

TEACHER CHARACTERISTICS AND
STUDENT OUTCOMES: A MULTIPLE
REGRESSION ANALYSIS

BY

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ABSTRACT

This study explores the perceived decline in the quality of American public education during the 1970s and early 1980s. The reports that were issued in 1983 in response to this perception are discussed, with emphasis being placed on one aspect of the reports' suggestions for improving the quality of public education: increasing teacher excellence. Evidence is presented that teachers do make a difference in the educational attainment of their students. Several characteristics of teachers that are expected to be related to student output are analyzed.

Major findings are that the present models do little to explain student achievement. Only one teacher characteristic exhibited a strong relationship to student outcomes: teacher experience. Educational expenditures did have a statistically significant relationship to student outcomes, but the direction of the relationship was ambiguous.

Recent reform proposals, including the career ladder, had no relationship to student outcomes.

To many interested observers, the state of education in America is in decline. While this may or may not be the case, few would profess to believe that the quality of public education in America is where it should be. The public perceives schools as being less effective today than in the past. Scores on standardized tests are not as high as in previous years. There has been a decrease in higher level thinking skills among high school students. American students aren't as competitive with foreign students as we would like to believe. In short, our education system seems to be failing us.

In the first section of this paper, we seek to explore the decline in the quality of American education, presenting evidence that such a decline has in fact occurred. We will show that the quality of education is not as high as is needed in today's society. We will discuss the flood of commission reports presented in response to this decline. Finally, we will narrow our scope to one aspect of the commission reports' suggestions--improving teacher quality--discussing whether teachers are an appropriate focus for reform efforts.

In the second section of this paper, we will discuss the various characteristics of teachers which can be influenced by public policymakers. We will focus on traditional inputs in the education process such as teacher pay, teacher graduate education, student/teacher ratios, teacher experience, and educational expenditures. We will also address recent inputs designed to improve the quality of teachers---career ladders

and teacher appraisal---using the Texas model as reference. We will attempt to ascertain which teacher variables are related to student achievement. We will conduct multivariate regression analyses using standardized test scores and planned college attendance as our measures of student outcomes.

An Environment for Reform

Parents and the general public became increasingly dissatisfied with the quality of public education during the 1960s and particularly during the 1970s. This fact is evidenced by trend statistics from both the Roper Organization and the Gallup Poll on Public Attitudes toward Education conducted by Phi Delta Kappan. The Roper data show a definite decrease in the levels of public confidence in the public schools over the time period we are considering: in 1959, sixty-five percent of Americans felt that public education was doing an excellent or good job. The percentage had declined to forty-eight percent by 1978 (Tomlinson 53). Likewise Gallup data exhibit the same decline in confidence, among both the public at large and parents of school children. Each year, the poll asked respondents to assign a letter grade to the local schools. Between 1974 and 1982, the percentage giving the schools an A or B rating fell from forty-eight percent to thirty-seven percent. Parents with children in public schools, though exhibiting higher levels of confidence than the general public, nevertheless showed the same drop in assurance; from sixty-four percent in 1974 to forty-nine percent in 1982 (Doyle 8).¹

There has been a much publicized decline in standardized test scores, specifically the Scholastic Aptitude Test, since the early 1960s. Beginning in 1963, SAT scores began a steady fall that lasted until 1979. The drop ended with mean performance in verbal scores equivalent to performance at the 32nd percentile in 1963. Similarly, mean math performance was equivalent to performance at the 39th percentile in 1963 (Congressional Budget Office 1986, in Hanushek 1986).²

Many reasons were cited for the declining scores, including the changing composition of students taking the exam, television, the role of the family in the educational process, a decrease in student motivation, the dispersal of learning activities and emphasis in the schools, and the diminished seriousness of purpose and attention to the mastery of skills and knowledge in the learning process (Advisory Panel on Scholastic Aptitude Test Score Decline, in Doyle). The issues raised here were cited again, and to greater effect, by the deluge of reports and commissions in the early 1980s (Doyle 7).³

However, Boyer (1983) argues that, discounting SAT scores, other measures of educational effectiveness do not show a decline over time at all. The real decline, he states, is in support for public education among the aging white middle class.

Peterson (1983, in Kelly 1985) concurs with Boyer in arguing that the crises in education cannot be attributed to overall decline in student achievement, so much as to the fact that the difference in achievement scores between blacks and whites and between males and females have closed. Retention rates

among black males have increased while they have declined among white males. Schools have moved toward equalizing educational disparities borne of gender, ethnicity and race. This trend toward educational equality, or the fear of it, has contributed to an erosion of middle class support for public education (p. 33).

While the use of standardized test scores as a measure of the quality of public education over time is debatable, it can be said American students don't seem to know what they should about other subjects such as history and literature. A recent study by Ravitch and Finn (1987) showed that in a national assessment of eleventh graders' knowledge of history and literature, the average score on the history portion of an assessment was 54.5 percent. The average score on the literature portion of the assessment was even lower, at 51.8 percent. The authors characterized these findings in the terms traditionally used by educators: a score of less than sixty percent is failing. Thus "if there were such a thing as a national report card for those studying American history and literature, then we would have to say that this nationally representative sample . . . earns failing marks in both subjects" (p. 1).

Perhaps even more serious than the underachievement of American students in literature and history is the comparison of American students to foreign children.⁴ Lerner (1982), while studying research sponsored by the International Association for the Evaluation of Educational Achievement, finds that the

United States compares quite poorly to other developed nations:

"Out of nineteen tests, we were never ranked first or second; we came in last three times and, if comparisons are limited to other developed nations only, the U.S. ranked at the bottom seven times" (p. 64).

In addressing the argument that such tests are comparing groups that are considerably different in academic selectiveness because many more U.S. students remain in school to their senior year than do students of other nations, Lerner points out that Japan and Sweden, two countries having retention rates most similar to the U.S., both rate highly in these comparisons. In an achievement comparison in high school mathematics, Walberg (1983) found that American high school students score on average at the first or second percentile of Japanese norms. Walberg (1986) goes on to say that the Japanese spend twice as much time studying than do students in the United States, thus they may compress eight years of American high school and college work into four years (p. 303). While one could certainly take issue with that statement, it illustrates the disparities that exist between American and foreign students.

While comparisons of American youth to foreign children and declining test scores have long been the subject of scholarly articles and popular media reports, it wasn't until these findings were discussed in light of current economic concerns that steps began to be taken to rectify what was seen as the dismal state of public education. In the late 1970s, the United States was experiencing a recession, soaring inflation, the

stagnation of some of its older industries such as steel and automobiles, and most threateningly, increased competition from abroad, especially in the high-tech industries. In response to this economic crises, the business community mobilized its formidable financial and political resources behind demands for high quality academic education. This mass mobilization of resources served to focus the broader, more diffuse constituency for reform at the grassroots level. The combination amounted to "political dynamite" and, by the early 1980s, education professionals and politicians alike were eagerly pushing for reform (Chubb and Moe 9).

The business sector had a legitimate platform from which to push change. Two hundred years ago Adam Smith argued that the wealth of nations is dependent upon the abilities of their people. Thus, education is not idle consumption but a useful investment for nations and the individuals who obtain it. In an era of increasing competitiveness among nations, the expansion of technologically advanced industries, or "knowledge industries," may mean that abilities dependent upon quality education will be in greater demand (Walberg 1983).

Doyle and Hartle (1985) argue accordingly when they say that, during the late 1970s, there was a growing perception that high quality education was necessary to ensure economic competitiveness. They give two components of this belief. First, high quality education would help insure a highly trained and motivated labor force, a necessity in an increasingly technological world. Second, the presence of quality schools

would attract new industries and would help keep old ones (p. 13).⁵

There was also a type of cost/benefit analysis occurring throughout the various levels of government, as well as within the general public. The costs of education in terms of dollars, number of persons involved and time, had risen dramatically over the years. For example, the value of education invested in the American labor force was well over \$800 billion (Walberg 1983). Spending on schools and colleges had risen to \$200 billion per year, nearly seven percent of the gross national product. Furthermore, the annual costs of public education amounted to in excess of \$2,500 per pupil (Walberg 1984).

However, at the same time, the product of the educational system, the students, had apparently declined in the quality of their learning and in the amount that they learned (Walberg 1986). Both the public and government wanted better results for the vast sums of money being pumped into the educational system. The time was right for education reform, and in the early 1980s, the inundation of education commission reports began.

The Reports

Of the vast number of education reports published in 1982 and 1983, by far the most prominent was the National Commission on Excellence in Education's A Nation at Risk: The Imperative for Educational Reform, which stated:

Our Nation is at risk. The educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a nation and a people... Some 23 million American adults are functionally illiterate. (A)chievement of high school students on most standardized tests is now lower than 26 years ago when sputnik was launched (p. 5).

In response to the "erosion" taking place in public education, the commission called for stronger high school graduation requirements, higher academic standards for all students, more time spent on instruction, greater leadership by elected officials as well as educators, and improvements in teacher training and compensation.

The report had an extremely wide appeal and over 500,000 copies were distributed by various organizations (Tomlinson 4). Not since Conant's The American High School Today (1959) had a publication aroused so many to action in pursuit of educational quality reform.⁶ Just as the Sputnik crisis provided the catalyst for the educational excellence movement of the late 1950s and early 1960s, A Nation at Risk ushered in a new era of reform in the early 1980s, an era we are still in today.

The success of A Nation at Risk provided a springboard for a number of reports and studies on education, the vast majority of which were critical of American education and especially educators.⁷ There are many variations in the studies; it would require a small encyclopedia to describe all of the detailed proposals. Altbach (1985) provides a succinct summary of the more important recommendations of the reports:⁸

* The schools must stress science and math and move away

from the "frills" that are seen to have little relevance to preparing America for global economic competition.

- * The school curriculum should be more related to the job market and to perceived needs of industry.
- * Foreign-language instruction should be started in the elementary schools and should generally receive a high priority.
- * Students should spend more time in school, and that time should be used more effectively for instructional purposes.
- * The teaching profession has fallen on hard times. The quality, pay, and autonomy of teachers must be improved. Teacher education programs must be strengthened. "Merit pay" is seen as a means of attracting better teachers and rewarding those who perform well, but there is little guidance concerning how "merit" is to be determined.

While each of these recommendations deserves, and has received, intense scholarly attention, it is to the last recommendation--improving teacher quality--that we now turn our attention.

As mentioned above, most of the reports were critical of teachers. A Nation at Risk is typical of most reports in saying that many of the problems in American education are due to poor teaching, and that poor teaching is the result of recruiting and retaining poor teachers. The report had as a central concern the question of why it appeared to take more educators to get less learning out of fewer students than in the past. Over the past two decades, while the scores on standardized tests and the number of students enrolled in school have decreased, the number of teachers has increased. Since it is popularly held that teachers are responsible for learning, and since the teachers themselves claim that the "student-teacher ratio" has a significant influence on their ability to help their students

learn, it is logical that as the number of students declines and the number of teachers increases, student achievement should improve; instead, it has diminished (Tomlinson 13).

Presenting further evidence in its indictment of teachers, the report stated that teachers have been overrepresented at the low end of the distribution of SAT scores; they are provided inadequate training, they insist on limiting their career mobility since they refuse to accept differential pay; and while clinging to the notion of being the salient factor in the learning process, nonetheless disclaim responsibility for the decline in the indicators of academic achievement (Tomlinson 13).

The commission found little causal relationship between the instructional skill of teachers and student achievement. Teachers should be important to learning. They are the conduit through which information flows to students. Teachers should not only know their subject area well, but also be able to effectively communicate its content to students. Furthermore, the more well versed teachers are in their subject areas and the greater their ability to communicate it, the more students should learn. Hence, there should be a definite causal relationship between the skill of teachers and consequent student achievement. The commission found little support for this proposition (Tomlinson 14).

Other reports had equally scathing opinions of teachers. The Twentieth Century Fund (1983) went as far as to blame teachers' unions for education decline. Unionization prevents

school districts from rewarding merit and from firing the incompetent. Wages for teachers, most reports recognize, are low. Improving the quality of education, many reports assert, is simply a question of raising teachers' pay. As in business, if teachers are paid better, they will perform better; if there are salary incentives tied to performance, then teachers will strive to improve their instructional ability. Mediocrity will be the rule among the teaching profession without the incentives of merit pay. With the rise in salaries, more intelligent personnel will enter the teaching profession, and the problem of excellence will be thereby resolved (Kelly 37).

Finally, most reports emphasize the need for evaluation of teacher performance. This is largely due to the commissions' apparent perception of teachers as not being a distinct professional group with specific training needs, or with requirements that extend beyond those of a mere technician. The commissions seem to view the act of teaching, if it occurs, as having definite qualities that can be observed. Because of these observable qualities, good teachers can be recognized and rewarded and poor teachers can be identified and removed.

Do Teachers Teach?

Intuitively, it simply makes sense that teachers are important influents on student achievement. The effective schools literature demonstrates that this is indeed the case. However, this belief has not always been widely held. The assumption that teachers do make a difference was strongly

challenged by Coleman, et al., in Equality of Educational Opportunity (1966). The Coleman Report, as it came to be known, had as its original goal the exploration of the issues surrounding integration. In an analysis based on a national sample of nearly 600,000 students across twelve grades and in over 3000 schools, Coleman concluded that academic performance was determined almost entirely by background characteristics of the students and their peers and hardly at all by characteristics of either teachers or of the schools themselves. Jencks, et al. (1972) came to a similar conclusion in a later reanalysis of the same data.

The policy implication of such a finding was that changing school organization and investing more resources in the schools would not significantly affect the educational achievement of students. In short, the types of activities available to government policymakers were considered impotent in achieving the goal of increasing student learning.

Today, many conclusions of the Coleman Report are given little credence. Many methodological shortcomings of the analysis have been noted. Evertson (1986) points out that relative teacher contributions to student achievement were not assessed in the Coleman data, nor was there systematic observation of classroom teachers. Conclusions were based on school measures averaged across classrooms. Thus, relationships between teachers' classroom behaviors and student achievement weren't carefully explored (p. 159).

Hanushek (1986) says that the lack of valid measures of

the teacher characteristics that are associated with good teaching are in part to blame for Coleman's faulty findings.

Hence, he writes:

(The findings) have primarily resulted from a confusion between the difficulty in explicitly measuring components of effectiveness and true effectiveness. In other words, existing measures of characteristics of teachers and schools are seriously flawed and thus are poor indicators of the true effects of schools; when these measurement errors are corrected, schools are seen to have important effects on student performance (p. 195).

There is a voluminous amount of literature presenting evidence that teachers do in fact influence student achievement. Rutter, et al. (1979), in one of the most noted works in the effective schools research, found that schools do have an important impact on children's learning. In a three year study of secondary schools in London, England, they concluded that the atmosphere of the school played a major role in student achievement. Teacher oriented factors in student achievement included the effective use of classroom time, high expectations for student performance, frequent teacher-student interaction and feedback to students about their performance, and a positive attitude toward students.

Ironically, Coleman himself (1982), with Hoffer and Kilgore, upon analyzing the massive High School and Beyond data set found that, while environmental factors were the salient determinants of achievement, differences do exist among schools. In a comparison of public and private schools, they concluded that the requirements for educational success were physical and intellectual discipline, high expectations and standards on

the part of both students and teachers, and a safe and orderly environment. According to the authors, these factors are more likely to be found in private schools than in public schools. Not surprisingly, this finding spawned a considerable amount of debate. Nevertheless, Coleman and his associates did demonstrate that teachers do make a difference.

Coleman (1990) recently found that teacher differences show a cumulative effect over the years in school. That is, there is a positive relationship between students' grade level and the impact of the teacher on students' learning. He also found that teacher differences show more relation to difference in achievement of educationally disadvantaged minority students than to achievement of whites. This result is an extremely important one, for it suggests that for any groups whether minority or not, the effect of good teachers is greatest upon the children who suffer most educational disadvantage in their background, and that a given investment in upgrading teacher quality will have most effect on achievement in underprivileged areas (p.105).

Hawley and Rosenholtz (1984) describe teaching as "the core technology of formal education" (p. 4). They argue that teachers have direct effects on student achievement in that they:

modify curricula, intentionally or not. They keep the gates through which students must pass to gain access to the learning resources available. Teachers allocate and manage students' time, set and communicate standards and expectations for student performance, and in a multitude of ways, enhance or impede what students learn (p. 7).

Sizer (1984) calls teachers:

The crucial element . . . An imaginative, appropriate curriculum placed in an attractive setting can be unwittingly smothered by journeymen instructors. It will be eviscerated by incompetents. On the other hand, good teachers can inspire powerful learning in adolescents, even under the most difficult circumstances (p. 180).

If teaching is the "core technology of formal education" and teachers are "the crucial element" and the gatekeepers for access to learning, then it is critical to determine what factor or combination of factors it is that enables teachers to teach. Of those teacher characteristics which can be controlled by public policy, which are salient in contributing to student achievement? It is to this question that we now turn our attention.

Teacher Characteristics

In approaching the question of which teacher factors contribute to student achievement, we will use the method of input-output analysis. While this method of investigation is most prevalent in economic literature, it is also applicable to the study of policy questions. In its most basic form, the process of input-output analysis is a strategy through which one attempts to measure changes in the system output(s) brought about by changes in the quantity and quality of system inputs (Cohn 7).

While numerous studies have been performed using this model, many scholars disagree as to which teacher factors should be used as inputs. Most studies, however, address the "core"

set of factors: those that make up the bulk of basic expenditures (Hanushek 1986, 1160). Educational expenditures, which are the amount of financial resources spent on teachers' salaries, books, and other educational resources that have a direct influence on students, comprise the majority of total district expenditures. Although most studies have concluded that economic resources of various kinds are unrelated to student outcomes, it is logical that the more a district spends on education, the more likely it is that students will be given a better opportunity to learn. Schools that offer better salaries and smaller classes, both of which require more financial resources, should attract better teachers. Also, districts with more financial resources would be able to provide better quality instructional aids such as computers, laboratories, and current and innovative instructional materials which should have a direct impact on student learning (Chubb and Moe 102).

Teachers' salaries are by far the largest single element in educational expenditures. These salaries, in turn, are determined by such teacher characteristics as years teaching experience, level of graduate education, and job assignment. A relatively new determinant of teacher salaries in some states, which is related to the three previous characteristics, is teachers' placement on a career ladder. While the first three characteristics are self-explanatory, the final one requires further description.⁹

While several states have in place some form of career ladder system, we will focus on the structure of the Texas career

ladder, since it is the system we are most familiar with and from which have gathered our data. As mandated by Texas House Bill 72 in 1984, Texas teachers are assigned to a career ladder level based on the abovementioned criteria: experience, job-related education or advanced academic training, and job assignment. One other requirement, performance appraisal, requires in-class observations by trained evaluators. Through a prescribed procedure, the quality of every teacher's performance must be evaluated in order to determine whether the teacher should be promoted to career ladder Levels Two, Three, and Four (all teachers were initially placed on Level One). Upon ascension to each succeeding level, teachers receive a salary bonus.¹⁰ It is believed that giving teachers a financial reward for high performance will provide them an incentive for maintaining that level of performance. Further benefits to districts and students would be the recruitment and retention of quality personnel due to the higher salaries. Also, by bringing teacher salaries more in line with the salaries of other similarly trained professionals, teachers might gain a more prestigious place in society, further aiding in the recruitment and retention of good teachers.

The performance appraisal process used in Texas is the Texas Teacher Appraisal System (TTAS). This process provides for the in-class evaluation of teachers by two appraisers, including the teacher's supervisor and an observer external to the district. The TTAS instrument outlines fourteen criteria, which have been found in previous research to be

related to student learning, under five domains: Instructional Strategies, Classroom Management and Organization, Presentation of Subject Matter, Learning Environment and Growth and Responsibilities. Each criterion includes a specific list of indicators which show that the criterion has been met. The task of the appraiser is to record whether or not the necessary behavior has been exhibited in the classroom. The two observers' scorings are then averaged and indexed to produce a final appraisal score for the teacher. It is the average of these scores across each district that we wish to relate to educational output.

Analysis

Intuitively, the average teacher appraisal score should be positively related to measures of student achievement. Teachers who exhibit teaching characteristics found to be related to student learning should produce students who exhibit higher levels of achievement. Similarly, districts with a higher percentage of teachers on upper levels of the career ladder should likewise produce higher achieving students. Thus, career ladder standing should be positively related to student achievement. We will examine the percentages of teachers in each district both on Level Two and Level Three.¹¹

Furthermore, other characteristics relating to teachers should be determinants of student achievement. Conventional wisdom holds that teacher experience should be positively related to student outcomes. The longer one does something, this line

of reasoning goes, the better at it one becomes. It is also expected that earning an advanced academic degree is also beneficial, and should have a similar effect on student outcomes. Smaller classes (as expressed in student/teacher ratios) should also improve student achievement since presumably it would allow for more individualized instruction. Finally, teacher salaries, not including bonus pay for placement on career ladder, should be positively related to student outcomes. If a central idea of merit-pay, that it attracts better qualified personnel, is correct, then teachers who are paid a better salary should produce better students. It is expected that quality teachers are able to choose schools that offer more money above the state's mandated base level. Therefore, better salaries should attract better teachers, and, in turn, lead to higher student achievement.

A complaint lodged against the career ladder system is that unfairness results because the career ladder is not adequately funded and thus some qualified teachers are unable to move up in districts where local funds are insufficient to provide career ladder bonuses to all qualifying teachers (Clements 33). To take into account this situation, we will measure the effectiveness of these variables controlling for per pupil wealth, which is simply the amount of taxable value per student in each district. We will further control for the educational "effort" of each district. Effort here is defined as each district's per pupil educational expenditures. Lastly, we will control for the ethnicity of each district, both in

the makeup of teachers and students. Race will be divided into four classes: white; black; Hispanic; and other, which is comprised of Asians, and American Indians/Eskimos.

We will use two separate measures of student achievement: standardized test scores, in this case, the Texas Educational Assessment of Minimum Skills (TEAMS); and planned college attendance. The TEAMS test was administered yearly to all students in grades 3, 5, 7, 9, and 11 until 1990.¹² Our measure is the average percentage of students in all five grades passing all three sections (reading, writing, and mathematics) of the TEAMS test across the entire district.

Standardized test scores are the most commonly used measure in investigating the educational process. While many scholars question the validity of test scores as measures of student achievement, Hanushek (1986) points out that performance on tests is being used by states to evaluate educational programs, as well as to allocate funds. Also, besides their ready availability, one argument for the use of test scores is that they are valued in and of themselves. Many educators view them as important measures of critical basic skills. Policymakers and parents tend to value higher test results over lower scores. Test scores are even used as criteria for high school graduation in many states. Another argument for the use of test scores relates to continuation in higher education. While studies show there is little relationship between achievement scores and later income differences, it can be said that test scores have an important role in selecting individuals for additional

education (p. 1154).

The second measure, planned college attendance, is an indirect measure of student achievement at best. It is, however, a measure of the attitudes of students. Do they like school well enough to desire to continue with postsecondary education? Has the teacher instilled within them a love of learning that becomes a catalyst for wanting to achieve a higher education? Most studies of educational effectiveness use some value of actual, instead of intended, college attendance. Due to the limitations of our database, we are forced to work with the latter. However, it could be argued that intended college attendance is actually the better measure of student achievement. Due to financial constraints, a lack of support at home, or other disadvantages, a student who has actually benefited from high school--that is, learned something or at least gained a positive attitude towards learning--may never make it to college. That same student might very well report an intention to attend college. Hence, that student will be considered a failure of the educational system if actual college attendance is the measure of achievement, whereas he will be considered a success if the planned college attendance is used.

In order to examine the relationships between the two dependent variables and the list of independent variables, we will employ the multiple regression technique. This process produces a regression coefficient, which expresses the relationship between one independent variable and the dependent variable while controlling for all other variables in the model.

It is, however difficult to judge the relative importance of the independent variables based on the multiple regression coefficients alone. The regression coefficients are calculated in tandem with the units of measurement for each of the independent variables and are therefore sensitive to how those variables are measured. One regression coefficient may be much larger than another regression coefficient, not because the independent variable is more strongly related to the dependent variable, but because the independent variable is measured in much smaller units (Johnson and Joslyn 328).

To ascertain the relative importance of each of the independent variables, each regression coefficient was standardized to reflect the mean and variance of each of the independent variables. The standardized regression coefficients, or betas, indicate the relative importance of each independent variable in explaining the variation in the dependent variable, when controlling for all of the other variables in the model. Betas may vary from -1 to +1 so they indicate not only the direction of the controlled relationship with an independent variable but also the level of variance in the dependent variable accounted for by each of the independent variables (Johnson and Joslyn 329).

For this study, data were collected for all 1,061 Texas public school districts from the school year 1988-89. Texas was chosen because of the availability of data. It is believed that findings based on this data are generalizable to other parts of the country because Texas has such wide geographic

and socioeconomic variation. This school year was chosen because it is the latest year for which comprehensive data have been published.¹³

The tables contain the name of each teacher characteristic listed in order of relative strength of its relationship to the dependent variable (by beta). The tables also list the variables' regression coefficient and statistical significance.

TABLE 1 HERE

As the data from Table 1 show, teacher characteristics are of little benefit in explaining TEAMS scores. Of the eighteen inputs and controls, only two--the percentage of white students in the district and educational expenditures per pupil--have statistically significant relationships. The large beta for percentage of white students is intuitively pleasing; white, middle class students tend to score higher on standardized exams. Hence, this relationship is expected.

A more important finding is the relationship between per pupil educational expenditures and student achievement. Most of the literature minimizes the impact of educational expenditures on student outcomes.¹⁴ However, though a control variable in our model, educational expenditures does appear

to explain average TEAMS scores relatively well in this model (beta = .13). This finding is meaningful because funding is one of the more easily controlled aspects of public policy. While not definitive, our finding does provide evidence that increased educational spending does have some impact on student outcomes as measured by test scores.

We fail to find any other statistically significant relationships between teacher inputs and student outcomes, and thus have little basis for the assumption that there is any other relationships between the two. However, because insignificant relationships may be the result of insufficient data (in this case for instance, we were unable to control for students' socioeconomic status), as opposed to simply no relationship between achievement and the given characteristic, it is worthwhile to consider the directions of the various inputs' regression coefficients.¹⁵

Of the teacher characteristics we are examining: experience, salary, education, student/teacher ratio, career ladder level, and appraisal score; only half are in the predicted direction. The percent of teachers with less than five years experience (a measure of inexperience) has a negative sign. This means that the fewer inexperienced teachers there are within a district, the higher are achievement scores. This finding is reinforced by the positive sign for average teacher experience. As the average years of teaching experience increase across the districts, achievement also increases. This conclusion is in agreement with Hanushek (1986) when he states that teacher

experience is the only input that bears any relationship to student outcomes.

In support of the idea that higher pay attracts better teachers, there is a positive relationship between average teacher salary and achievement. This finding, though inclusive, is important because, as mentioned above, policymakers are most able to influence expenditures. If teachers respond positively to high salaries, then it might simply be a matter of raising them to help increase achievement, though it certainly can't be said that raising salaries is a "cure all."

There is also a positive relationship between the percentage of teachers on career ladder Level Three and achievement. This finding means that the career ladder does appear to be rewarding good teachers. In contradiction of this finding, however, there is a negative relationship between the percentage of teachers on career ladder Level Two and achievement. Thus the insignificant finding can probably be taken as being correct. There appears to be no relationship between career ladder standing and student achievement.

While not anticipated, the lack of relationship makes sense. Teachers are judged for placement on the career ladder relative to other teachers in that district. Therefore, while the highest quality teachers of that district may very well be on Level Three, there is no measure of how well these teachers rank with teachers of other districts. While placement on the career ladder might be a sign of excellence in relation to the districts' other teachers, it bears no relationship with student

achievement across district lines.

A similar finding is that the average teacher appraisal score has a negative relationship with achievement. Once again, appraisals are conducted from within each district, by different evaluators. Even though one observer must be external to the district, different evaluators are obviously needed in different areas. Because the evaluation is partly subjective in nature, it should be expected that appraisal scores have no relationship to achievement.

Lastly, the sign for student/teacher ratios is not in the expected direction. The positive sign means that as more students share the same teacher, achievement increases instead of declines. It is probably safe to conclude that no relationship exists.

TABLE 2 HERE

The data from Table 2 do little to add to our understanding of the causes of student achievement. Once again, there are few significant relationships. Salient relationships that are statistically significant are the percentage of teachers with less than five years experience (inexperience) and per pupil educational expenditures.

The data concerning the inexperience measure strongly support our interpretation of Table 1, as well as Hanushek's (1986) findings: that teacher experience is related to outcomes. This conclusion is tempered somewhat by the finding that average teacher experience is negatively related to achievement and statistically insignificant. However, due to the abundance of evidence in this and other studies, it seems fair to conclude that teacher experience is an important determinant of student achievement and, therefore, of teacher effectiveness.

The data show that educational expenditures are statistically significant and relatively important in explaining outcomes. The sign, however, is not in the predicted direction. When taking into account both measures of student output, it must be concluded that educational expenditures are at best ambiguously related to outcomes.

Though statistically insignificant, other measures of teacher characteristics are related to planned college attendance in the predicted direction. Teacher salary and the percent of teachers on Level Three again have the "correct" sign. Once again, however, the percent of teachers on Level Two and appraisal scores are negatively related to outcomes.

Different from the data in Table 1 are the signs corresponding to the percent of teachers with advanced degrees and student/teacher ratios. In Table 2, both of these are in the expected direction, thus lending some support, albeit small, to the conventional wisdom that smaller student/teacher ratios and advanced degrees should be related to student outcomes.

Conclusion

In this study we explored the perceived decline in quality of American public education. We discussed the reports that were a result of this perception, and focused on one aspect of the reports' suggestions: improving the quality of teachers. We presented evidence that teachers do, in fact, make a difference in the educational process. We identified several characteristics of teachers that should be related to student outcomes and analyzed those relationships.

While the models did little to explain student outcomes, some findings were significant. Per pupil expenditures, treated in the majority of the literature as insignificant, do seem to be related to student outcomes. The direction of the relationship, however, is indeterminable from this data.

Teacher experience seems to be positively related to student outcomes. This finding makes sense, and is supported by previous studies.

The reform proposals--career ladders and appraisals--don't exhibit any relationship with student outcomes. Whether they achieve the goal of recognizing teacher excellence is beyond the scope of this paper. If, however, the goal of the programs is to improve student achievement, they don't appear to be working.

TABLE 1: Multivariate Explanation of Average District TEAMS Scores (Percent Passing): Multiple Regression Analysis, 1988-89

Variable	Regression Coefficient	Standardized Regression Coefficient (Beta)	Significance Level
percent students white	.2776	.3197	.0178
percent teachers white	.1858	.1687	.7851
percent teachers hispanic	.1655	.1463	.8099
per pupil educational expenditures	.0036	.1321	.0031
percent teachers with less than 5 yrs. teaching experience	-.1474	-.0797	.169
percent students hispanic	.0663	.0763	.4661
percent teachers with advanced degree	-.0884	-.0493	.1846
percent students not white,black,hispanic	.6801	.047	.1547
per pupil wealth of district	-1.6E-6	-.0323	.4546
percent students black	.0604	.0319	.7243
percent teachers on Level Two	-.0501	-.0319	.4028
percent teachers not white,black,hispanic	-.7259	-.0276	.4886
percent teachers black	.0659	.0268	.9253
student/teacher ratio	.0066	.0144	.635
percent teachers on Level Three	.0333	.0119	.7374
average teacher experience	.1228	.0117	.8387
average teacher salary	4.5E-6	.0026	.939
average teacher appraisal score	-.0042	-.0016	.9628

R-Square=.092

TABLE 2: Multivariate Explanation of Percentage of Students Planning to Attend College: Multiple Regression Analysis, 1988-89

Variable	Regression Coefficient	Standardized Regression Coefficient (Beta)	Significance Level
percent teachers white	.4073	.2725	.6605
percent teachers hispanic	.3559	.232	.704
percent teachers with less than 5 yrs. teaching experience	-.4917	-.1959	.0007
per pupil educational expenditures	-.0052	-.1369	.0018
percent students not white,black,hispanic	1.61	.0821	.0134
percent teachers black	.2396	.0718	.8023
average teacher appraisal score	-.1673	-.046	.1686
percent students black	-.1075	-.0418	.6444
percent teachers on Level Three	.1488	.0391	.2702
percent teachers on Level Two	-.0732	-.0343	.3659
student/teacher ratio	-.0116	-.0186	.54
average teacher salary	3.02E-5	.0127	.7077
percent teachers not white,black,hispanic	-.3988	-.0117	.7798
percent students hispanic	.0126	.0107	.919
percent teachers with advanced degree	.0152	.0062	.8662
per pupil wealth of district	-2.5E-7	-.003	.9352
percent students white	-.003	-.0026	.9847
average teacher experience	-.029	-.002	.9717

R-Square=.0621

NOTES

1. For further information on the decline in public confidence in the American education system, see Elam (1978).
2. Barbera Lerner (1982) provides evidence from a number of studies showing a substantial decline in the competence of American high school students.
3. See Stedman and Smith (1983) for a refutation of this argument.
4. See Stedman and Smith (1983) for a refutation of this argument.
5. See Stedman and Smith (1983) for a refutation of this argument.
6. See Clowse (1981) for a history and analysis of educational quality reform in the 1950s.
7. Noteable reports include the Education Commission of the States (1983); the Business-Higher Education Forum (1983); Goodlad (1984); Sizer (1984); College Board (1983); Twentieth Century Fund (1983).
8. Peterson (1985) argues that the reports did not address difficult issues related to education, and that they say little that is not already known by educators, teachers, and parents. this, coupled with the lack of real power to implement changes means that commissions are not equipped for serious policy analysis, and that the process is largely symbolic. Stedman and Smith (1983) dispute the quality of the analysis in the reports.
9. Much of the information on the career ladder and the Texas Teacher Appraisal System comes from Nelson, et al. (1986).
10. Salary bonuses for Level Two range from \$1,500 to \$2,000; for Level Three, salary bonuses range from \$3,000 to \$4,000; for Level Four, salary bonuses range from \$4,500 to \$6,000.
11. During the 1988-89 school year, from which the data were gathered, Level Four hadn't been implemented yet. Implementation of the Master Teacher Level began in November of 1990, with the administration of the first Master Teacher test.
12. The TEAMS test is no longer in use. Beginning in the fall of 1990, a new test designed to better measure higher level thinking skills was administered.

NOTES

13. Data for this study was drawn from the Texas Education Agency (1990) publication.
14. See Hanushek (1986) and (1981) for a comprehensive review of the literature.
15. The use of relationship directions in the absence of statistically significant relationships is done in Hanushek (1986) and (1981). See also (1979).

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