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Out-of-Field Teaching, Educational Inequality, and the Organization of Schools: An Exploratory Analysis

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Out-of-Field Teaching, Educational Inequality, and the Organization of Schools: An Exploratory Analysis

Abstract

Contemporary educational theory holds that one of the pivotal causes of inadequate student achievement, especially in disadvantaged schools, is the inability of schools to adequately staff classrooms with qualified teachers. Deficits in the quantity of teachers produced and in the quality of preparation prospective teachers receive have long been singled out as primary explanations for underqualified teaching. In this study, I hypothesize that the manner in which schools are organized and in which teachers are utilized can account for as much of the problem of underqualified teaching as do inadequacies in teacher training or the supply of teachers. This analysis specifically focuses on a little recognized source of underqualified teaching—the problem of out-of-field teaching—teachers being assigned by school administrators to teach subjects that do not match their training or education. I use data from the Schools and Staffing Survey—a large, comprehensive, nationally representative survey of teachers conducted by the National Center for Education Statistics. The results show that while most teachers, even in disadvantaged schools, hold basic qualifications, a significant proportion of these qualified teachers, especially in disadvantaged schools, are assigned to teach classes out of their fields. Data also show that out-of-field teaching is not primarily due to school hiring difficulties resulting from teacher shortages. In contrast, the analysis shows that a number of aspects of the administration and organization of schools are significantly related to out-of-field teaching. For example, school district regulations concerning minimal education requirements for new hires, the quality of principal leadership, the strategies schools use to cope with teacher recruitment and hiring, and average school class sizes all have an independent association with the extent of out-of-field teaching in schools, after controlling for other factors.

Disciplines

Curriculum and Social Inquiry | Educational Administration and Supervision | Educational Leadership | Educational Methods | Teacher Education and Professional Development

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Out-of-Field Teaching, Educational Inequality, and the Organization of Schools: An Exploratory Analysis

A Research Report

by
Richard M. Ingersoll
University of Pennsylvania

January 2002
(Document R-02-1)



Center for the Study of Teaching and Policy

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An earlier version of this paper was presented at the annual meeting of the American Educational Research Association, in New Orleans, April 2000. Thanks are due to David Chapman and Elizabeth Cohen for useful suggestions and feedback on the paper. This research was partly supported by a grant (with co-principal investigator—Linda Darling-Hammond) from the Center for the Study of Teaching and Policy under the Educational Research and Development Centers Program, PR/Award R308B970003, as administered by the National Institute on Educational Governance, Finance, Policymaking and Management, Office and Educational Research and Improvement, U.S. Department of Education. Opinions reflect those of the author and do not necessarily reflect those of the granting agencies.

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ABSTRACT

Contemporary educational theory holds that one of the pivotal causes of inadequate student achievement, especially in disadvantaged schools, is the inability of schools to adequately staff classrooms with qualified teachers. Deficits in the quantity of teachers produced and in the quality of preparation prospective teachers receive have long been singled out as primary explanations for underqualified teaching. In this study, I hypothesize that the manner in which schools are organized and in which teachers are utilized can account for as much of the problem of underqualified teaching as do inadequacies in teacher training or the supply of teachers. This analysis specifically focuses on a little recognized source of underqualified teaching—the problem of out-of-field teaching—teachers being assigned by school administrators to teach subjects that do not match their training or education. I use data from the Schools and Staffing Survey—a large, comprehensive, nationally representative survey of teachers conducted by the National Center for Education Statistics. The results show that while most teachers, even in disadvantaged schools, hold basic qualifications, a significant proportion of these qualified teachers, especially in disadvantaged schools, are assigned to teach classes out of their fields. Data also show that out-of-field teaching is not primarily due to school hiring difficulties resulting from teacher shortages. In contrast, the analysis shows that a number of aspects of the administration and organization of schools are significantly related to out-of-field teaching. For example, school district regulations concerning minimal education requirements for new hires, the quality of principal leadership, the strategies schools use to cope with teacher recruitment and hiring, and average school class sizes all have an independent association with the extent of out-of-field teaching in schools, after controlling for other factors.

INTRODUCTION

Few educational problems have received more attention in recent times than the failure to ensure that elementary and secondary classrooms are all staffed with qualified teachers. Over the past two decades, dozens of studies, commissions, and national reports have drawn attention to the importance of the qualifications and quality of the teaching force. This concern is understandable. With teacher compensation being the largest single cost component of education in any country, teachers are a particularly important resource especially if, as most agree, student educational outcomes ultimately depend on the quality of their work.

Not surprisingly, the issue of teacher quality has also been at the heart of the ongoing national debate over equality of educational opportunity. Unequal access to qualified teachers and, hence, to quality teaching is considered a primary factor in the stratification of educational resources, opportunities to learn, and, ultimately, educational outcomes. Commentators, researchers, and policymakers have long held that the most needy students in the United States—especially those in schools serving poor, minority, and urban communities—are taught by the least qualified teachers (e.g., Rosenbaum, 1976; National Commission on Excellence in Education, 1983; Oakes, 1985, 1990; Dreeben & Gamoran, 1986; Darling-Hammond, 1987; Kozol, 1991; Stevens 1993; Elmore & Fuhrman 1995; Guiton & Oakes 1995; Bennefeld 1997; Haycock, 1998, 2000; Urban League, 1999).

It is widely believed that perennial teacher shortages, presumably resulting from increasing student enrollments and a “graying” teacher workforce (see Ingersoll, 2001b), disproportionately fall on and exacerbate staffing inequities in low-income and disadvantaged schools. In addition, the depth and breadth of the training and preparation of prospective members of the teaching force vary widely; and, according to contemporary theory, disadvantaged school districts, unable to match the salaries, benefits, and resources offered by more affluent schools, have difficulty competing for the more qualified teaching candidates, leading, in turn, to lower student achievement. Some leading social critics have directly tied problems of inner-city joblessness and underemployment to a dearth of qualified teachers in poor, urban public schools, resulting from teacher shortages. (e.g., Wilson 1996).

As a result, in recent years unequal access to qualified teachers has been cast as a major social problem and has received widespread coverage in the national media. The problem has also been the subject of a growing body of empirical research (e.g., Hirsch, Koppich, & Knapp, 2001; National Commission on Teaching and America’s Future, 1996, 1997) from which have come a number of reform and policy initiatives.

Numerous studies have examined overall levels and disparities of access to qualified teachers using nationally representative data (e.g., Blank & Gruebel, 1993; Blank & Langesen 1999; Choy et al. 1993; Henke, Choy, & Geis, 1996; Henke, Choy, Chen, Geis, & Alt, 1997; Horn, Hafner, & Owings, 1992; Oakes, 1985, 1990; Pascal, 1987; Raudenbush, Fotiu & Cheong, 1998; Smerdon, 1999). These analyses have documented that the quality of teaching staffs does, indeed, vary across different types of schools and that, in general, the quality of teachers are often lower in disadvantaged, low-income, and high-minority schools.

Because it is difficult to obtain large-scale data on the actual degree of quality teaching provided to students in classrooms, most of this research turns to what is more easily measured and more readily available: teacher qualifications. Although the qualifications of teachers, such as their education, training, and experience, are only indirect measures of the quality of teachers, most analysts agree they provide useful information on this important educational resource (e.g., Haertel, 1991; Haney, Madus, & Kreitzer, 1987; Kennedy, 1992). Teaching, unlike many other occupations,

has an extensive body of empirical research documenting that teachers' qualifications are an important component of teacher performance (e.g., Ferguson, 1991; Greenwald, Hedges, & Laine, 1996; Hedges, Laine, & Greenwald, 1994; National Commission on Teaching and America's Future, 1996, 1997).

Existing empirical research has shed much light on the distribution of qualified teachers across different kinds of schools. But it has not shed much light on the causes of these differences. There has been little empirical research investigating the sources of inadequacies and disparities in access to qualified teachers, especially using nationally representative data. For example, there have been surprisingly few efforts that closely examine with national data the breadth and depth of teacher shortages, how much impact they have on teacher qualifications, and in which kinds of schools they occur most frequently (Ingersoll, 2001b). There have also been few efforts to isolate, with national data, which aspects of the context, policies, organization, administration, or conditions of districts and schools are related to a school's success in providing qualified teachers for all classrooms.¹

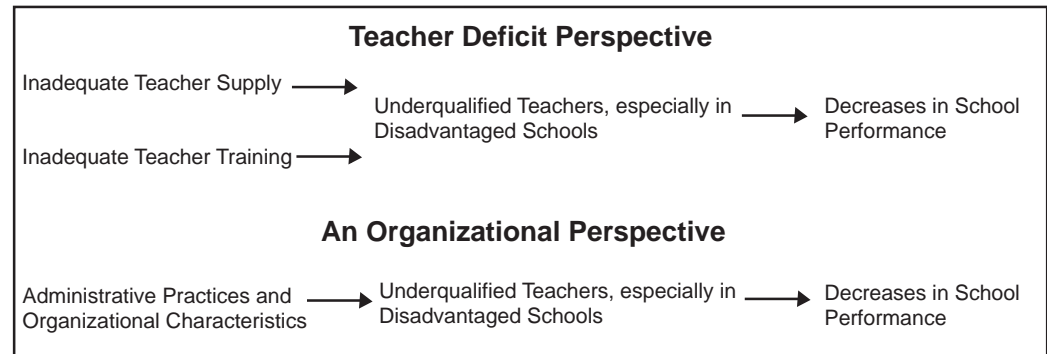
Teacher policy and reform has primarily been directed either at upgrading the quality of teachers or at increasing the quantity of teachers. To address the quality issue, many states have pushed for more rigorous preservice and inservice teacher education, training, and certification standards. In response to the quantity issue, a host of initiatives and programs have sprung up that attempt to increase the supply of available teachers by recruiting new candidates into teaching, especially to schools serving disadvantaged students. For example, a key goal of President Clinton's educational agenda was to recruit thousands of new teachers to serve in disadvantaged schools. A wide range of alternative licensing programs has been implemented to ease entry into teaching. Programs such as Troops-to-Teachers are designed to entice professionals into mid-career changes to teaching. Other programs, such as Teach for America, seek to lure the "best and brightest" into the profession. Finally, financial incentives such as signing bonuses, student loan forgiveness, housing assistance, and tuition reimbursement have all been instituted to aid teacher recruitment (Clinton, 1999; Feistritzer, 1997; Kopp, 1992).

UNDERQUALIFIED TEACHING, EDUCATIONAL INEQUALITY, AND THE ORGANIZATION OF SCHOOLS

This study examines the sources of inadequacies and inequities in teacher qualifications, especially in schools serving low-income, high minority enrollment, urban communities. Whereas the dominant viewpoint, as summarized above, holds that the source of the problem of unqualified teachers primarily lies in deficits in either the quality or the quantity of teachers—a view hereafter referred to as the teacher deficit perspective—this study adopts a different perspective—one focused on the organization of schools—to empirically explore the reasons *why* particular kinds of schools have less qualified teachers. The central hypothesis of this study is: to fully understand the problem of unqualified teachers, it is necessary to not only examine the quantity and quality of the teaching force but also to examine the characteristics of the organizations within which teachers work. In other words, the manner in which schools are organized and teachers are employed and utilized can account for as much of the problem of underqualified teaching as do inadequacies in the supply or training of teachers. (See Figure 1)

At the outset, it needs to be recognized that investigating the role of school decision makers in the problems of the educational system, especially for disadvantaged communities, is a highly contentious subject. Some school critics,

Figure 1. Two Perspectives on the Causes and Consequences of Underqualified Teaching



especially those with a conservative political orientation, have argued that incompetent and corrupt school managers are a major factor in the plight of low-income, inner-city public schools. Liberal-left critics have forcefully responded that this viewpoint unfairly places responsibility for the problems of low-performing schools on the victims of these same problems and unfairly shifts responsibility away from systemic inequities in funding and resources embedded in the larger educational or socioeconomic system (e.g., Kozol, 1991).

This study's organizational perspective shifts attention away from this polarized debate and focuses on which aspects of schools—their practices, policies, characteristics, and conditions—affect the extent to which classrooms are staffed with qualified teachers. Understanding if and how school decision makers can either undermine or foster quality teaching is of vital importance because of the obvious implications for devising reforms, policies, and interventions that address all the key factors at the root of the problem of underqualified teaching (e.g., Chester, Offenber, & Xu, 2001).

This study focuses on one of the least recognized, least understood sources of underqualified teaching in schools—the problem of out-of-field teaching—teachers assigned by school administrators to teach subjects which do not match their training or education. This is a crucial factor because highly qualified teachers may actually become highly unqualified if they are assigned to teach subjects for which they have little training or education. Until recently, it has also been an under-recognized issue largely because of an absence of accurate data—a situation remedied with the release of the Schools and Staffing Survey (SASS) by the National Center for Education Statistics (NCES) in the early 1990s.

In previous analyses (Ingersoll, 1995, 1996, 1999, 2000) I have used these data to profile the levels and distribution of out-of-field teachers. The data document that there are high levels of out-of-field teaching in American schools. These findings have also been replicated; NCES analysts have calculated levels of out-of-field teaching using the same, or similar, data sources and have reached the same conclusion (e.g. Bandeira de Mello & Broughman, 1996; Bobbitt and McMillen, 1995; Smerdon, 1999). As a result, over the past couple of years the problem of out-of-field teaching has become a prominent topic in the realm of educational policy, been widely reported and commented upon in the national media, and been featured in a number of major educational reports (e.g., National Commission on Teaching and America's Future, 1996, 1997; Education Trust 1996, 1998; Education Week, 1997, 1998, 2000). However, despite this new awareness and attention, the problem of out-of-field teaching remains widely misunderstood. At the heard of this misunderstanding is a crucial question: What are the reasons for the prevalence of out-of-field teaching in American schools?

It is widely assumed that out-of-field teaching, like other kinds of underqualified teaching, is also a result of deficits in the quantity and quality of teachers. In contrast to the teacher deficit perspective, this study adopts an organizational perspective to investigate the sources of out-of-field teaching in schools. It seeks to build on earlier work, by specifically focusing on the connection between out-of-field teaching and the manner in which schools and teachers are organized, managed, and administered. Below I outline this perspective.

Unlike traditional professions, teachers have only limited authority over key workplace decisions. For example, teachers have little say over which courses they are assigned to teach. Decisions concerning the hiring and the allocation of teachers to course and program assignments are primarily the responsibility and prerogative of school principals (Ingersoll, 2000). The latter are charged with the often difficult task of providing a broad array of programs and courses with limited resources, a limited budget, and a limited teaching staff. Along with these limitations, principals' staffing decisions can also be constrained by numerous other factors, such as teacher union work rules, teacher seniority issues, school district regulations, class-size guidelines, and contractual obligations concerning the number and type of class assignments allocated to teaching employees. For example, in a typical secondary school, teacher employment contracts stipulate that full-time teaching staff must be assigned to teach five classes in a normal seven class-period day.

However, the data show that within these constraints school principals have an unusual degree of discretion in staffing decisions. Whereas teacher training is subject to an elaborate array of state licensing requirements, there is far less regulation of how teachers are utilized once on the job (Education Week, 2000; Ingersoll, 1999; Robinson, 1985; Ruby, 1999). In this context, principals may find that assigning teachers to teach out of their fields is often not only legal, but also more efficient and less expensive than the alternatives. For example, rather than trying to find and hire a new science teacher to teach a newly state-mandated, but under-funded science curriculum, a principal may find it more convenient to assign a couple of English and social studies teachers to cover a section or two in science. If a teacher suddenly leaves in the middle of a semester, a principal may opt to hire a readily available but not fully qualified substitute teacher rather than instigate a formal search for a new teacher. When faced with the choice between hiring a fully qualified candidate for an English position and hiring a less qualified candidate who is also willing to coach a major varsity sport, a principal may find it more expedient to do the latter. If a full-time music teacher is under contract, but student enrollment is sufficient to fill only three music classes, the principal may find it both necessary and cost effective to assign the music teacher to teach two classes in English, in addition to the three classes in music, in order to employ the teacher for a regular full-time complement of five classes per semester.

Faced with a myriad of such trade-offs and judgments, some degree of teacher misassignment by principals is probably unavoidable. However, while the SASS data show that out-of-field teaching is widespread, the data also show there are large school-to-school differences in this practice. Notably, low-income and disadvantaged schools have more out-of-field teaching than most other kinds of schools (Ingersoll, 1999). This raises an important question that is at the center of this study: What accounts for large school differences in levels of out-of-field teaching?

This analysis addresses this question by investigating the relationships between the degree of out-of-field teaching in schools and a number of possible factors suggested by the above discussion. These include the demographic characteristics of schools, such as low-income and minority student enrollment; factors suggested by the teacher deficit perspective, such as the extent to which schools experience difficulties in recruiting qualified teaching staff for their teaching job openings; and,

finally, a number of administrative practices and organizational characteristics suggested by an organizational perspective. These latter practices and characteristics are described below.

ADMINISTRATIVE PRACTICES, ORGANIZATIONAL CHARACTERISTICS, AND OUT-OF-FIELD TEACHING

Hiring Policies

While data from SASS show that school principals have a great deal of control over teacher hiring decisions, the data also show that the central administrations of public school districts vary in the extent to which they impose standards on these school-level decisions or have formal regulations concerning minimal training requirements for new hires. For example, the data show that about two thirds of all school districts formally require new teacher hires to hold a college major or minor in the main field to be taught (Ingersoll, 2000). We would expect such regulations to constrain the capacity of school principals to hire out-of-field candidates for openings. This analysis will examine whether the existence of these kinds of regulations is related to decreases in the amount of out-of-field teaching in schools.

Principal Leadership

The degree to which a school is faced with teacher recruitment and hiring difficulties and the kinds of regulations imposed by district-level administrators may shape a principal's teacher hiring and staffing decisions. An organizational perspective, however, suggests there is also an overlooked role for the leadership skills of principals in the employment, assignment, and utilization of teachers. This analysis will explore this factor by examining whether there is a positive association between the general leadership skill of principals and the degree of out-of-field teaching in schools.

Staffing Practices

Depending upon the constraints within which principals work, the degree of discretion allowed to them, and their leadership skills, there could be numerous options, choices, and strategies available to principals in regard to teacher hiring and assignment (Ingersoll, 1999, 2000). As discussed previously, when faced with difficulty in finding qualified candidates to fill teaching openings, school principals might opt to hire an available but underqualified teacher at the cost of a regular teacher salary, choose to reassign an existing teacher to cover part or all of the hard-to-staff classes at no additional salary, or opt to employ a long-term substitute teacher at a relatively low salary. We would expect each of these choices to result in significantly more out-of-field teaching.

Alternatively, rather than resort to the above, principals might opt to leave some hard-to-staff teaching openings unfilled and shift student enrollment to existing classes. This would create larger classes, save salary costs, and, presumably, result in less out-of-field teaching. In other cases, especially in more affluent and advantaged communities, school officials might have the budgetary resources available to enhance teacher recruitment efforts by providing higher starting salaries. This analysis will examine the relationships between these contrasting managerial choices and the degree of out-of-field teaching that exists in schools.

Teacher Unions

Teacher unions and their work rules further constrain the staffing decisions of school principals. It is unclear, however, what effect such constraints have on the degree of out-of-field teaching. On the one hand, some opponents of teacher unions have directly blamed teacher unions for the prevalence of out-of-field teaching. In this view, self-serving work rules promulgated by teacher unions, especially seniority rules, are the main reason that classrooms are staffed with underqualified teachers. The use and abuse of such rules is especially prevalent, this argument holds, in times of teacher oversupply, when school officials face the need to cut or shift staff because of fiscal cutbacks or declining enrollments. In such situations, “last-hired, first-fired” union seniority rules require that more experienced teachers be given priority, regardless of competence. As a result, according to this view, veteran teachers are often given out-of-field assignments, in-field junior staff are transferred or laid off, and students suffer accordingly (e.g., Toch, 1996). This viewpoint predicts that schools with teacher unions will have significantly more out-of-field teaching.

On the other hand, members and leaders of teacher unions often oppose the practice of out-of-field teaching. For example, Albert Shanker (1985), the former head of the American Federation of Teachers, condemned out-of-field teaching as education’s “dirty little secret” and called for its elimination. According to this viewpoint, the presence of a teacher union in a school district could have an attenuating effect on the practice of out-of-field teaching. This analysis will test these competing claims by examining whether the presence of teacher unions is related to the degree of out-of-field teaching in schools.

School Size

Small schools, by definition, usually have fewer overall resources than do larger schools. This includes the number of teachers. As a result, small schools may find it more difficult to allow staff specialization, and teachers in these schools may often be required to be generalists. This tendency predicts smaller schools may have more out-of-field teaching than larger schools. This analysis will test whether there is, in fact, an inverse association between school size and out-of-field teaching.

In sum, the objective of this study is to investigate the sources of school-to-school differences in underqualified teaching. It focuses, in particular, on a major but misunderstood source of underqualified teaching—the phenomenon known as out-of-field teaching. The question at the center of this study is: why are particular schools, especially those in disadvantaged communities, more likely to have out-of-field teachers? To address this question this study compares and examines two explanations—the dominant teacher deficit perspective focused on deficits in the quantity and quality of teacher supply and an alternative organizational perspective focused upon the manner in which schools are organized and teachers are employed and utilized. These perspectives are not necessarily mutually exclusive—both may help account for school variation in out-of-field teaching. The analysis examines the relative strength of factors drawn from these perspectives in explaining the degree of out-of-field teaching, especially in disadvantaged schools.

DATA AND METHODS

Data

The data for this study come from NCES' Schools and Staffing Survey (SASS), the largest and most comprehensive data set available on the staffing, occupational, and organizational characteristics of elementary and secondary schools. The survey was specifically designed to remedy the lack of nationally representative and comprehensive data on these issues (Haggstrom, Darling-Hammond, & Grissmer, 1988).

The U.S. Census Bureau collected the SASS data for NCES from random samples stratified by state, sector, and school level. To date, three independent cycles of SASS have been completed: 1987-1988, 1990-1991, and 1993-1994. (As of 12/01 the 1999-2000 SASS data had not been released; for information on SASS, see Choy et al., 1993 or Henke et al., 1997.) Each cycle of SASS includes several sets of separate, but linked, questionnaires for school administrators and for a random sample of teachers within each school. The response rate was relatively high: 86 percent for teachers and 94 percent for administrators. The data used in this study are primarily from the 1993-1994 SASS. The sample contains about 46,700 teachers employed in about 9,000 public elementary, secondary, and combined (K-12) schools. Throughout, this analysis uses data weighted to compensate for the over- and under-sampling of the complex stratified survey design. Each observation is weighted by the inverse of its probability of selection in order to obtain unbiased estimates of population parameters.

Representing a wide range of information on the characteristics of teachers, schools, and school districts across the country, SASS is particularly useful for addressing research questions on access to qualified teachers. Teachers reported their certification status and the major and minor fields of study for degrees earned at both the undergraduate and graduate levels. In addition, for each teacher sampled, data were collected on the subject taught, grade level, and number of students enrolled for each class period in the school day. From administrators, SASS obtained a wide range of information on school demographic characteristics, staffing procedures, teacher recruiting difficulties, administrative practices, and organizational characteristics.

Methods

There are two stages to the data analysis and data presentation. The first stage documents levels of teacher qualifications and out-of-field teaching across different types of schools. It focuses on establishing the role of out-of-field teaching as a major source of underqualified teachers, especially in disadvantaged schools. The second stage then turns to an investigation of the sources of school-to-school variations in out-of-field teaching.

First Stage

One of the difficulties encountered in researching the problem of underqualified teachers has been a lack of consensus on the best standard by which to define a qualified teacher. Few would argue that teachers ought not be qualified; moreover, there exists substantial empirical support for the reasonable proposition that the qualifications of teachers are tied to student achievement (e.g., Greenwald et al., 1996; Raudenbush, Fotiu, & Cheong, 1999). But controversy swirls around how much education, what types of training, and which kinds of preparation teachers ought to have to be considered qualified in any given field (e.g., Haertel, 1991; Haney et al., 1987; Kennedy, 1992).

Like much previous empirical research on teacher qualifications, this study focuses on a variety of indicators, such as teachers' college degrees and teaching certificates. And similar to previous empirical research, an important premise underlies this analysis—that to be considered adequately qualified, teachers ought to have, as a minimal prerequisite, some agreed-upon credential (such as a degree or a certificate) in the fields they are assigned to teach. Having a credential signifying some level of training or education in a field does not guarantee one is a quality teacher, nor even that one is a qualified teacher, but the assumption underlying this research is that a credential is a necessary, if not sufficient, requirement of both.²

The first stage of the analysis presents descriptive statistics on levels of teacher education, teacher certification, and teaching experience and the extent to which these levels vary according to school poverty enrollment level, school minority enrollment level, and school urbanicity. This stage of the analysis also presents data on the extent of out-of-field teaching.

Previous studies have used a number of different measures of out-of-field teaching, representing a range of standards.³ Some measures focus on whether teachers have a teaching certificate in the fields they teach, others focus on whether teachers have an undergraduate or graduate degree, and still others focus on whether teachers have both a certificate and a degree in the fields they are assigned to teach. Measures of out-of-field teaching also vary according to whether they focus on the numbers of teachers doing it or the numbers of students exposed to it and according to which fields and subjects are examined and which grade levels are investigated. This project will use several different measures of out-of-field teaching, drawn from previous work. The first stage of the analysis focuses on the proportion of those teaching in five different fields without an undergraduate or graduate major or minor in that field. The five fields are general elementary education, and secondary-level mathematics, English, social studies, and science. I count both education and academic majors and minors as qualification to teach; for example, either a major in math or in math education counts as being qualified to teach math.⁴

Second Stage

Having documented cross-school levels of out-of-field teaching, the second stage of the analysis seeks to explain why particular schools are more or less likely to have different levels of out-of-field teaching. In particular, the analysis focuses on the link between the degree of out-of-field teaching in schools and factors representing the demographic characteristics of the students, the teacher deficit perspective, and an organizational perspective. This second stage begins with a summary of recent trends in overall levels of teacher supply, demand, and shortages; the numbers of schools that actually experience difficulty recruiting qualified faculty to fill their teaching openings; and the extent to which these difficulties affect the levels of out-of-field teaching. The analysis then turns to a more advanced statistical analysis of the relative association of various factors with out-of-field teaching at the secondary level. The secondary sub sample includes 23,867 teachers in grades 7-12. It includes all those teaching in any of eight fields, parallel to conventional departmental divisions at the secondary level: English, mathematics, social studies, science, art/music, physical education, foreign language, and vocational education. It excludes those employed in middle schools.

The dependent variable in this portion of the analysis is a second measure of out-of-field teaching—for each secondary-level teacher, the percentage of their daily classes in which they do not have an academic or education undergraduate or graduate major or minor in the field taught.⁵ The analysis examines the relative association of this measure of out-of-field teaching with four groups of independent variables: teacher

qualifications, school demographic characteristics, school recruiting and hiring difficulties, and school administrative practices and organizational characteristics. Table 1 provides summary statistics for these variables, and Figure 2 provides definitions.

For measures of teacher qualifications, the regression analysis includes controls for each teacher’s highest degree earned and total years of teaching experience. For school demographic characteristics, the analysis includes measures of school poverty enrollment, school minority enrollment, and school urbanicity. For school recruiting and hiring difficulties, the analysis includes a measure to control for whether schools had teaching job openings in the year of the survey and a measure to gauge the extent of difficulty these schools experienced with recruiting qualified faculty to fill their openings for 13 teaching fields. Finally, after controlling for the teacher and school factors cited above, the analysis includes a number of factors previously introduced, reflecting school administrative practices and organizational characteristics. These

Table 1. Means and Standard Deviations for Variables Used in Multiple Regression Analysis of Out-of-Field Teaching at the Secondary Level

	Mean	Standard Deviation
Percent 7 - 12th classes taught by out-of-field teachers	16	35
Teacher Qualifications		
Highest Degree (scale of 0-3)	1.6	.62
Teaching Experience (years)	16	9.4
School Demographic Characteristics		
Percent students in school receiving free/reduced lunch	23	22.8
Percent minority students in school	28	28.5
Percent rural schools	43	-
Percent suburban schools	32	-
School Recruiting and Hiring Difficulties		
Percent schools with teaching job openings	87	-
Hiring difficulties (scale of 0-13)	1.5	1.9
Administrative Practices/Organizational Characteristics		
Major/minor required of hires (scale of 1-3)	2.6	.60
Principal leadership (scale of 1-4)	2.1	.68
Hiring/assigning underqualified (scale of 0-4)	.31	.61
Class size	23	8
Starting teacher salary (\$)	23,177	3,358
Percent schools with teacher union	73	
School size	1084	640

Figure 2. Definitions of Measures Used in the Multiple Regression Analysis of Out-of-Field Teaching at the Secondary Level

Out-of-Field Teaching

- % Secondary Classes Out of Field: for each 7-12th grade teacher, percentage classes in which teacher does not have an undergraduate or graduate major or minor in field taught. Both academic and education majors/minors are counted (e.g., math and math education). Measure includes all those teaching in any of eight fields, parallel to conventional departmental divisions at the secondary level: English, mathematics, social studies, science, art/music, physical education, foreign language, vocational education. It excludes those employed in middle schools. (For more detail on this measure, see Ingersoll 1995)

Teacher Qualifications

- Highest Degree: a 4 category variable, where 0 = less than bachelor's degree, 1 = bachelor's degree, 2 = master's degree, 3 = above master's degree.
- Teaching Experience: total years of teaching experience

School Demographic Characteristics

- Poverty Enrollment: percentage of students receiving the federal free or reduced-price lunch program for students from families below poverty level
- Minority Enrollment: percentage of students that were black, Hispanic, American Indian, Asian and Pacific Islander
- Rural: a dichotomous variable where 0 = central city or urban fringe/large town and 1 = rural/small town
- Suburban: a dichotomous variable where 0 = rural/small town or central city and 1 = urban fringe/large town

School Recruiting and Hiring Difficulties

- Teaching Job Openings: a dichotomous variable where 0 = school had no teaching job opening(s) that year and 1 = school had teaching job opening(s) that year
- Hiring Difficulties: On a scale of 0 to 13, sum of 13 teaching fields for which school administrator reported either "somewhat difficult," "very difficult," or "could not fill" in response to item which asked: "how difficult or easy was it to fill the vacancies for this school year in each of the following fields?" The latter includes: special education, ESL/ESOL/bilingual education, English, mathematics, social studies, physical science, life science, music, foreign languages, business or marketing, industrial arts, home economics, trade and industry, agriculture.

Administrative Practices/Organizational Characteristics

- Major/Minor Required of Hires: on a scale of 1 = not used, 2 = used, 3 = required, school district requirement for new hires having college major or minor in field to be taught, as reported by school administrators.
- Principal Leadership: on a scale of 1 = strongly disagree to 4 = strongly agree the school mean of 6 items asked of teachers about whether their principal: recognizes staff members for good work; knows what kind of school he/she wants; communicates his/her expectations; is supportive and encouraging; backs up teachers; and communicates with teachers about instructional practices. Factor analysis (with varimax rotation method) was used to develop this measure. Item loadings of .4 were considered necessary for inclusion. Items in the factor had high internal consistency ($\alpha > .7$).
- Hiring or Assigning Underqualified: on a scale of 0 to 4, sum used of 4 possible methods to cover vacancies, as reported by school administrators: hire a less than fully qualified teacher; assign teacher of another subject or grade level to teach the class; assign administrator or counselor to teach the class; use short-term or long-term substitutes. To avoid missing observations, this variable is calculated for all schools, even those without vacancies or without hiring difficulties that, by definition, would not have indicated use of these strategies.
- Average Class Size: school's mean student enrollment per classroom.
- Starting Teacher Salary: normal yearly base salary for teacher with a bachelor's degree and no experience, as reported by school administrators. Divided by 1,000, to make units refer to increments of \$1,000.
- Presence of Teacher Union: a dichotomous variable where 0 = school district has no teacher union and 1 = school district does have one.
- School Size: student enrollment of school. Divided by 100, to make units refer to increments of 100 students.

latter measures include: 1) a variable assessing whether the school district has informal or formal rules stipulating that new teacher hires have a major or minor in the main field to be taught; 2) a measure representing teachers' subjective ratings of the leadership skills of their principals; 3) a measure of the extent to which a school covers hard-to-fill teaching openings by hiring underqualified teachers, reassigning teachers of another subject or grade level, or using short-term or long-term substitutes; and 4) measures of both school size and the school's average class size, the normal yearly starting salary provided by the school for new, inexperienced teachers, and whether there is a teacher union in the school district.

The purpose of this second portion of the analysis is to examine whether the proportion of secondary-level classes taught in schools by out-of-field teachers is related to the above measures of school administrative practices and organizational characteristics, while controlling for school recruiting and hiring difficulties, school demographic characteristics, and the qualifications of the teachers sampled in the school. The analysis proceeds by using multiple regression to estimate a mathematical equation—a model—indicating the relative association of each of the variables with the measure of out-of-field teaching. That is, the statistical association of each variable with out-of-field teaching is individually determined, while the other variables are held constant or, in other words, controlled.

The data in the analysis are couched at two levels—teacher level and school level. Over the past two decades there has been much discussion concerning the most appropriate multiple regression method for modeling multilevel data. Accurately predicting an outcome, such as out-of-field classes, for members of an organization such as teachers, while taking into account the characteristics of both the teachers and the organization, is a complex statistical task. Conventional multiple regression techniques operate at one level of analysis and, hence, cannot properly model an outcome that is a product of factors at more than one level. As a result, researchers recently have developed a number of statistical techniques specifically designed for modeling multilevel data. Such techniques have the advantage of allowing the analysis to simultaneously model the relationships between both individual teacher characteristics and their own amount of out-of-field classes and between the characteristics of schools and the average amount of out-of-field classes of the teachers in those schools. This allows the analysis to account for variation in out-of-field teaching, both between teachers within schools and between teaching staffs across schools. That is, multilevel techniques do not assume that schools are entirely uniform entities, nor do they assume that they are entirely non-uniform entities. This analysis uses one particular multilevel program, SAS' PROC MIXED, which has the additional advantage of allowing for the inclusion of the survey's design weights.⁶

RESULTS

Levels of Teacher Qualifications and Out-of-Field Teaching

The data show that most public elementary and secondary teachers have basic education and training (see Table 2). Almost all public school teachers have completed a four-year college education. Ninety-nine percent of public school teachers hold a bachelor's degree, and almost half have obtained graduate degrees. Moreover, 94 percent of public school teachers have regular or full state-approved teaching certificates.

The data also reveal some distinct cross-school differences in the qualifications of teachers. Schools with high poverty enrollments, schools with high minority enrollments, and those in urban areas sometimes have less access to qualified teachers.

Table 2. Percentage of elementary and secondary public school teachers, by highest degree earned and by highest type of certification, by type of school.

	Less than Bachelor's Degree	Bachelor's Degree	Master's Degree or More	No Certification	Less-than-Regular Certification	Regular Certification
Total	.7	52	47	2	4	94
Poverty Enrollment						
Low	.9	45	54	1.5	3	96
High	.6	56	43	4	6	90
Minority Enrollment						
Low	.6	51	48	1	3	96
High	.9	52	47	4	7	89
Community						
Rural	.8	58	41	2	3	95
Suburban	.7	46	53	2	3	96
Urban	.7	49	50	3	5	92
Not Poor / White / Suburban	.3	41	58	2	2	96
Poor / Minority / Urban	.2	51	49	7	9	85

Notes:

- Less than Regular Certification includes all those with emergency, temporary, alternative, or provisional certification.
- Regular Certification includes all those with probationary, regular, standard, full, or advanced certification. (Probationary refers to initial license issued after satisfying all requirements except completion of probationary period.)
- Low poverty refers to schools where 15% or less of the students receive publicly funded free or reduced price lunches. High poverty refers to schools where over 80% do so.
- Low minority refers to schools where 15% or less of the students are minority. High minority refers to schools where over 80% are. Middle categories of poverty and minority are not shown.
- Not Poor / White / Suburban refers to schools that are low poverty and low minority and suburban.
- Poor / Minority / Urban refers to schools that are high poverty and high minority and urban.

For example, teachers in high-poverty schools are less likely to have graduate degrees than are teachers in low-poverty schools. On the other hand, there is little difference between suburban and urban schools and between high-minority and low-minority schools in the percentage of teachers with graduate degrees.

Disparities in teachers' qualifications are more clear and distinct when these demographic characteristics are combined. For example, teachers in not poor / white / suburban schools (hereafter referred to as advantaged schools) are more likely to have graduate degrees and more likely to have full certificates than those in poor / minority / urban schools (hereafter referred to as disadvantaged schools). But, it is also important to recognize that these data tell us little of the quality of these qualifications; there may be inequities in teacher qualifications not revealed here.

The experience levels of teachers in advantaged and disadvantaged schools also differ, as shown in Table 3. Just over one tenth of all public school teachers are beginners (three years or less) and just under one third are senior (more than 20 years). In disadvantaged schools, twice as many teachers are beginners and fewer teachers are senior than in advantaged schools. To many critics of educational equality, this is an important finding; experience in a teaching staff is considered a vital asset. However, it is necessary to recognize that not all share this view. Some place more value on

Table 3. Percentage of elementary and secondary public school teachers, by total teaching experience, by type of school.

	1 Year or less	3 Years or Less	More than 20 years
Total	4.5	12.2	31.4
Poverty Enrollment			
Low	3.6	10	35.3
High	5.6	17.5	26.3
Minority Enrollment			
Low	3.9	10.7	33
High	5.2	15.8	30
Community			
Rural	5	12.7	28.7
Suburban	3.9	11.4	35
Urban	4.4	12.4	31.3
Not Poor/White/Suburban	3	9.4	38
Poor/Minority/Urban	5.8	18.6	27

Notes:

- Low poverty refers to schools where 15% or less of the students receive publicly funded free or reduced price lunches. High poverty refers to schools where over 80% do so.
- Low minority refers to schools where 15% or less of the students are minority. High minority refers to schools where over 80% are. Middle categories of poverty and minority are not shown.
- Not Poor/White/Suburban refers to schools that are low poverty and low minority and suburban.
- Poor/Minority/Urban refers to schools that are high poverty and high minority and urban.

youth than experience in teachers and view a disproportionately junior staff as an asset and a disproportionately senior staff as a liability. For example, Kozol (1991, p. 51) argues that disadvantaged schools suffer from too many senior teachers and too few “exciting, youthful teachers.” These data cannot resolve the debate over the relative merits of youth and experience in teachers. They do show, however, that on average Kozol is incorrect about one thing; disadvantaged schools have more junior level staff than do advantaged schools. Moreover, not only are there more beginners in disadvantaged schools, but beginners in those schools are less likely to be fully qualified. Table 4 is identical to Table 2 except that it focuses only on beginning teachers. It shows that while almost all beginning teachers have at least bachelor degrees and 81 percent have full certificates, in disadvantaged schools only 59 percent of beginning teachers have regular teaching certificates.

Table 4. Percentage of *beginning* elementary and secondary public school teachers and by highest degree earned, by highest type of certification, by type of school.

	Less than Bachelor's Degree	Bachelor's Degree	Master's Degree or More	No Certification	Less-than-Regular Certification	Regular Certification
Total	1	82	17	6	13	81
Poverty Enrollment						
Low	2	78	21	3	13	84
High	.4	83	17	13	17	70
Minority Enrollment						
Low	1	84	14	2	13	84
High	.6	78	21	14	21	65
Community						
Rural	1	87	12	4	12	84
Suburban	2	79	19	4	11	85
Urban	.9	78	21	12	17	71
Not-Poor/White/Suburban	.6	78	22	3	13	84
Poor/Minority/Urban	.2	76	24	19	22	59

Notes:

- Beginning Teachers refers to teachers with 3 years or less total teaching experience.
- Less than Regular Certification includes all those with emergency, temporary, alternative or provisional certification.
- Regular Certification includes all those with probationary, regular, standard, full, or advanced certification. (Probationary refers to initial license issued after satisfying all requirements except completion of probationary period.)
- Low poverty refers to schools where 15% or less of the students receive publicly funded free or reduced price lunches. High poverty refers to schools where over 80% do so.
- Low minority refers to schools where 15% or less of the students are minority. High minority refers to schools where over 80% are. Middle categories of poverty and minority are not shown.
- Not Poor/White/Suburban refers to schools that are low poverty and low minority and suburban.
- Poor/Minority/Urban refers to schools that are high poverty and high minority and urban.

However, the most glaring and prominent source of inadequate access to qualified teachers is not a lack of basic education or training of teachers, but rather a lack of fit between teachers' preparation and teachers' class assignments: the phenomenon of out-of-field teaching. Whereas most teachers, even in disadvantaged schools, have a bachelor's degree and a regular teaching certificate, many teachers at both the elementary and the secondary levels are assigned to teach classes in fields that do not match their educational background.

At the elementary school level, the data show that 12 percent of those who teach regular pre-elementary or general elementary classes do not have an undergraduate or graduate major or minor in the fields of pre-elementary education, early childhood education, or elementary education (see column 1 of Table 5).⁷ Interestingly, the data also show that beginning elementary teachers are more prone than experienced elementary teachers to be teaching out of their fields (see bottom row of Table 5). There are also cross-school disparities: elementary teachers in poor schools and in schools serving predominantly minority student populations are less likely to have a major or minor in the field.

However, the standard by which one defines a qualified elementary teacher impacts the amount of out-of-field teaching found in elementary schools. Out-of-field levels drop significantly when looking at those without teaching certificates in contrast to those without a major or minor. In background analyses (not shown here), only five percent of regular elementary teachers did not have regular certificates in the fields of pre-elementary education or elementary education.

The data also show that levels of out-of-field teaching are higher at the secondary level than at the elementary level.⁸ For example, about a third of all public secondary school math teachers have neither a major nor a minor in math, math education, or related disciplines, such as engineering or physics. About one quarter of all secondary school English teachers have neither a major nor a minor in English or related subjects, such as literature, communications, speech, journalism, English education, or reading education. In science, slightly lower levels—about one fifth of all public secondary school teachers—do not have at least a minor in one of the sciences or in science education. Finally, about a fifth of social studies teachers are without at least a minor in any of the social sciences, in public affairs, in social studies education, or in history (see columns 2-8 of Table 5).⁹

As is true in elementary schools, there are also large cross-school differences in out-of-field teaching in secondary schools. In most fields, teachers in high-poverty schools are more likely to be out of field than are teachers in more affluent schools. For example, almost a third of social studies teachers in high-poverty schools, as opposed to 16 percent in low-poverty schools, do not have at least a minor in social studies or a related discipline. To be sure, advantaged schools are not free of out-of-field teaching. Many teachers in these kinds of schools also teach out of their fields. But misassignment is clearly a major factor behind lack of access to qualified teachers in disadvantaged schools. The poverty and race gaps for out-of-field teaching (in Table 5) are distinctly wider than the poverty and race gaps for teacher qualifications (in Table 2). In other words, *although teachers in disadvantaged schools are slightly more likely to have fewer qualifications, they are far more likely to be misassigned than are those in advantaged schools*. These cross-school findings are consistent across all three cycles of the SASS data and with analyses that use other measures of out-of-field teaching, such as the percentage of classes or the percentage of students taught by out-of-field teachers (e.g., Haycock, 1998, 2000; Ingersoll, 1996).

At the secondary level, out-of-field teaching levels are similar whether one is looking at teachers without a major or minor or at teachers without certification in their assigned fields. For example, I have found in other analyses that about a third of

Table 5. Percentage of public school teachers in selected field *without* a major or a minor in that field, by school type and teacher experience.

	(1) Elem.	(2) English	(3) Math	(4) Science	(5) Life Science	(6) Physical Science	(7) Social Studies	(8) History
Total	12.2	24.1	31.4	19.9	32.9	56.9	19.3	53.1
Poverty Enrollment								
Low	11.6	21.8	27.5	17.2	28.9	50.6	16.2	47.1
High	20.8	20.1	37.6	28.0	39.4	68.4	29.6	63.6
Minority Enrollment								
Low	8.1	21.7	27.3	17.0	32.1	55.3	18.8	55.4
High	19.5	28.5	37.8	24.6	33.6	54.2	25.5	56.8
Community								
Rural	8.3	23.1	30.2	19.5	34.1	60.2	19.5	56.8
Suburban	14.5	21.8	29.6	21.5	32.1	55.1	16.9	50.6
Urban	14.7	25.3	33.1	16.7	31.8	50.5	21.1	48.0
Not Poor / White / Suburban	13.8	-	-	-	-	-	-	-
Poor / Minority / Urban	21.3	-	-	-	-	-	-	-
Teacher's Experience								
Less than 5 years	15.2	26.1	31.7	19.7	36.1	56.8	21.3	54.8
More than 25 years	11.5	17.8	25.6	13.3	24.5	52.7	14.8	48.7

Notes:

- Column 1—Elementary includes all those teaching in the fields of prekindergarten, kindergarten or general elementary in grades K-8. It includes those teaching in self-contained classes, where the teacher teaches multiple subjects to the same class of students all or most of the day. It includes K-8 teachers employed in middle schools. It excludes departmentalized teachers who teach subject-matter courses to several classes of different students all or most of the day. Elementary teachers with a major or minor in the fields of pre-elementary, early childhood education, or elementary education are defined as in-field.
- Columns 2-7—The teaching fields of English, math, science and social studies only include departmentalized teachers in grades 7-12. It excludes those employed in middle schools. For details on definitions of these assignment fields and the major/minors defined as in-field in each, see Ingersoll 1999.
- Columns 5, 6, and 8—The estimates for life science, physical science, and history represent the percentage of teachers without at least a minor in those particular subfields. For example, in science, teachers (column 4) who hold a minor in any one of the sciences are defined as in-field. On the other hand, in physical science, teachers (column 6)—which includes physics, chemistry, space science, and geology—must hold a minor in one of those physical sciences to be defined as in-field, rather than simply a minor in any science.
- Low poverty refers to schools where 15% or less of the students receive publicly funded free or reduced price lunches. High poverty refers to schools where over 80% do so.
- Low minority refers to schools where 15% or less of the students are minority. High minority refers to schools where over 80% are. Middle categories of poverty and minority are not shown.
- Not Poor / White / Suburban refers to schools that are low poverty and low minority and suburban.
- Poor / Minority / Urban refers to schools that are high poverty and high minority and urban.
- “-” means too few cases for reliable estimate.
- Columns 5 and 6 (life science and physical science) are subfields of Column 4 (science), and Column 8 (history) is a subfield of Column 7 (social studies).

public secondary math teachers do not have teaching certificates in math—a figure similar to those lacking a major or minor in math (Ingersoll, 1999). But focusing on those without certificates can lead one to underestimate the amount of underqualified teaching within broad multi-disciplinarian fields, such as science and social studies. Teachers in these fields are routinely required to teach any of a wide array of disciplines and subfields within the department. However, simply having a certificate in the larger field may not mean that teachers are qualified to teach all of the subjects within the field. For example, a teacher with a degree in biology and a certificate in science may not be qualified to teach physics. Indeed, in science and in social studies, as shown in columns 5, 6, and 8 in Table 5, there are high levels of within-department, but out-of-subfield teaching. Over half of those teaching physical science classes (chemistry, physics, earth, or space science) are without a major or minor in any of the physical sciences. Likewise, over half of all those teaching history are without a major or minor in history.

Several points must be stressed concerning these data on out-of-field teaching. On the one hand, there is no doubt that some of these out-of-field teachers may actually be qualified even though they do not have a minor or major in the field. Some may be qualified by virtue of knowledge gained through previous jobs, through life experiences, or through informal training. Others may have completed substantial college coursework in a field and have a certificate but lack a major or minor in that field.

On the other hand, these measures represent a relatively low standard by which to define a qualified teacher. To many observers, even a moderate number of teachers lacking the minimal prerequisite of a college minor signals the existence of serious problems in schools. Indeed, if the definition of a qualified teacher is upgraded to include only those who hold *both* a college major and a teaching certificate in the field, the amount of out-of-field teaching substantially increases. (Ingersoll, 2001c). Moreover, the actual numbers of students affected are not trivial: every year in each of the fields of English, math, and history well over four million secondary-level students are taught by teachers with neither a major nor a minor in the field.

It is also important to recognize the implications of these data for explaining the sources of out-of-field teaching. Many of those who subscribe to the teacher deficit perspective assume that out-of-field teaching is a problem of poorly prepared teachers. In this view, a lack of adequate rigor, breadth, and depth, especially in academic and substantive coursework, in college or university teacher training programs results in more out-of-field teaching.¹⁰ Proponents of this view often argue that the problem can be remedied by requiring prospective teachers to complete a “real” undergraduate major in an academic discipline.

The data show, however, that most teachers have at least a bachelor’s degree and a full certificate. Many of these teachers have education, not academic, degrees. But having an education degree does not mean a teacher lacks content training in a particular subject or specialty. Very few teachers have only a generic major or minor in education, such as in secondary education or curriculum. Most have subject-area education majors or minors, such as in math education, English education, etc.

Of course, critics of teacher education have long argued that subject-area education degrees, such as math education, have tended to be overloaded with required courses in education to the neglect of coursework in the subject itself. This is not a new criticism; indeed it was a major point made in the *Nation at Risk* report released in 1983 (National Commission on Excellence in Education). Precisely because of such problems many states have, over the past two decades, upgraded teacher education by, among other things, requiring education majors to complete substantial coursework in an academic discipline. For instance, at many teacher-training

institutions a degree in math education currently requires as much coursework in the math department as does a degree in math itself (National Association of State Directors of Teacher Education and Certification, 1997).

No doubt the teaching force has and can continue to benefit from higher education and training standards, but this view of out-of-field teaching misses the distinction between training and assignment. Many teachers are assigned by their principals to teach classes that do not match the field of their degree or certification or both. The data show that, while beginning teachers are more prone than experienced teachers to be misassigned, those teaching out of field at either the elementary or secondary level are typically veterans with an average of 14 years of teaching experience, and about 45 percent of out-of-field teachers hold graduate degrees in disciplines other than the subjects in which they have been assigned to teach. Hence, out-of-field teachers are typically experienced and qualified individuals who have been assigned to teach in fields that do not match their training or education. This is a widespread phenomenon; the data show that each year some out-of-field teaching takes place in well over half of all U.S. secondary schools and each year over one fifth of the public secondary teaching force does some out-of-field teaching. At the secondary level, these misassignments typically involve one or two classes out of a normal daily schedule of five classes.

If not due to inadequacies in the training of teachers, what is the reason for out-of-field teaching? What accounts for the degree to which school administrators misassign teachers, especially in schools serving disadvantaged populations?

The Sources of Out-of-Field Teaching

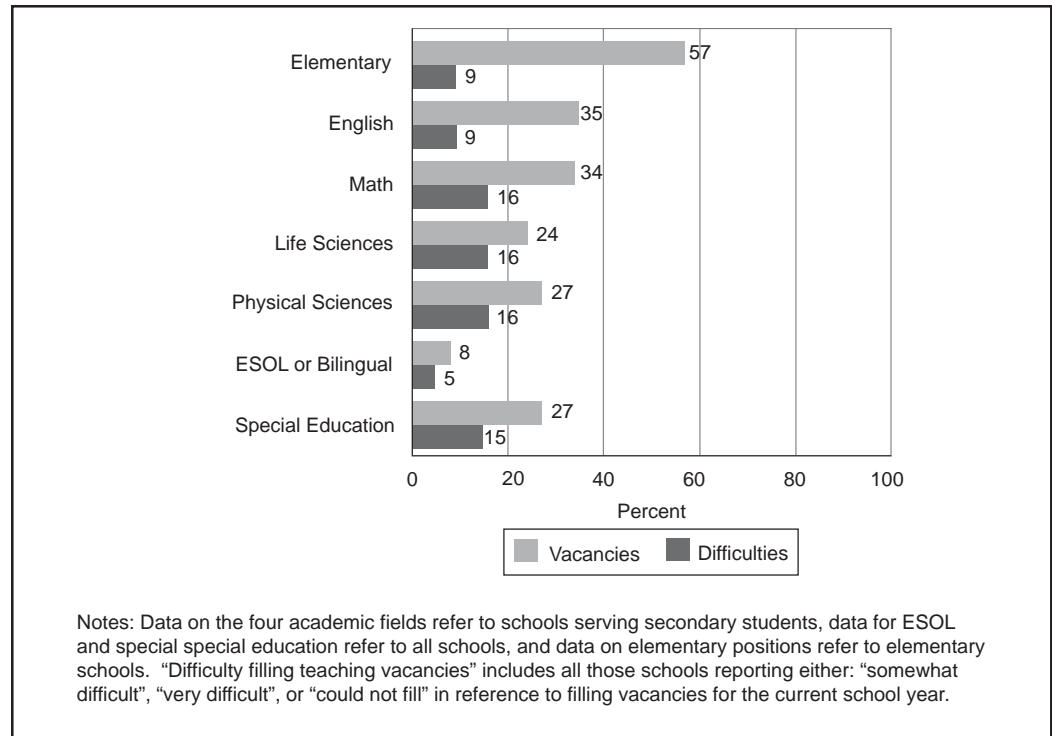
Teacher Shortages

Data from SASS and other NCES data sources show that, consistent with the shortage predictions, demand for teachers has increased since the mid 1980s (e.g., see Ingersoll, 1999, 2001b). Since 1984, student enrollments have increased, most schools have had job openings for teachers, and the size of the teacher workforce (K-12) has increased, although the rate of these increases began to decline slightly in the late 1990s (Gerald & Hussar, 1998; Snyder, Hoffman, & Geddes, 1997, pp. 12-13). Most important, substantial numbers of schools with teaching openings have experienced difficulties with recruitment. For example, in both 1990-1991 and 1993-1994 about 47 percent of schools with openings reported some degree of difficulty finding qualified candidates in one or more fields.

The data also show there are several problems with teacher shortages as an explanation for out-of-field teaching. First, shortages cannot explain the high levels of out-of-field teaching that exist in English and social studies, fields that have long been known to have teacher surpluses. Second, even when the rates of student enrollment increases were at their peak, only a minority of the total population of schools actually experienced recruitment problems in any given field. For instance, the data show that in 1993-1994, 35 percent of secondary schools had job openings for English teachers, and about one quarter had at least some difficulty filling the openings. But, this represented only nine percent of all secondary schools. Similarly, 34 percent of secondary schools had job openings for math teachers and just under half of these indicated they had at least some difficulty filling them, but this represented only 16 percent of all secondary schools (Figure 3).¹¹

Comparing the data in Figure 3 and Table 5 clearly shows that these recruiting and hiring difficulties do not account for all, or even most, out-of-field teaching. For example, while only nine percent of secondary schools had any difficulty filling their

Figure 3. Percentage schools with teaching vacancies and percentage schools with difficulties filling teaching vacancies, by field



openings for English teachers in 1993 (Figure 3), almost a quarter of all employed public secondary-school English teachers did not have a major or minor in English or related subjects in that same year (Table 5). Likewise, while only 16 percent of secondary schools reported problems filling their openings for math teachers, about a third of all employed math teachers did not have a major or minor in math. Additional analysis indicates that levels of out-of-field teaching were higher in schools reporting more difficulties in finding qualified candidates for their job openings. But the data also indicate that about half of all misassigned teachers in any given year were employed in schools that reported no difficulties whatsoever finding qualified candidates for their job openings that year.

In sum, the data show that some schools face difficulties finding qualified teachers to fill positions, and this problem leads to out-of-field teaching assignments. But the data suggest that shortages and their attendant hiring difficulties are not the sole factor behind out-of-field teaching. Rather than simply focusing on macro, demographic sources of this problem, this analysis hypothesizes that out-of-field teaching also occurs because of the way schools are organized and administered.

Predictors of Out-of-Field Teaching

This section presents the results of multiple regression analyses estimating the relative association between the dependent variable—the percentage of out-of-field classes—and four groups of independent variables: teacher qualifications, school demographic characteristics, school recruiting and hiring difficulties, and school administrative practices and organizational characteristics.

Table 6. Multilevel Multiple Regression Analysis of Percent Secondary Level Classes Out of Field

	<u>Model 1</u>		<u>Model 2</u>	
	(b)	(se)	(b)	(se)
Intercept	41.4*	3.3	44.9*	3.06
Teacher Qualifications				
Highest Degree	-2.9*	.427	-3.2*	.41
Teaching Experience	-.16*	.028	-.15*	.027
School Demographic Characteristics				
Poverty Enrollment	.09*	.015	-	-
Minority Enrollment	-	-	.11*	.01
Rural	-3.8*	.919	-2.0*	.93
Suburban	-1.2	.925	-.45	.902
School Recruiting and Hiring Difficulties				
Teaching Job Openings	-1.7	1.01	-1.53	.956
Hiring Difficulties	.03	.183	-.04	.176
Administrative Practices/Organizational Characteristics				
Major/Minor Required of Hires	-1.9*	.53	-1.7*	.517
Principal Leadership	-1.3*	.38	-1.5*	.363
Hiring/ Assigning Underqualified	1.1*	.53	.65	.520
Average Class Size	-.67*	.033	-.66*	.031
Starting Teacher Salary (by 1000)	.23*	.107	.04	.104
Presence of Teacher Union	.84	.77	1.34	.754
School Size (by 100)	-.02	.06	-.13*	.058
Proportion of School-Level Variance Explained (Rsq)	.16		.19	
Sample Size (N)	18,770		19,921	
Notes:				
<ul style="list-style-type: none"> • *p < .05 (Unstandardized coefficients displayed) • Model 1 includes a variable for school poverty enrollment • Model 2 includes a variable for school minority enrollment 				

Table 6 displays the results of these analyses. Because school poverty enrollment and school minority enrollment are highly inter-correlated, I tested their effects separately; Model 1 includes a variable for school poverty enrollment, and Model 2 includes a variable for school minority enrollment. Moreover, this part of the analysis focuses solely on the secondary level: grades 7-12. The data in the previous stage of the analysis (Table 5) indicated that levels of out-of-field teaching are more pronounced in secondary schools than in elementary schools. Moreover, to many observers the problem in secondary schools is a more compelling case because classes at the secondary level usually require a greater level of subject-matter mastery and training on the part of teachers than do those at the elementary-school level, and, hence, being taught by an out-of-field teacher could be more consequential for students at that level.

The models show that the two control measures of teacher qualifications are both related to the degree to which teachers are assigned out of their fields. Teachers without at least a bachelor's degree are, by definition, out of field. Teachers' experience is also strongly related; beginning teachers are more likely to be misassigned than are more senior teachers. The data presented earlier in Table 5 showed that teachers in both high-poverty and high-minority schools are more often out-of-field; the data in Table 6 document that this association holds up after controlling for other factors. However, while teachers in urban schools are more often out-of-field than teachers in rural schools, the difference between out-of-field teaching in urban and suburban schools is not statistically significant (at a 95 percent level of confidence).

Surprisingly, school hiring and hiring difficulties themselves do not appear to be major factors related to the amount of out-of-field teaching in schools. As discussed earlier, there is a significant bivariate positive correlation between the degree to which a school has difficulty finding qualified candidates to fill their openings and the degree of out-of-field teaching in the school. But after controlling for other factors, this relationship becomes weak and statistically insignificant, as shown in Table 6.

The question of particular interest here is: after controlling for these characteristics of teachers and schools, what administrative practices and organizational characteristics of schools have an independent association with the average amount of out-of-field teaching in schools? The analysis shows that, indeed, several aspects of schools are related to misassignment. For example, school districts vary in the extent to which they impose standards on the teacher hiring process, and these hiring regulations are related to the average degree of out-of-field teaching in schools. The SASS data (see Ingersoll, 2000) show that about two thirds of school districts require that new teacher hires hold a college major or minor in the field to be taught, and, as shown in Table 6, teachers in schools governed by these district-level policies do less out-of-field teaching.

The data also show that an additional factor associated with the degree of out-of-field teaching in a school is the perceived leadership effectiveness of the principal. Schools vary in how well their teachers rate the performance of their principals on attributes of "good" leadership (e.g., principals that recognize good teaching, communicate well, are supportive, back teachers up). The data in Table 6 show significantly less out-of-field teaching occurring in schools in which the teachers highly rate the leadership performance of their principals. Of course, it is unclear from this finding which aspects of principals' behavior may be related to their staffing assignment practices and whether the attitudes of teachers toward principals are a cause or effect of such practices.

While difficulty in filling teaching vacancies does not have an independent effect on the degree of out-of-field teaching, how school administrators choose to cope with their hiring difficulties does have an effect. Of those schools with teaching

openings, about one third reported the use of one or more of the following strategies to cover their vacancies: hiring less than fully qualified teachers, reassigning teachers trained in another field to teach the unstaffed classes, or using substitute teachers. Almost by definition these strategies result in out-of-field teaching, and, as expected, the analysis in Model 1 shows more out-of-field teaching in schools that employed these methods to fill their vacancies. In Model 2, however, this factor is not quite statistically significant (at a 95 percent level of confidence).

In contrast, other schools administrators might opt to expand class sizes or cancel classes rather than use misassignment to cope with staffing difficulties. The analysis shows that average class sizes are strongly related to the degree of out-of-field teaching in schools. Schools with larger classes tend to have less out-of-field teaching.

Finally, the models tested the association of several other characteristics of schools with misassignment. Smaller schools have more out-of-field teaching in Model 2, although this predictor fails to achieve statistical significance in Model 1. Higher starting teacher salaries are weakly associated with higher levels of out-of-field teaching in Model 1 and fail to achieve statistical significance in Model 2. The presence of a teacher union is not related to the extent of out-of-field teaching in either model.

Notably, these analyses failed to find any factors representing either the teacher deficit or the organizational perspectives that accounted for the effects of poverty and minority enrollment. In other words, none of the variables, when introduced to the models, significantly reduced the estimates for the effects of poverty and minority enrollment.

Several cautions and limitations need to be stressed. First, it must be remembered these multivariate findings do not show causality but represent associations between particular school measures and the degree of out-of-field teaching in schools. Second, the regression models account for only a portion of school-to-school differences in out-of-field teaching. Further research is needed to refine and verify these exploratory findings. If borne out by further analysis, these findings do, however, suggest important implications for both theory and policy concerning the problem of underqualified teachers and teaching.

IMPLICATIONS

The source of the problem of underqualified teachers, according to most researchers and commentators, lies primarily in inadequacies in the quantity of teachers produced (i.e., shortages) and in the quality of the preparation these teaching candidates receive (i.e., low standards for teacher training; paucity of academic subject-matter coursework). Consistent with this teacher deficit perspective, the dominant policy responses have been attempts to upgrade the quality of teachers through more rigorous training, testing, and licensing requirements and to increase the quantity of teachers supplied through various recruitment strategies.

In contrast, this study tests the extent to which the problem of unqualified teachers has to do with the manner in which schools are organized and teachers are employed and utilized. To do so, this analysis targets the practice of out-of-field teaching and shows that it is widespread, especially in those schools serving disadvantaged communities. Furthermore, the analysis shows that out-of-field teaching is not primarily due to a deficit in either the quality or the quantity of teachers. Rather, out-of-field teaching is a common administrative practice whereby otherwise qualified teachers are assigned by school principals to teach classes in subjects which do not match their fields of training. This practice takes place as often as not in schools that do not suffer from teacher recruitment problems. Hence, this analysis suggests

that the above kinds of teacher reforms, while often highly worthwhile, will not eliminate the problem of underqualified teaching unless they also address the problem of misassignment. In short, recruiting large numbers of new candidates into teaching and mandating more rigorous training requirements for them will not solve the problem of underqualified teaching if large numbers of such teachers, especially in disadvantaged schools, continue to be assigned to teach subjects other than those for which they were trained.

Focusing blame on teachers, on teacher training institutions, or on inexorable, macro demographic trends suggests that schools are simply victims and diverts attention from an important root of the problem—the way schools are organized and teachers are managed. A central objective of this analysis was to explore which aspects of the organization and administration of schools factor into the degree of misassignment in schools. My results suggest that the way school administrators—especially school principals—respond to and cope with staffing decisions and challenges affects the levels of out-of-field teaching more than does the extent to which schools face teacher shortages and attendant hiring difficulties. When facing difficulty finding qualified candidates to fill teaching job openings, some school principals resort to hiring less than fully qualified teachers, assigning teachers of one subject or grade level to teach classes in others, or employing substitute teachers to cover hard-to-staff classes. These decisions, of course, result in more out-of-field teaching. Sometimes these choices are unavoidable and some out of field teaching must be expected. But the results also show that school principals vary in their staffing strategies. Sometimes, top-down regulations shape the choices available. For example, school districts that have formal regulations concerning minimal training requirements for new hires have less out-of-field teaching. Interestingly, one of the stronger predictors of the amount of out-of-field teaching in schools is the leadership performance of principals. The measure used for the latter was a composite indicator based on evaluations by teachers and, hence, could be highly subjective. Like the other factors, however, it is also highly suggestive.

What all of these findings collectively suggest is a role for managerial choice, agency, and responsibility—elements often overlooked in the educational literature on the sources of underqualified teachers. One strategy for raising teaching quality in schools would be to improve the assignment of teachers already employed in schools. This would be a low-cost alternative or complement to strategies aiming to modify the quality or quantity of teacher training graduates. It would also be an intervention that could be undertaken immediately, as opposed to the lag time it takes for modifications in the output of teacher training institutions to actually lead to changes in classroom practice in schools.

While this analysis suggests some alternative staffing strategies for school leaders, it does not suggest that any of these options will be easy or cost free. Staffing decisions involve some difficult trade-offs and tough choices for school administrators. For example, lowering class sizes, currently a popular reform idea, appears to come at the expense of increasing out-of-field teaching. Likewise, the data suggest reducing the size of schools, another currently popular reform idea, may also result in more out-of-field teaching. The results also contradict the view that teacher unions are a major source of out-of-field teaching. Schools with unions do not have more out-of-field teaching. Union work rules certainly have an impact on the management and administration of schools, but eliminating teacher unions will not eliminate out-of-field teaching.

FUTURE RESEARCH POSSIBILITIES

The large-scale survey data analyzed here provide an overall portrait of the levels and sources of out-of-field teaching and can suggest which factors are associated with out-of-field teaching. But they have obvious limits for understanding the processes behind school staffing. Follow-up field investigations are needed to illuminate the decision-making processes surrounding the hiring, assignment, and utilization of teachers in particular kinds of schools. What are the hidden incentives systems within which administrators make staffing decisions? How do particular teachers come to be teaching particular classes? What are the reasons behind the misassignment of teachers?

Although this analysis has begun to explore the factors related to school-to-school differences in out-of-field teaching, it does not address adequately a larger question: Why is out-of-field teaching prevalent across the American K-12 education system as a whole? In addition to close-up, micro-level field studies, a second avenue for further research is macro-level, historical, and comparative investigation of the roots of this mode of organizing the work of teachers. One possible explanation is that the prevalence of out-of-field teaching is rooted in the semi-professional status of teaching—a predominantly female occupation.

Unlike Canada and many European and Asian nations, this country's elementary and secondary school teaching force is largely treated as lower-status, semi-skilled workers, especially those working in disadvantaged schools. Since the turn of the century American educators have promoted the view that teaching, like the traditional male-dominated professions, is highly complex work requiring specialized knowledge and skill and, like these professions, deserves commensurate prestige, authority, and compensation. These efforts have, however, met only limited success (Lortie, 1969; Ingersoll, 2000). The comparison with traditional professions is stark. Few would require cardiologists to deliver babies, real estate lawyers to defend criminal cases, chemical engineers to design bridges, or sociology professors to teach English. The commonly held assumption is that such traditional professions require a great deal of expertise and, hence, specialization is necessary. In contrast, underlying out-of-field teaching is the assumption that female-dominated, pre-collegiate school teaching requires far less skill, training, and expertise than these traditional professions, and, hence, specialization is less necessary. From this perspective, the continuing treatment and status of teaching as a semi-profession has resulted in what the data tell us, that out-of-field teaching is not simply an emergency condition, but a common and accepted administrative practice in many schools in this country, especially those in disadvantaged communities. From this perspective, the long-term solution to upgrading the quality of teaching is to upgrade the quality of the teaching job. In short, well-paid, well-respected professions that offer good working conditions would be less inclined to resort to lowering standards as a coping mechanism.

ENDNOTES

- ¹ A notable exception is recent work by Darling-Hammond (1999) on state-to-state differences in levels of qualified teachers. Her work traces the effects of a range of state-level contextual factors such as the presence of professional standards boards, the proportion of accredited teacher training programs, and the extent of teacher hiring standards at the school-district level on aggregate levels of qualified teachers in the state.
- ² For further discussion of this debate over the necessity of teacher qualifications, see Ingersoll, 2001a.
- ³ For a detailed review and evaluation of a variety of different measures of out-of-field teaching, see Ingersoll, 2001c.
- ⁴ For details on this first type of out-of-field teaching measure and a chart showing the categorization of disciplines and subjects into fields of training and fields of teaching assignment, see Ingersoll, 1999.
- ⁵ For more detail on this second type of out-of-field teaching measure, see Ingersoll, 1995.
- ⁶ In the multilevel models, the level-1 (within-school) portion investigates the changes in the percent of out-of-field classes for each teacher in each school as a function of two of each teacher's background characteristics (education and teaching experience) and random error. The regression coefficients are structural relations occurring with each school that indicate how the percent of out-of-field classes in each school is distributed across the measured teacher characteristics.

The level-2 (between-school) portion of the models investigates the changes in each school's mean percent of out-of-field classes, adjusted for teacher characteristics, as a function of a number of school-level characteristics. These regression coefficients represent structural relationships between school-level characteristics and the adjusted mean of percent out-of-field classes for each school.

Because multilevel models are more general than multiple regression models of the type estimated by ordinary least squares or probability weighted least squares, there are additional choices to make regarding the specification of the model. These include: (1) whether to treat the slope coefficients in the level-1 model as random or fixed and (2) whether to center teacher characteristics data around the mean value for teachers in each school.

The models estimated here treat the intercept in the level-1 model as random and made up of two components: a component that is common to all teachers within a school and a component that is unique to each teacher. The common school component arises from unmeasured school-level characteristics. Each of the remaining terms in the level-1 model (years of teaching experience, education) are modeled as having fixed effects. This is how the slope coefficients in a standard linear regression analysis are modeled. They are fixed parameters to be estimated, as opposed to random parameters with means and standard deviations. For the model estimated here, there are no reasons to suspect that the effects of teacher characteristics have random effects on out-of-field teaching, and the available data are not extensive enough (in terms of teachers per school) to estimate such a complex model, so it is not pursued in this analysis.

The models estimated here also do not center the teacher characteristics data around the school means. That is, the coefficients for the teacher characteristics will not be expressed as deviations from the school mean but as deviations from the entire sample. If one centers around the mean value for teachers in each school, then one uses the variation in teacher characteristics within schools to estimate the effect of the teacher characteristics on out-of-field teaching. If one does not center, then both within- and between-school variation in teacher characteristics are used to estimate the effects of the teacher characteristics on out-of-field teaching.

Because there are not compelling theoretical reasons to do so and also because of limitations in the within-school sample size, this analysis does not center the teacher data. Hence, in this analysis, the effects on out-of-field classes of, for instance, having more or less teaching experience do not refer to comparisons within each school but across the entire sample of teachers.

- ⁷ The data in column 1 of Table 5 refer to public elementary and middle school (grades K-8) teachers whose assignment is pre-elementary or general elementary and who teach in self-contained classes. The latter refers to those who teach multiple subjects to the same students for all or most of the day. This excludes departmentalized elementary teachers and specialists such as who teach art, music, physical education, math, or special education to different students throughout the day.
- ⁸ The data in columns 2-8 of Table 5 refer to public secondary school (grades 7-12) teachers who are departmentalized. The latter refers to those who teach subject-matter classes to different classes of students for all or most of the day. It excludes departmentalized teachers employed in middle schools.
- ⁹ See Ingersoll 1999 and 2001c for details on these particular measures.
- ¹⁰ This viewpoint is especially common among news columnists. See for example, the syndicated columns of David Broder, Thomas Sowell, Maggie Gallagher the week of September 14 to 20th, 1996.
- ¹¹ In Figure 3, the data on the four academic fields refer to schools serving secondary students, the data for ESOL and special education refer to all schools, and the data on elementary positions refer to elementary schools. "A difficulty filling teaching vacancies" includes all those schools reporting either: "somewhat difficult"; "very difficult"; or "could not fill"; in reference to filling vacancies for the current school year.
- ¹² See, Haycock, 1998; Stecher, Bohrnstedt, Kirst, McRobbie, & Williams, 2001; and Bohrnstedt, Stecher, & Wiley, 2000 for insightful discussion of the unanticipated outcomes of class-size reduction reforms.

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