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Turnover Among Mathematics and Science Teachers in the U.S.

Abstract

For some time educational policy analysts have been predicting that shortfalls of teachers resulting primarily from increases in student enrollment and teacher retirements will make it very difficult for schools to find qualified teachers and, in turn, will hurt school performance. Moreover, analysts have argued that shortages will be worse for particular fields, such as math and science, because of difficulties in recruiting qualified candidates. This paper summarizes what the best available nationally representative data reveal about the rates of, and reasons for, teacher turnover for both math/science and other teachers. The data show that, contrary to conventional wisdom, the problems schools have adequately staffing classrooms with qualified teachers are not primarily due to teacher shortfalls, stemming from either increases in student enrollment or increases in teacher retirement. Rather, the data show that school staffing difficulties are primarily a result of a "revolving door" where large numbers of teachers depart teaching for other reasons, such as job dissatisfaction and in order to pursue better jobs or other careers. These findings have important implications for educational policy. Teacher recruitment programs - the dominant policy approach to addressing school staffing inadequacies - will not solve the staffing problems of schools, if they do not also address the problem of teacher retention. In short, the data indicate that recruiting more teachers will not solve teacher shortages if large numbers of such teachers then prematurely leave.

Comments

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Archived Information

Turnover Among Mathematics and Science Teachers in the U.S.

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Prepared for the

**National Commission on
Mathematics and Science Teaching
for the 21st Century,
Chaired by John Glenn**

February, 2000

Summary

For some time educational policy analysts have been predicting that shortfalls of teachers resulting primarily from increases in student enrollment and teacher retirements will make it very difficult for schools to find qualified teachers and, in turn, will hurt school performance. Moreover, analysts have argued that shortages will be worse for particular fields, such as math and science, because of difficulties in recruiting qualified candidates. This paper summarizes what the best available nationally representative data reveal about the rates of, and reasons for, teacher turnover for both math/science and other teachers. The data show that, contrary to conventional wisdom, the problems schools have adequately staffing classrooms with qualified teachers are not primarily due to teacher shortfalls, stemming from either increases in student enrollment or increases in teacher retirement. Rather, the data show that school staffing difficulties are primarily a result of a "revolving door" -- where large numbers of teachers depart teaching for other reasons, such as job dissatisfaction and in order to pursue better jobs or other careers. These findings have important implications for educational policy. Teacher recruitment programs - the dominant policy approach to addressing school staffing inadequacies - will not solve the staffing problems of schools, if they do not also address the problem of teacher retention. In short, the data indicate that recruiting more teachers will not solve teacher shortages if large numbers of such teachers then prematurely leave.

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. In the mid 1980s a series of highly publicized reports began to focus national attention on the coming possibility of severe teacher shortages in elementary and secondary schools (e.g. National Commission on Excellence in Education 1983; National Academy of Sciences 1987). These reports predicted a dramatic increase in the demand for new teachers primarily resulting from two converging demographic trends -- increasing student enrollments and increasing teacher turnover due to a "graying" teaching force. Subsequent shortfalls of teachers would, in turn, force many school systems to resort to lowering standards to fill teaching openings, the net effect of which would inevitably be high numbers of underqualified teachers and lower school performance. These reports also stressed that shortages will affect some teaching fields more than others. Special education, math and science teachers, in particular, have usually been targeted as fields with especially high turnover and those predicted most likely to suffer shortages (e.g. Boe, Bobbitt and Cook 1997; Grissmer and Kirby 1992). As a result, over the past decade the inability of schools to adequately staff classrooms with qualified teachers (hereafter, school staffing problems) has increasingly been recognized as a major social problem, has received widespread coverage in the national media, and has been the target of a growing number of reform and policy initiatives (e.g. National Commission on Teaching 1997).

A dominant policy response to school staffing problems has been to attempt to increase the quantity of teacher supply. Over the past decade a wide range of initiatives have been implemented to recruit new candidates into teaching. Among these are programs, such as "troops-to-teachers" and others designed to entice professionals, especially those with math and science backgrounds into mid-career changes to teaching; alternative certification programs, whereby college graduates can postpone formal education training, obtain an emergency teaching license, and begin teaching immediately; and Peace Corps-like programs, such as "Teach for America," designed to lure the "best and brightest" into understaffed schools.

Concern over school staffing problems has also given impetus to research on teacher shortages and turnover. However, as numerous analysts have noted, it was difficult, initially, to study these issues because of a lack of accurate data, especially at a nationally representative level, on many of the pertinent issues surrounding teacher supply, demand and quality. In order to obtain such data, the National Center for Education Statistics (NCES), the statistical arm of the U.S. Department of Education, designed the Schools and Staffing Survey (SASS) in the late 1980s. This is now the largest and most comprehensive data source available on the staffing, occupational, and organizational aspects of schools. SASS administers survey questionnaires to a random sample of about 55,000 teachers from all types of schools and from all 50 states. In addition, all those teachers who left their teaching jobs in the year subsequent to the administration of the initial survey questionnaire are again contacted to obtain information on their departures. This supplemental study, known as the Teacher Followup Survey (TFS), is the largest and most comprehensive data source on teacher turnover in the U.S. NCES has administered SASS/TFS on a regular basis; to date, three cycles have been released - 1987-89;

1990-92; 1993-95. The next cycle is scheduled to be conducted during the 1999-2001 school years.

Over the past six years I have been undertaking research using SASS and TFS to study a number of issues concerned with teacher turnover, shortages and quality. In this paper I will draw from this larger body of research to briefly summarize what the data reveal about the rates of and reasons for teacher turnover. (For those interested in more detail on the data sources, the findings or discussion of the issues, I would be happy to provide copies of the published work, listed in the reference section, from which this paper draws).

The data presented here come primarily from the most recent TFS (1995) and represent all teachers for grades k through 12 and from all types of schools, both public and private. Math and science teachers are the primary focus of this paper. The latter are those identified by their principals as having their main teaching assignment in either math or science and represent about 11 percent of the total teaching force. About 22 percent of these math/science teachers are employed in elementary or middle schools, another 73 percent are in secondary schools and about 5 percent are in combined (k-12 grades) schools. Throughout, I will compare the data on math/science teachers with the data for all teachers. Moreover, in order to provide a benchmark for both, I will also compare teachers' rates of turnover to levels of employee turnover in other occupations.

There are two types of teacher turnover from schools. The first, known as teacher attrition, refers to those who leave the occupation of teaching altogether. The second type, known as teacher migration, refers to those who transfer or move to different teaching jobs in other schools. Research on teacher supply and demand has often emphasized the first type and neglected the second type. Many assume that teacher migration is a less significant form of turnover because it does not increase or decrease the overall supply of teachers, as do retirements and career changes and, hence, assume it does not contribute to the problem of staffing schools and does not contribute to overall shortages. From a systemic point of view, this is probably correct. However, from the viewpoint of those managing schools, teacher migration and attrition have the same effect - in either case it results in a decrease in staff which usually must be replaced.

Hence, from the school perspective, teacher migration can, indeed, contribute to the problem of keeping schools staffed with qualified teachers. For this reason, this paper will present data on both teacher migration and teacher attrition. Hereafter, I will refer to teacher migration as "movers," teacher attrition as "leavers" and total turnover as "departures."

After establishing how many teachers depart from their teaching jobs and how these rates compare with other occupations, this paper presents statistics on the reasons why teachers move from or leave their teaching jobs. These data are drawn from items in the TFS questionnaire that ask teachers to indicate the reasons (up to three) for their departures, from a list provided in the survey questionnaire (see below). In addition, I present data from an additional set of items that asks teachers to indicate the sources (up to three) of their dissatisfaction, if they had indicated job dissatisfaction as a reason for their turnover. Finally, I conclude by briefly discussing the

implications of these findings for understanding and addressing the staffing problems of schools.

Definitions of Measures of Reasons for Turnover

Teachers could list up to 3 choices from a list of 12 reasons for their departures. I grouped the 12 reasons into 5 categories, as follows:

. **Retirement.**

. **School Staffing Action:** reduction-in-force/lay-off/school closing/reassignment.

. **Family or Personal:** family or personal move; pregnancy/child rearing; health; other family or personal reason.

. **To Pursue other Job:** to pursue another career; to take courses to improve career opportunities in or outside the field of education; for better teaching job.

. **Dissatisfaction:** dissatisfied with teaching as a career; dissatisfied with the school; for better salary or benefits.

Of those teachers who indicated dissatisfaction as a reason for their departure, they could list up to 3 choices from a list of 12 reasons for their dissatisfaction. I grouped the 12 reasons into 9 categories, as follows:

. **Poor Salary**

. **Poor Administrative Support:** lack of recognition and support from administration; lack of resources and material/equipment for your classroom; inadequate support from administration

. **Student Discipline Problems**

. **Lack of Faculty Influence and Autonomy:** lack of influence over school policies and practices; lack of control over own classroom

. **Poor Student Motivation:** poor student motivation to learn

. **Poor Opportunity for Professional Advancement**

. **Inadequate Time to Prepare:** inadequate time to prepare lesson/teaching plans

. **Intrusions on Teaching Time:** intrusions on teaching time (i.e. not enough time working directly with teaching students)

. **Class Sizes too Large**

Results

Levels of Turnover

Teaching is a relatively large occupation - it represents 4% of the entire nationwide civilian workforce. There are, for example, over twice as many k-12 teachers as registered nurses and five times as many teachers as either lawyers or professors. Moreover, the rate of turnover for teachers appears to be higher than in many other occupations. One of the best known sources of national data on rates of employee turnover, the Bureau of National Affairs, has shown that nationwide levels of employee turnover, gathered from a wide range of occupations, have been quite stable over the past decade; averaging 11% per year (Bureau of National Affairs 1998). The employee turnover rate provides an overall benchmark, however, a more similar point of comparison is nursing, which like teaching is a predominantly female occupation that has experienced perennial workplace staffing problems. A recent survey of hospitals found the average turnover rate of registered nurses in the mid 1990s was 12 percent (William M. Mercer 1999). Comparison of the TFS data with either the rate for nurses or the

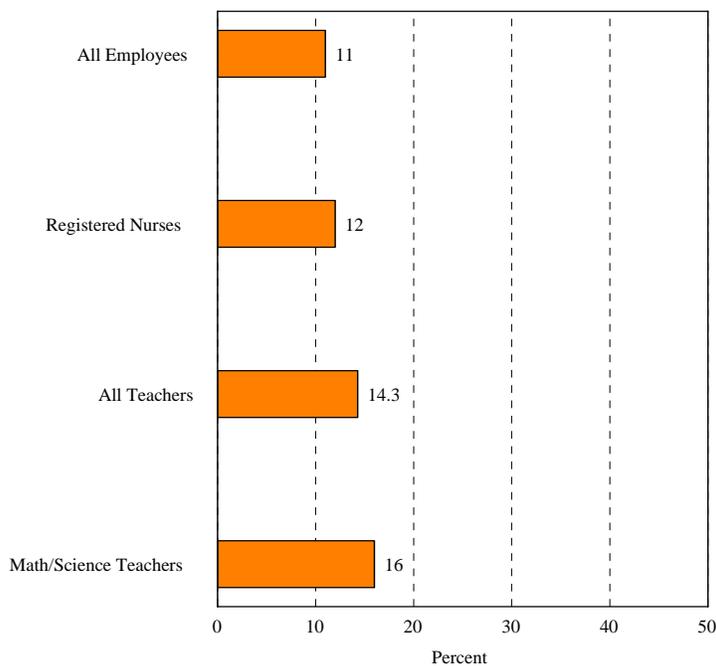


Figure 1 - Percent employee turnover, percent nurse turnover and percent teacher turnover.

rate for employees in general suggests that teaching has a relatively high turnover rate: 14.3 percent in 1994-95 (see figure 1). As a result, numerically, teacher turnover is a large phenomenon; the data show that in 1994-95 over 417,000 teachers, from a force of about 3 million, departed their teaching jobs. Total teacher turnover is about evenly split between migration and attrition; 7 percent of teacher turnover were movers (migration) and 7.3 percent left the occupation altogether (attrition). Interestingly, the turnover rates for math/science teachers - 16 percent - are not much higher than for other teachers (and the difference is not statistically significant).

Turnover, however, is not equally spread across the teaching force. Teacher's decisions whether to stay or leave are influenced, in particular, by the

length of their teaching experience. Beginning teachers have very high rates of departure, these rates significantly decline through the mid-career period, and then rise again in the retirement years. This means that teaching is an occupation that loses many of its newly trained members

very early in their careers. Figure 2, for example, provides a rough estimate of the cumulative losses of beginning teachers from attrition in their first several years of teaching. The data suggest that after just three years, 29 percent of all beginning teachers have left teaching

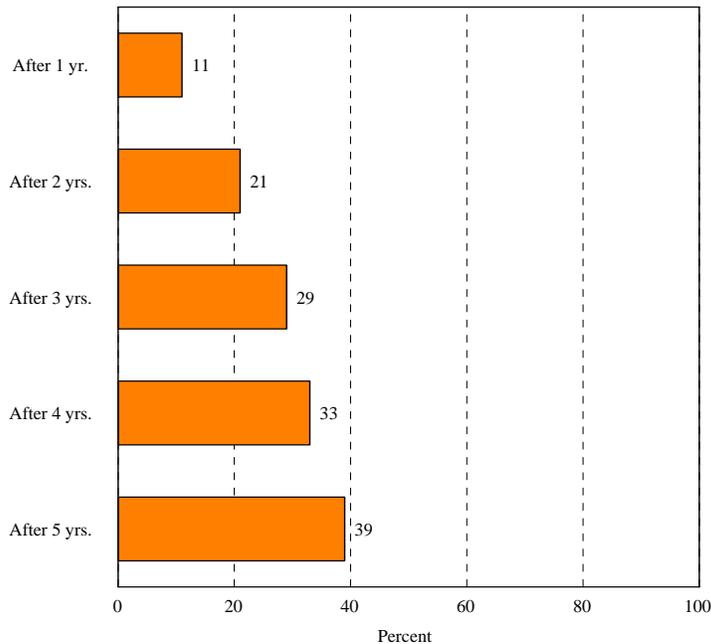


Figure 2 - Beginning teacher attrition (cumulative percent teachers having left teaching occupation, by years of experience)

altogether, and after 5 years, fully 39 percent have left teaching. Because of sample size limitations it is not possible to make precise estimates of the cumulative losses for math/science teachers alone, however, the data suggest they are only slightly higher than the averages depicted in figure 2.

These high rates of turnover account for most of the demand for new teachers, which, in turn, is a driving force behind school staffing problems. The data show that, while it is true that student enrollments are increasing, the demand for new teachers is not primarily due to these increases.

In recent years, the vast majority of new hires are simply replacements for those who have just departed. For instance, the TFS data show that about 286,200 teachers (excluding within-district transfers) were newly hired by schools just prior to the 1993-94 school year. But, in the following 12 months, about 213,000 teachers - an amount equivalent to 75 percent of those just hired - left the occupation altogether. In short, the demand for new teachers, and the subsequent problems schools face insuring classrooms are staffed with qualified teachers, are to a significant extent due to teachers moving from or leaving their jobs at higher rates than in many other occupations. These patterns are chronic - similar results are found in all three cycles of the TFS data from the late 1980s to the mid 1990s.

In recent years, the vast majority of new hires are simply replacements for those who have just departed. For

Reasons for Turnover

This next section turns to the reasons behind these relatively high rates of teacher turnover. Table 1 lists the data on teachers' reasons for their turnover, separately for all teachers and math/science teachers and also separately for movers (migration) and leavers (attrition). Note that the column segments in table 1 displaying percent teachers giving various reasons for turnover each add up to more than 100 percent, because respondents could indicate up to three

reasons for their departures. The same applies to the columns displaying reasons for dissatisfaction-related turnover. These same data (but with movers and leavers combined) are also more succinctly summarized in figures 3 and 4.

Table 1 - Percent Teacher Turnover and Percent Teachers Giving Various Reasons for their Turnover

	All Teachers		Math and Science Teachers	
	Movers	Leavers	Movers	Leavers
Rates of Turnover	7	7.3	9	7
Reasons for Turnover				
Retirement	-	25	-	26
School Staffing Action	34	8	28	11
Family or Personal	36	44	32	45
To Pursue other Job	29	25	33	21
Dissatisfaction	32	25	48	28
Reasons for Dissatisfaction				
<i>Poor Salary</i>	49	61	53	66
<i>Poor Administrative Support</i>	51	32	57	22
<i>Student Discipline Problems</i>	22	24	33	21
<i>Lack of Faculty Influence & + Autonomy</i>	18	15	11	15
<i>Poor Student Motivation</i>	12	18	17	32
<i>Poor Opportunity for Professional Advancement</i>	8	5	4	1
<i>Inadequate Time to Prepare</i>	5	6	3	6
<i>Intrusions on Teaching Time</i>	5	11	6	12
<i>Class Sizes too Large</i>	3	11	.5	9

As illustrated in figure 3 and table 1, overall, math/science teachers do not greatly differ from other teachers in the reasons why they depart from their teaching jobs. Contrary to conventional wisdom, retirement is not an especially prominent factor. The latter actually accounts for only a

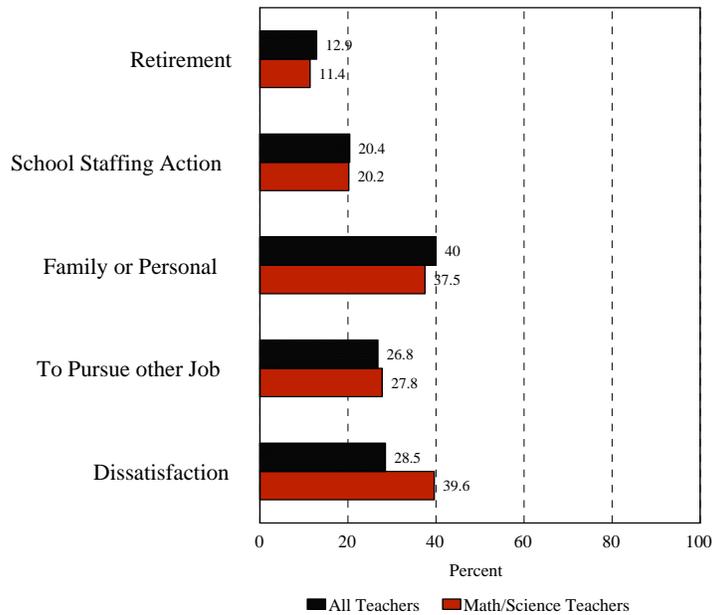


Figure 3 - Percent teachers giving various reasons for their turnover.

small part (13%) of total turnover. Of course, if one focuses on attrition alone (only those leaving teaching altogether) retirement is more prominent because, by definition, migration excludes retirement. Even in this case, however, retirement is not an especially prominent factor; retirement accounts for only a quarter of attrition (25%). Notably, retirement also does not account for the relatively high rates of turnover by math/science teachers.

School staffing cutbacks, due to lay-offs, school closings and reorganizations, account for a larger proportion of total turnover than does retirement. Staffing actions more often result in migration to other teaching jobs rather than

leaving the teaching occupation altogether (34% of migration and 8% of attrition).

Personal reasons, such as departures for pregnancy, child rearing, health problems and family moves are more often given as reasons for turnover than are either retirement or staffing actions (36 percent of migration and 44 percent of attrition).

Finally, two related reasons are, collectively, a very prominent source of turnover. About half of all teachers who depart their jobs give as a reason either job dissatisfaction or the desire to pursue another job, in or out of education. Notably, math/science teachers are significantly more likely to move from or leave their teaching jobs because of job dissatisfaction than are other teachers (40 percent of math/science and 29 percent of all teachers).

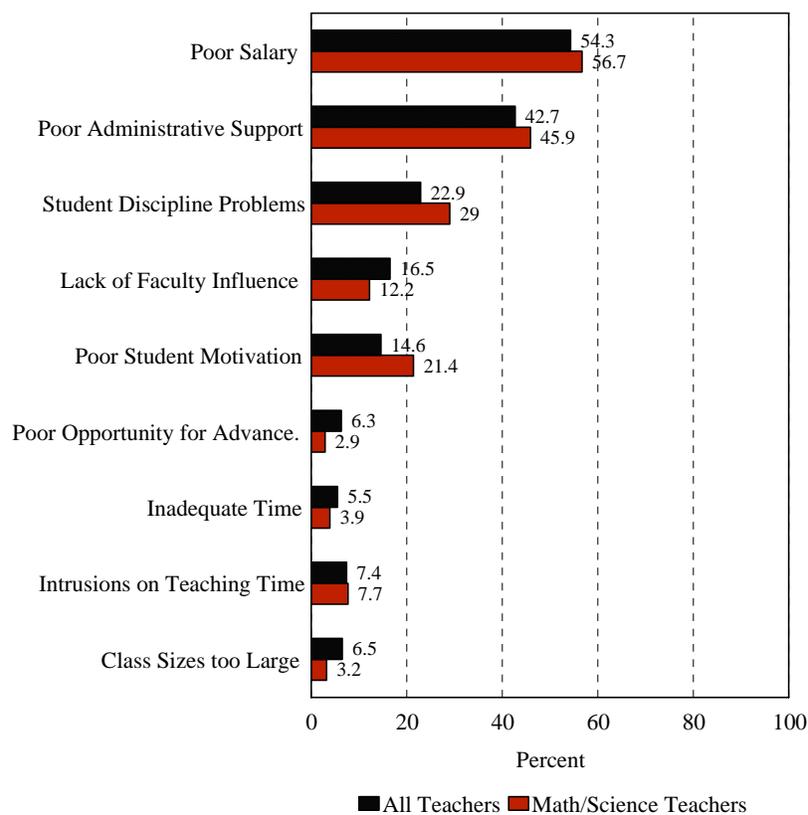


Figure 4 - Percent teachers giving various reasons for their dissatisfaction-related turnover.

As illustrated in figure 4 and table 1, of those who depart because of job dissatisfaction, the most common reasons given are: low salaries; a lack of support from the administration; student discipline problems; lack of student motivation; and lack of influence over school decisionmaking. Moreover, several factors stand out as not serious enough to lead to much turnover: large class sizes; intrusions on classroom time; lack of planning time; and lack of opportunity for professional advancement.

Moreover, further analysis of the TFS migration data shows that there is a strong flow of teachers from more desirable to less desirable schools. For example, schools with low salaries, student discipline problems, and little faculty input into school decisionmaking tend to lose teachers to schools without these problems.

In general, similar kinds of dissatisfactions lie behind both teacher migration and teacher

In sum, the data indicate that math/science teachers, like other teachers, depart their jobs for a variety of reasons. Retirement accounts for a relatively small number of total departures, a moderate number of departures are due to school staffing actions, a large proportion indicate they depart for personal reasons, and a large proportion also report they depart either because they are dissatisfied with their jobs or in order to seek better jobs or other career opportunities.

Implications

Since the early 1980s, educational policy analysts have predicted that shortfalls of teachers resulting primarily from two converging demographic trends -- increasing student enrollments and increasing teacher retirements -- will lead to problems staffing schools with

qualified teachers and, in turn, lower educational performance.

This analysis suggests, however, that school staffing problems for both math/science and other teachers are not solely due to teacher shortfalls resulting from either increases in student enrollment or increases in teacher retirement. In contrast, the data suggest that school staffing problems are also a result of a "revolving door" -- where large numbers of teachers depart teaching for reasons other than retirement.

Teacher turnover is a significant phenomenon and a dominant factor driving demand for new teachers. The data show that, while it is true that student enrollments are increasing, the demand for new teachers is primarily due to teachers moving from or leaving their jobs at relatively high rates. Moreover, this analysis shows that, while it is true that teacher retirements are increasing, the overall amount of turnover accounted for by retirement is relatively minor when compared to that resulting from other causes, such as teacher job dissatisfaction and teachers seeking to pursue better jobs or other careers.

These findings have important implications for educational policy. Supply and demand theory holds that where the quantity of teachers demanded is greater than the quantity of teachers supplied, there are two basic policy remedies: increase the quantity supplied or decrease the quantity demanded. As noted in the beginning of this paper, teacher recruitment, an example of the former approach, has been and continues to be a dominant approach to addressing school staffing inadequacies. However, this analysis suggests that recruitment programs alone will not solve the staffing problems of schools, if they do not also address the problem of teacher retention. In short, this analysis suggests that recruiting more teachers will not solve staffing inadequacies if large numbers of such teachers then prematurely leave.

From the perspective of this analysis, schools are not simply victims of inexorable demographic trends, and there is a significant role for the management of schools in both the genesis of and solution to school staffing problems. Rather than increase the quantity of teacher supply, an alternative solution to school staffing problems, implied by this analysis, is to decrease the demand for new teachers by decreasing turnover. The data suggest that improvements in the conditions of the teaching job, such as increased support from the school administration, increased salaries, reduction of student discipline problems, and enhanced faculty input into school decisionmaking, would all contribute to lower rates of turnover, in turn, diminish school staffing problems and, hence, ultimately, aid the performance of schools.

References

- Boe, E., Bobbitt, S., Cook, L. 1997. "Whither didst Thou Go?" *Journal of Special Education*. 30:371-389.
- Bureau of National Affairs. 1998. "BNAs Quarterly Report on Job Absence and Turnover." *Bulletin to Management*. Washington D.C.: Bureau of National Affairs
- Grissmer, D. and Kirby, S. 1992. *Patterns of Attrition Among Indiana Teachers, 1965-1987*. Santa Monica, CA: Rand Corporation.
- Ingersoll, R. (1998) "The Problem of Out-of-Field Teaching." *Phi Delta Kappan*. 79: 773-76. (also on the *Kappan* website: www.pdkintl.org/kappan/king9806.htm).
- Ingersoll, R. (1999a) "The Problem of Underqualified Teachers in American Secondary Schools." *Educational Researcher*. 28: 26-37. (also on the American Educational Research Association website: www.aera.net/pubs/er/arts/28-02/ingersoll01.htm).
- Ingersoll, R. (1999b). *Teacher Turnover, Teacher Shortages and the Organization of Schools*. Seattle, WA: Center for the Study of Teaching and Policy, University of Washington. (also on the Center's website: www.ctpweb.org)
- William M. Mercer (1999). *Survey of registered nurse attraction and retention*. Atlanta, GA: William M. Mercer, Inc.
- National Academy of Sciences. 1987. *Toward Understanding Teacher Supply and Demand*. Washington, D.C.: National Academy Press.
- National Commission on Excellence in Education. 1983. *A Nation at Risk: The Imperative for Educational Reform*. Washington, D.C.: Government Printing Office.
- National Commission on Teaching and America's Future. 1997. *Doing What Matters Most: Investing in Quality Teaching*. New York: National Commission on Teaching and America's Future.

