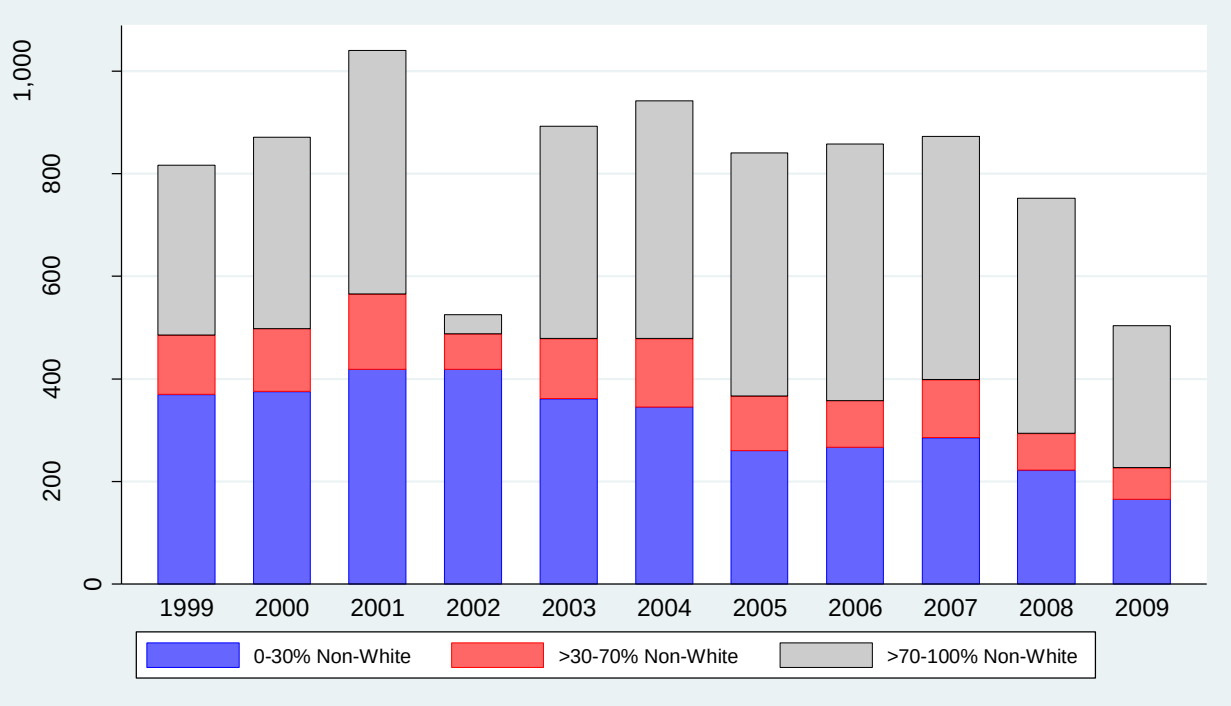

FIGURE 10D. Distribution of first-year teachers assigned to science classrooms by initial school percent non-white, 1999 to 2009

TABLE 11. Number of first-year science teachers by certificate subject area and initial school percent free/reduced-price lunch and non-white, 1999 to 2009

Certificate Subject		Percent eligible for free/reduced-price lunch			Percent non-white		
		0-30%	>30-70%	>70-100%	0-30%	>30-70%	>70-100%
Middle Child.	Biology	109	83	139	128	36	169
	Chemistry	32	16	33	35	8	38
	Physics	6	2	6	6	1	7
	Earth	33	25	51	35	13	61
	General	83	42	44	107	12	50
Adolescent	Biology	1,828	1,115	1,238	1,834	567	1,812
	Chemistry	765	339	333	765	177	498
	Physics	287	127	88	277	58	168
	Earth	696	301	194	724	154	316
	General	1,546	681	358	1561	360	670
Uncertified		426	522	1,141	430	268	1,410
Total		3,449	2,312	3,099	3,486	1,146	4,285

Notes: Totals do not match those in Table 5 due to missing data. Sums across subjects with school characteristics do not equal sums because teachers can be certified in more than one subject and most certificates for general science are combined with other subjects (e.g., adolescent biology with a general science extension).

TABLE 12. Characteristics of schools at which first-year science teachers accept positions by preparation pathway, 1999 to 2009

Preparation Pathway		Eligible for Free/ Reduced-Price Lunch (%)	Racial/Ethnic Minority (%)	Charter School (%)	Enrollment (#)	Teachers (#)	**AYP Status (2003-2009)** ELA (%)	Math (%)	Science (%)	Graduation Rate (%)
Tradition		30.6	34.4	1.2	1,106	79	89.3	92.7	96.9	95.2
		(26.6)	(35.3)	(11.1)	(778)	(49)	(31.0)	(26.1)	(17.4)	(21.4)
Alternative		63.6	86.1	0.6	995	65	70.2	83.9	90.1	83.2
		(31.7)	(24.7)	(7.6)	(948)	(53)	(45.8)	(36.7)	(29.9)	(37.4)
Interstate Reciprocity		43.4	65.7	1.6	1,132	76	76.5	88.5	91.9	86.9
		(35.1)	(38)	(12.6)	(933)	(53)	(42.5)	(32.0)	(27.5)	(33.8)
Individual Evaluation		35.3	47.3	0.4	1,263	80	85.1	88.8	96.8	91.8
		(30.8)	(38.9)	(6.6)	(880)	(53)	(35.6)	(31.6)	(17.6)	(27.4)
No science pathway		57.1	72.0	3.4	981	60	82.7	93.4	94.0	87.0
		(33.8)	(35.3)	(18.2)	(724)	(43)	(37.8)	(24.8)	(23.8)	(33.8)
Total	N	8,917	8,917	8,918	8,919	8,918	5,425	5,370	2,756	2,804
	Mean	43.5	55.3	1.5	1,093	73	82.3	90.1	94.4	91.0
	S.D.	(33.3)	(40.0)	(12.2)	(830)	(50)	(38.1)	(29.9)	(23.0)	(28.7)

Notes: Standard deviations in parentheses. AYP ELA and math statuses are based on student performance in grades 3 through 8 and Regents end-of-course exams (except in 2003 and 2004 when they are based on grades 4 and 8 and the Regents exams). AYP science status is based on student performance in grades 4 and 8 and Regents end-of-course exams.

Service

What is the transfer and attrition behavior of first-year science teachers during the first five years of their careers?

The fourth stage of becoming at teacher is determining how long to remain a teacher. Efforts to encourage more individuals to enter the science teacher labor force will not be as effective if recruited individuals teach for a shorter rather than longer period of time. To analyze the career paths of first-year science teachers, I define two types of labor forces: the local (i.e., individual school) labor force and the state labor force. They differ in how one group of teachers is classified.

At the end of each school year, a teacher makes one of four career decisions regarding their employment status for the following year: (1) stay at the same school and continue to teach science, (2) transfer to another school but continue to teach science, (3) transfer out of science teaching but remain a teacher at the same school, or (4) exit the New York State public school teacher labor force. Teachers choosing the first option remain members of both the local and the state science teacher labor forces whereas those choosing the third and fourth option are no longer members of either. Teachers who transfer to another school but continue to teach science have exited the local science labor force but remain part of the state's science teacher labor force.

Among all individuals beginning their science teaching careers between 2003 and 2008, 22 percent exited the statewide science teacher labor market after the first year and 34 percent exited the local science teacher labor force (meaning 12 percent transferred to another school to teach science) (table 13). After the end of the fifth year after first accepting a teaching position, 52 percent of teachers had exited the New York's science teacher labor force with an additional 18 percent of teachers transferring from their initial school to teach science elsewhere. Another useful retention statistic is the median length of service. Half of all teachers continued to teach science in the state for four years whereas only half taught science for two years at their initial school.

Transfer and attrition behavior differed meaningful across preparation pathway. At the end of the first year, 25 percent of traditional and alternative pathway teachers left their initial science placement. The two groups' career paths diverged after the second year and diverged even further after the third year as more alternative pathway teachers left their initial science placements. This coincides with the completion of their alternative preparation program and the expiration of their Transitional B or Transitional C certificates and reflects differences in quit rates, not differences in transfer rates. Whereas 10-11 percent quit after the first year, about 22 percent of remaining active alternative pathway teachers quit after their second and third years compared to 6 percent of traditional pathway teachers (table NY4). Upon the expiration of the Transitional B and C certificates at the end of the third year, alternative pathway teachers are eligible for an Initial or Professional Certificate which allows them to teach in any school in the state. And, in fact, they were more likely to transfer to other schools to teach science than traditional pathway teachers: 11 versus 8 percent (table NY4). Teachers from the interstate reciprocity and individual evaluation pathways had longer initial service spells than alternative pathway teachers but shorter than traditional pathway teachers. Their transfer rates were also lower than both traditional and alternative pathway teachers. Quit rates were the highest and transfer rates were the lowest for teachers with an unknown science pathway.

TABLE 13. Retention rates in science positions at initial school and any school among teachers beginning careers between 2003 and 2009 during first five years of teaching

Years of Teaching	All Pathways (%)	Traditional (%)	Alternative (%)	Interstate Reciprocity (%)	Individual Evaluation (%)	Unknown Science Pathway (%)
Stay in Science Position at Initial School (local labor force)						
1	66.3	74.4	74.0	69.3	66.1	42.2
2	49.0	62.0	48.3	52.5	52.0	21.5
3	39.4	53.8	32.0	42.1	43.8	14.2
4	34.0	47.5	25.3	35.5	39.5	10.0
5	29.9	42.4	21.4	27.7	35.5	8.1
Stay in Science Position at Any School (statewide labor force)						
1	78.4	89.1	87.8	81.2	82.3	44.9
2	65.5	83.3	67.5	67.6	72.8	23.6
3	57.6	77.4	54.6	57.2	66.0	16.2
4	52.2	72.9	47.4	52.4	59.8	11.1
5	48.3	67.9	41.4	46.3	56.9	9.7

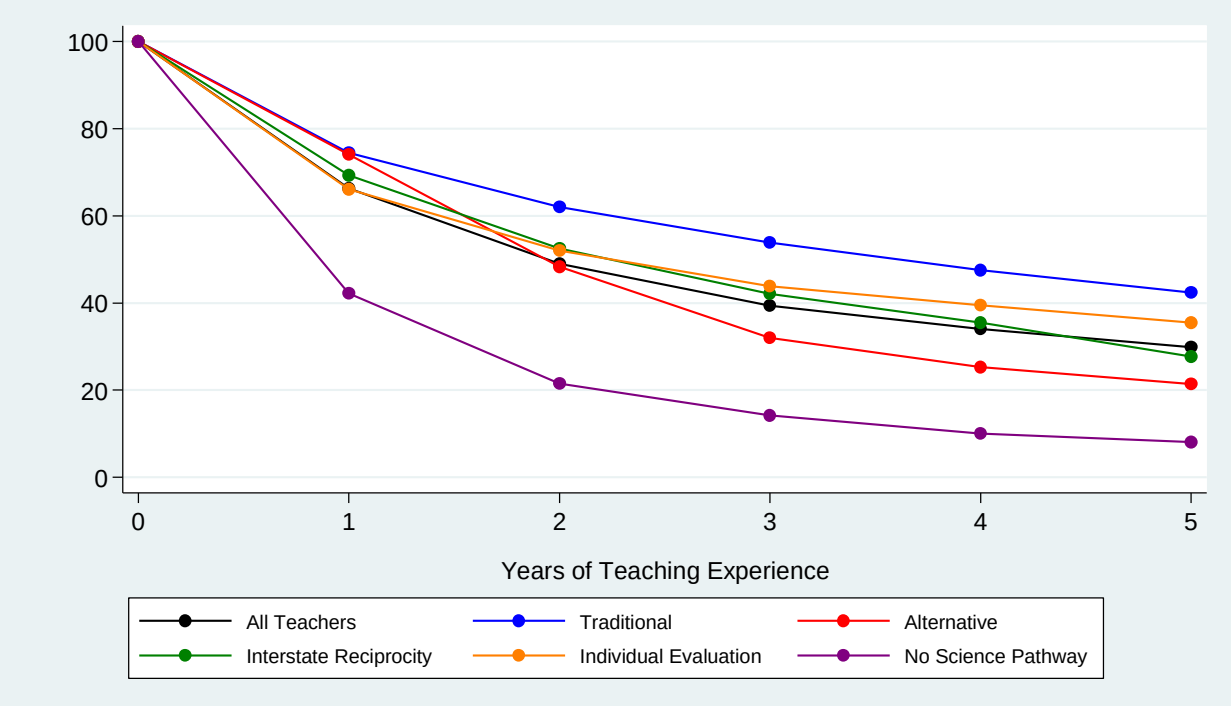

FIGURE 13A. Retention rates in science positions at initial school among teachers beginning their careers between 2003 and 2009 during first five years of teaching

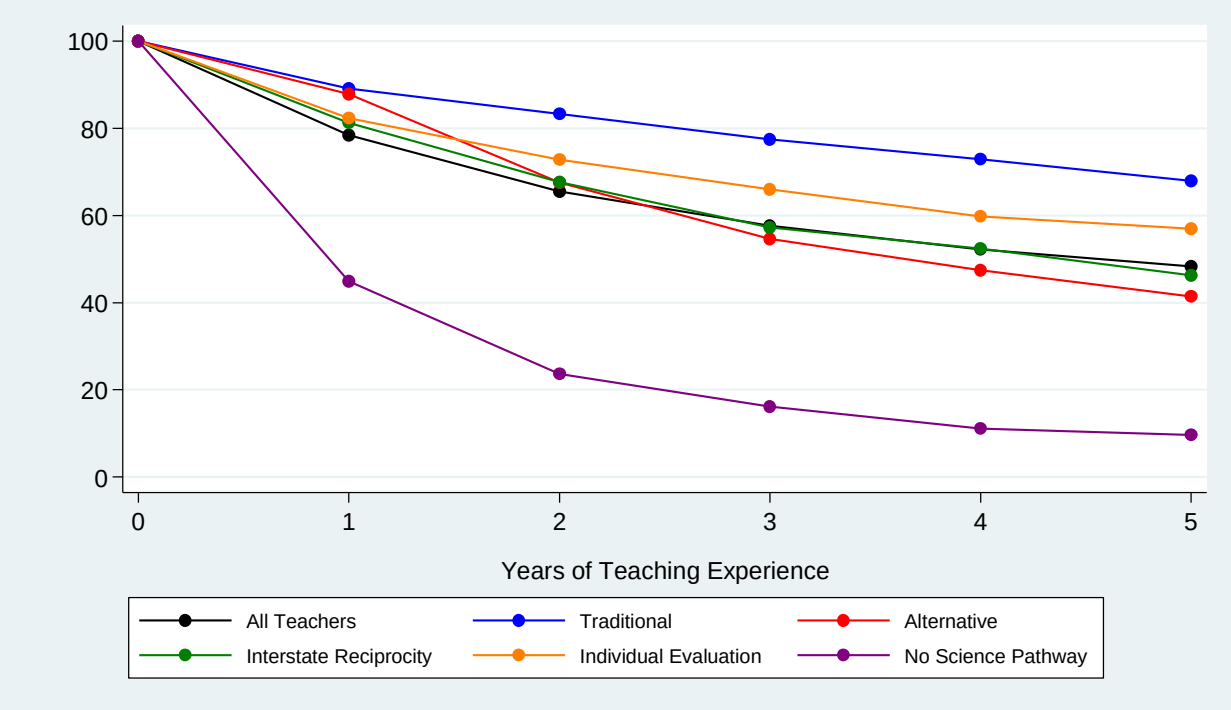

FIGURE 13B. Retention rates in science positions at any school among teachers beginning their careers between 2003 and 2009 during first five years of teaching

TABLE NY4. Retention, transfer, and attrition rates of first-year science teachers during first five years of career by preparation pathway, 2003-2009

Years of Teaching	N	Stay in Science at Same School (%)	Stay in Science but Transfer Position (%)	Stay in Teaching but Exit Science (%)	Stay in Non-Science Position (%)	Exit Teaching (%)
All Preparation Pathways						
1	5,317	66.3	12.1	8.4	0.0	13.1
2	4,069	65.6	9.2	3.6	8.8	12.8
3	2,867	68.6	7.0	2.8	11.6	9.9
4	1,970	70.2	5.9	2.2	13.8	8.0
5	1,237	72.8	4.6	1.9	14.4	6.3
Traditional						
1	1,984	74.4	14.7	0.8	0.0	10.2
2	1,583	80.4	11.9	0.8	0.8	6.2
3	1,180	83.8	7.6	0.9	1.3	6.4
4	806	84.9	7.1	0.6	1.6	5.8
5	484	87.0	3.7	1.0	2.1	6.2
Alternative						
1	1,152	74.0	13.9	1.0	0.0	11.2
2	803	65.6	10.2	1.2	0.9	22.0
3	456	67.8	11.2	1.5	2.0	17.5
4	254	74.8	8.7	1.2	3.1	12.2
5	144	75.0	10.4	1.4	2.1	11.1
Interstate Reciprocity						
1	345	69.3	11.9	0.9	0.0	18.0
2	265	73.2	7.9	1.9	2.3	14.7
3	176	76.7	5.7	1.7	2.3	13.6
4	122	80.3	6.6	0.8	5.7	6.6
5	72	77.8	8.3	1.4	2.8	9.7
Individual Evaluation						
1	769	66.1	16.3	2.2	0.0	15.5
2	634	73.5	11.5	1.6	3.2	10.3
3	515	78.6	8.3	2.3	3.5	7.2
4	417	80.1	6.5	1.7	3.6	8.2
5	324	85.2	5.2	1.5	4.0	4.0
Unknown Pathway						
1	1,067	42.2	2.7	37.6	0.0	17.5
2	784	26.7	1.4	13.9	39.8	18.2
3	540	23.9	1.5	8.7	53.3	12.6
4	371	20.5	0.5	7.3	61.5	10.2
5	213	18.8	0.5	4.7	70.4	5.6

Conclusion

Leveraging the wealth of detailed data on the teacher labor market in New York, this case study explored the preparation, certification, placement, and service of science teachers between 1999 and 2009. The state made substantial progress during this 11-year period toward its goal of having all first-year teachers entering the profession through formal preparation programs. New York ceased issuing temporary and emergency licenses, approved and expanded alternative preparation programs, and sought to eliminate the individual evaluation pathway into the state's teacher labor force. The number of science teachers produced annually through approved in-state programs increased 74 percent with 84 percent completing traditional preparation programs and 16 percent attending alternative programs. The annual number of requests for science certificate from first-time applicants increased 22 percent, and the share coming from individuals completing a formal preparation program increased from 50 to 79 percent. Seventy-seven percent of these requests were approved, and the percent issued to individuals entering through formal preparation programs increased from 66 to 92 percent.

The distribution of first-year science teachers among the preparation pathways changed markedly during the decade as did the characteristics of the schools in which they were placed. Science teachers accounted for between 7 and 9 percent of all first-year teachers hired each year. The percent of science teachers certified in science increased from 68 to 86 percent, and the percent completing a formal science preparation program increased from 37 to 78 percent. In the early years of the decade they were more likely to be placed in low poverty and low minority schools but by the end of the decade they were more likely to be placed in high poverty and high minority schools. Alternative pathway teachers were more likely to be place in high need schools than teachers from other pathways.

Once in the science classroom, New York continued to struggle to retain its science teachers. After five years of teaching, 30 percent remain teaching science in the same school at which they began their careers, 18 percent had transferred schools to teach science, and 52 percent had exited science teaching. Traditional pathway teachers had the longest initial teaching spells and alternative pathway teachers had the shortest.

This analysis highlighted key aspects of the early careers of science teachers in New York from preparation through the first five years of teaching. The patterns revealed provide useful information as to how science teachers enter the profession from different pathways, are placed in different schools, and teach for varying amounts of time. Combining these insights with those garnered from the other commissioned papers will hopefully be of assistance to the Committee in designing a learning continuum for science teachers to ensure they have the knowledge and skills to be successful throughout their careers.