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ABSTRACT

Data drawn from a longitudinal study of school resource use and student performance in elementary schools were analyzed to identify relationships between student academic acheivement in reading and mathematics and the personal characteristics, instructional behaviors, and attitudes and beliefs of teachers. Data were collected from fall, 1979, through spring, 1982, in four Wisconsin schools. Primarily, subjects were approximately 240 students in grade 3 during the 1979-80 school year; these students were followed during their fourth- and fifth-grade years. Data were also collected from other students, parents, all teachers and other professional staff members who instructed any student in the study, and school and district administrative personnel. Reported are community, school district, school, student, and teacher characteristics; the research methodology, including selection of variables; and results of regression analyses. Results revealed that no single set of teacher-related variables showed consistently stable relationships with student achievement across grade levels and subjects. Certain variables did appear in the final step-wise regression equations quite consistently, including years of teaching experience and number of professional magazines and journals read regularly. Several variables, such as satisfaction with teaching and some of the attitude and belief questions, seldom entered the final equations, or entered late and contributed little to the coefficient. References and 17 tables are appended. (RH)

STUDENT ACHIEVEMENT AND THE PERSONAL CHARACTERISTICS, INSTRUCTIONAL BEHAVIORS AND PROFESSIONAL BELIEFS OF ELEMENTARY SCHOOL TEACHERS

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Conventional wisdom is that the teacher is a major determinant, if not the most important determinant, of student learning in schools. That is, most laymen and most professional educators believe that teachers do make a difference! Anyone with experience in schools is aware that parents and students "know" that some teachers are better (i.e., more effective) than others. In fact, one of the concerns expressed most frequently when merit pay for teachers is discussed is that of how to deal with parents whose child is assigned to a teacher who has not been identified as deserving of merit pay.

Research results also support the view that teachers do, indeed, make a difference. Summers and Wolfe (1975) found that junior high school students did better with teachers who graduated from higher-rated colleges and with mathematics teachers who were trained in the new math era. They also found that low-achieving elementary students did better with relatively less experienced teachers, and that high-achieving students did better with more experienced teachers. Murnane (1975) also found that teachers exert a critical impact on student learning.

Research on effective schools also supports the primacy of the classroom teacher in student achievement. These studies support the view that student achievement is higher in schools where there is a clear focus on academic goals, appropriately structured learning activities, a teaching method which focuses on the learning task to be accomplished, and an

expectation of high achievement by students (Armor, et. al., 1976; Brookover, et. al., 1979; Brophy, 1979; Good, 1979; Glenn, 1981; Venezky and Winfield, 1979). Effective classroom management also is characteristic of effective schools. Teachers select appropriate modes and techniques of instruction. They establish and enforce reasonable rules of conduct, provide an orderly atmosphere for learning, and maintain discipline. Students know what the teacher expects of them, receive timely feedback on their performance, and are praised for good performance (Armor, et. al., 1976; Edmonds, 1979; Glenn, 1981; New York State Department of Education, 1976; Venezky and Winfield, 1979).

This paper reports the results of an analysis of the relationships between student academic achievement in reading and mathematics and the personal characteristics, instructional behaviors, and attitudes and beliefs of their teachers. The data used in the analysis were drawn from a longitudinal study of school resource utilization and student performance in elementary schools.

Population and Sample

The data were collected from fall, 1979, through spring, 1982, in four Wisconsin elementary schools. The primary subjects were approximately 240 students who were in grade 3 during the 1979-80 school year. These students subsequently were followed during their fourth- and fifth-grade years (1980-81 and 1981-82). The student sample also included children who entered school in fall, 1980, at the beginning of their fourth-grade year. In addition, data were collected from parents, all teachers and other professional staff members who instructed any student in the study, and school and district administrative personnel.

The four elementary schools met the following criteria for participation in the study:

1. They represented varying demographic characteristics.
2. They were expected to maintain relatively stable enrollment patterns.
3. They professed a commitment to individualize education, in some manner, for each student.
4. They were willing to participate for the duration of the study.

Community and School District Characteristics

General demographic information from the 1980 national census for the communities in which the four schools are located is presented in Table 1. Data for the state of Wisconsin and the nation also are provided for purposes of comparison. Two of the schools are located in urban areas with populations over 50,000; the other two schools are located in communities of less than 10,000. While there is variation among the communities in their geographic location, educational level and occupational status, the data in Table 1 indicate the four communities are relatively homogeneous with respect to median family income and poverty levels. While the income and poverty levels in these communities are quite representative of Wisconsin as a whole, they do tend to have higher educational and occupational levels then the state in general.

/Insert Table 1 here/

Data for the 1979-80 school year were obtained for the four school districts containing these elementary schools and for other Wisconsin school districts of similar size and are presented in Table 2.

/Insert Table 2 here/

Seven other Wisconsin school districts served community populations comparable in size to District 1. For these seven districts a mean and standard deviation were calculated for each of the nine variables shown in Table 2. The results indicate that District 1, when compared to other districts serving similar population sizes, fell within one standard deviation of the mean in all nine categories.

Districts 2 and 3 were compared to 70 other Wisconsin school districts with average daily membership ranging between 1,500 and 3,000 students using the mean for each variable. When compared to these districts, District 2 and District 3 both fell within one standard deviation of the mean on eight of the nine variables. The average daily membership of each district was slightly more than one standard deviation above the mean of the 70 districts.

District 4 was compared to other Wisconsin districts with average memberships of 3,000 to 5,000 students. District 4 fell within one standard deviation of the mean on five of the nine variables. The average daily membership of District 4 was more than two standard deviations above the mean for this group and the district was more than one standard deviation below the mean on average contract salary, teachers' average years of local experience, cost per member, and cost per member less transportation. The data presented in Table 2 suggest that the four school

districts in which the elementary schools included in this study were located are not atypical when compared to other Wisconsin school districts of similar size.

School Characteristics

The general characteristics of the four schools, which are outlined in Table 3, indicate they were similar in enrollment but dissimilar in physical plant and organizational patterns. Schools 1 and 2 were housed in

/Insert Table 3 here/

traditional buildings (i.e., completely separate self-contained classrooms joined by common hallways), except for a new wing in School 1 containing a large open space for grades 5 and 6. Although the teachers in School 1 were nominally organized into multigrade teams, planning and instruction took place on a graded basis with few exceptions; for example, in year 3 of the study some fifth graders were in math and science classes with sixth graders. School 2 was organized in a traditional graded manner; the only exception occurred in year 2 in which some fourth graders were placed in fifth grade math classes. Ability groups within a grade level were formed each year for some academic subjects at both Schools 1 and 2. These groups were essentially permanent except for language arts at School 1 in year 1.

In Schools 3 and 4, students were placed in multi-grade instructional units in large open areas with movable walls, chalkboards and bookshelves. Cross-grade planning and grouping practices occurred at both schools during all three years. However, implementation of an individualized model of instruction was carried out most successfully at School 3 where grouping across grades was utilized in most subject areas and regrouping occurred as

needed. That is, for a particular subject over the course of a year, a student in School 3 was likely to have several different teachers and to be placed in a subgroup with children from more than one grade level according to their common instructional needs. In School 4, cross-grade instructional planning and grouping was used quite extensively but the groups tended to remain stable once established with some exceptions for a particular subject and/or year.

Student Characteristics

General background characteristics of the students who comprised the sample are presented in Table 4. Characteristics such as preschool enrollment which remained more or less constant regardless of yearly fluctuations in the sample size are reported once for the entire sample. Characteristics of the group which changed yearly (e.g., participation in special services), are given on an annual basis.

/Insert Table 4 here/

The number of students recorded in the first row of Table 4 for each school refers to the total number of students included in the study at any time. Most of these students entered the first year but a few enrolled as fourth graders. Due to normal attrition, the entry of a few new students in fourth grade, and a change in attendance boundaries at one school, the number of students in each year of data collection varied as shown. Because parental consent was required for certain aspects of the study (e.g., use of achievement test data), certain analyses were performed with fewer students.

The student populations of the four schools were quite comparable on most of the dimensions outlined in Table 4. Although a notable exception appears in the aptitude level of students at School 2, these data must be viewed with some caution since the only scores available for School 2 were from a test given after completion of the study. Furthermore the test administered in School 2 was a different instrument. Data for the other three schools were from baseline testing in grade 2.

Attendance at preschool varied somewhat among the four schools, with the fewest students attending at School 1 and the most at School 2. Although higher preschool enrollment at School 2 might be related to lower aptitude, this conjecture is not born out in the special services enrollment. That is, a comparable proportion of School 2 students received special services such as Title I reading and math programs, remedial or learning disabilities programs, other special education programs, or special instruction in speech and hearing. Special educational services were received by somewhat fewer students at School 4. No explanation is available for the high proportion of male students at School 3.

Teacher Characteristics

Background information for the teachers of students in the study is presented in Table 5. Since analysis of students' achievement was based primarily on their performance in regular academic classes, personal characteristics are given only for teachers of academic subjects. Some teachers are represented in the data for two and occasionally for all three years. This is particularly true for Schools 3 and 4 which operated on a multi-grade unit basis, so that some or all of the teachers taught students in the study for two or three consecutive years. The extreme case occurred

at School 4 in which all six of the academic subject teachers in year 1 continued in year 2.

/Insert Table 5 here/

Table 5 indicates that for the population as a whole, the teachers of regular academic subjects in the third grade were predominantly female, were less often female in the fourth grade, and at the fifth grade level were equally divided among males and females. The proportion of teachers who held a master's degree increased over the three-year period from about one-fourth to one-half of the teachers. This change in part reflected the increasing number of male teachers. On a school basis, the proportion of female teachers was roughly comparable in the four schools, although there was some difference from vear to year. The proportion of teachers holding a master's degree ranged from one-fourth of the teachers at School 3 to about one-half of the teachers at School 4. School 4 was the only one in which a significant number of third- and fourth-grade teachers held a master's degree. (Recall, however, that in School 4 the same team of teachers taught both third and fourth grade).

The teachers of academic subjects averaged over ten years of experience for each year of the study. On the whole, teachers in School 4 were less experienced (as well as younger) than teachers in the other schools, and the range of ages was considerably less in School 4 than in the other schools.

Methodology and Instrumentation

After consent forms were secured from parents and school personnel, data collection proceeded during the three-year period according to the schedule outlined in Table 6. Information was gathered on variables in three general areas: student, teacher, and school-wide variables. The

major dependent variables for which data were collected were student achievement in reading and mathematics, although some data concerning student affective behavior also were collected.

/Insert Table 6 here/

Student Variables

Information about individual students, including their personal, educational and home background, was assembled using a student personal background instrument and an interview with parents. Student use of time in school was measured by means of a student classroom observation form. The Stanford Achievement Test and a Self-Observation Scales (Katzenmeyer and Stenner, 1975) were used to assess student academic performance and affective change, respectively.

Student personnel background record. Basic information concerning each student's personal characteristics such as age, sex, race, handicaps (if any), and previous educational experiences such as preschool enrollment was obtained from school cumulative records. Attendance data and a record of involvement in special programs were obtained annually. Baseline achievement and aptitude test scores were recorded using the most recent administration date prior to the study. (These baseline test dates ranged from mid-year of grade 1 at School 2 to fall of grade 3 at School 3.) In all but School 2 the Stanford Achievement Test and the Otis Lennon Test of Mental Ability had been administered. At School 2 the Comprehensive Test of Basic Skills and the CTB Test of Cognitive Skills were used; as previously discussed, the latter test was administered after the study. However, because it was the only source of student aptitude data for School 2, the scores were included in the student's records. Table 7 provides

information concerning the baseline as well as the post-test program for the study.

/Insert Table 7 here/

Parent Interview. The purpose of the parent interviews was to accumulate information about students' daily activities at home, i.e., out-of-school uses of time such as homework or TV viewing, and about a wide range of background variables including siblings, family socio-economic status, parents' educational level and occupation, the availability of reading resources in the home, frequency and type of contact with the school by parents and their general attitude toward the school. About one third of the parents were interviewed by telephone each year of the study. Although an effort was made to contact all parents, the final sample consisted of 199 interviews of a potential 281 families. In part, this was due to families not yet sampled moving after the first (or second) year of the study.

Student classroom observations. The use of time in school by individual students was recorded by the research team using a student classroom observation form designed specifically for the study. Each student was observed for a full school day in the fall, winter, and spring. It was possible to observe at least five students at two minute intervals, although it was not always possible to observe each student every minute of his or her school day. The observations were organized by subject with highest priority given to obtaining complete observations in reading and mathematics; the next priority was assigned to the other academic subjects (language arts, science, and social studies); and lowest priority was accorded art, music, physical education, and special programs.

Each observer observed five students simultaneously and at two-minute intervals characterized each student's use of time by recording one of the following eight categories: on-task independent study, on-task one-to-one instruction, on-task small-group instruction, on-task large-group instruction, on-task study with one or more peers, off-task, process behavior, or not observable. The latter three categories all exemplified off-task behavior but were distinguished by causal factors. "Off-task" indicated that the student could have been on-task in one of the preceding modes (e.g., small-group instruction) but instead was visiting, playing, daydreaming, or in some other fashion exhibiting non-attentive behavior. "Process behavior" usually referred to a waiting period when the student, due to factors outside his or her control, was forced to wait for the teacher to begin the class, correct a paper, give directions to the class, etc. The "non-observable" category was used when a student left the room for some reason. At least three days of observation were completed in reading and mathematics classes for 231 students in grade 3, 241 students in grade 4, and 205 students in grade 5. Complete longitudinal profiles over the three years are available for about 185 students.

Stanford Achievement Test

The major dependent variables in the study, student achievement in reading and mathematics, were measured by the Stanford Achievement Test at the end of each school year. The test forms appropriate to the grade level were administered as outlined in Table 7 and although some students were given the entire battery upon the school's request, only results of the reading and mathematics tests were of interest in the study. The subtests for reading and mathematics contained in the battery include reading comprehension, word study skills, mathematics concepts, mathematics computation, and mathematics applications. The tests were administered by

project staff and then hand scored, with the exception of School 3 which conducted its own testing program, used the scoring service of the publisher and then provided data to the research staff. The scores recorded included raw scores, scaled score, stanine, percentile, and grade equivalent. As indicated in Table 8, performance on the several subtests of the subject test was highly correlated across subtests and with the total test and agreed with the publisher's expected correlations; therefore total test scores were used in the analyses.

/Insert Table 8 here/

Teacher Variables

Information about the personal, educational, and professional background and activities of all teachers in the study was obtained using a teacher personal background record. Additional background information, attitudinal data about their profession, and self-report data about instructional practices were gathered from academic subject teachers by means of a teacher background, preferences and opinions questionnaire and from the Purdue Teacher Opinionnaire (Bentley and Rempel, 1980).

Teacher Personal Background Record. All teachers, both academic subject and special subject, who had contact with the students in the study were requested to complete a questionnaire concerning characteristics such as age, sex, undergraduate and graduate institutions attended, degrees held, participation in continuing education, involvement in professional and community organizations and activities, type and number of years of experience, and reasons for placement at the school and grade/subject. The questionnaire was completed when the teacher joined the study and for major variables such as degree attainment was updated annually thereafter. All

except one of the 44 teachers of academic subjects completed the questionnaire; the results for these teachers were reported in Table 6.

Teacher Background, Preferences and Opinions Questionnaire. Academic subject teachers provided further personal information such as parental education and employment and the location of previous teaching positions in the first section of a teacher background, preferences and opinions questionnaire which was adapted for this project from an instrument administered in conjunction with a federally funded welfare reform experiment (Murnane and Phillips, 1979). On the second section of the questionnaire the teachers indicated their preferences, if any, for teaching particular socioeconomic and ability levels of students and provided ratings of the ability and effort of the groups of students they actually taught. In addition, they responded to a variety of questions describing instructional practices such as use of pretesting, homework, competition, grading, and handling discipline matters. The third section of the questionnaire, consisting of 41 five-point Likert scale items, assessed teachers' opinions and beliefs about a wide range of areas including the purpose of schooling, the role of teachers and students, instructional techniques, classroom management, and the like. Of the 44 academic subject teachers, 37 completed this questionnaire.

Purdue Teacher Opinionnaire. Job satisfaction of the academic subject teachers was assessed by the Purdue Teacher Opinionnaire (Bentley and Kemple, 1980). The instrument provides a total measure of job satisfaction as well as subscores for the following 10 factors: teacher rapport with principal, satisfaction with teaching, rapport among teachers, teacher salary, teacher load, curriculum issues, teacher status, community support of education, school facilities and services, and community pressures. The opinionnaire was completed by 35 of the 44 academic subject

teachers and scored by the publisher, who provided a median rating and a percentile rank for each factor by teacher and by school based on national norms for the instrument.

Having described the general nature of the sample and the data bases which were used in the study, the remainder of this paper will deal with the analysis of relationships between the performance of students in reading and mathematics and the personal characteristics, attitudes, beliefs and instructional behavior of their teachers.

Methodology

The development of a data base suitable for examining the relationships between student achievement and teacher personal characteristics, instructional behaviors, and professional attitudes and beliefs involved three procedures. First, it was necessary to define a population of teachers and students for whom an association between teacher attributes (the independent variables), and student achievement in reading and mathematics, (the dependent variables), could reasonably be expected. Second, it was necessary to reduce the extensive amount of data on personal characteristics of teachers to a small set of non-collinear variables. Third, the extensive data on teacher attitudes and beliefs had to be reduced to a small set of non-collinear variables.

Definition of the Population

The population of teachers and students selected for these analyses were based in part on records of classroom observations of students in reading and mathematics classes. The determination of the particular teacher to whom a student's achievement in these subjects could be attributed was complicated by the flexible grouping practices used in some

schools, and by the use of special teachers in areas such as remedial reading or learning disabilities. In the course of a school year some students were observed with two or three different regular classroom teachers for reading or mathematics, other students were observed with a regular teacher most of the time but occasionally with a special teacher; still other students were observed with a special teacher throughout the year.

Students who were observed with more than one regular teacher for reading or mathematics were eliminated from the data base since it was impossible to assign their performance to a single teacher and their performance could not be apportioned among two or more teachers on other than an arbitrary basis. Students who spent all their time with a special teacher also were eliminated from the data base because they were given lower priority in classroom observations and consequently data for them were not complete. Students who were generally observed with a classroom teacher but on occasion observed with a special teacher for reading or mathematics were included on the assumption that the regular teacher initiated and followed up on this service for the child. That is, the professional judgment of the regular teacher was a major factor in the student receiving and benefiting from special services. In addition, it was decided to retain only teachers for whom there were six or more student observations in the subject under study. After these decision rules were applied, 13 reading teachers were retained in year 1 and year 2 and 14 were retained in year 3. Likewise, 10 mathematics teachers were retained in year 1 and year 2 and 17 were retained in year 3. Teacher-student dyads in reading were 202, 171, and 183 in the first, second and third years of the study, respectively. In mathematics, there were 198 teacher-student dyads in year 1, 156 in year 2 and 150 in year 3.

Table 9 provides information about the number of teacher/student dyads that could be identified for each regular classroom teacher for reading and for mathematics in each year of the study; Table 10 indicates the percent of the total student population represented by these teacher student dyads. The students in teacher-student dyads included a

/Insert Table 9 and Table 10 here/

relatively high percentage of the total student population in three of the four schools. As noted earlier, School 3 used extensive regrouping within a multigraded instructional setting. Consequently, in only one instance (reading in year 3) did the percentage of students in teacher-student dyads represent more than 50 percent of the total student population and in one case (mathematics in year 2) the number of students in teacher-student dyads was only 13 percent of the total student population.

Tables 11 and 12 provide information on reading achievement for the total population and for the teacher-student dyads used in this study. The data indicate that the level of achievement in the sample of teacher-student dyads is generally representative of the total population in each grade. A special situation should be noted in School 1, year 2 for reading. A teacher was replaced at the end of the first semester, requiring that the students in that class be dropped from the data base. The grouping practices in the school apparently were such that when these students were omitted, a less representative sample of the student body resulted, since the achievement for the sample of teacher-student dyads is rather discrepant from that obtained in year 1 and year 3.

/Insert Table 11 and Table 12 here/

The unit of analysis for this study is the teacher. Only a small number of teachers were identified for each subject in each year. This made it necessary to reduce the extensive pool of variables describing teacher personnel characteristics, instructional behavior and professional attitudes and beliefs.

Selection of Teacher Demographic Variables

Since some of the teachers appeared in more than one year, a total of 38 teachers are represented in the teacher-student dyads described in the preceding section. Information on 35 variables concerning their personal, educational, and professional background and activities were obtained from each of the 38 teachers. It was possible to eliminate 25 of the 35 variables after examining the raw data and descriptive statistics. Some of them displayed little or no variability and data were missing for others. Other variables were well proxied by another variable and these were eliminated. The 10 variables retained either had been shown in previous research to be of potential importance in explaining student achievement or were of particular interest in this study. The variables retained for further analysis were age, sex, graduate degree status, number of graduate credits earned in the past 24 months, current enrollment in a graduate degree program, membership in professional organizations, number of professional magazines and journals read regularly, years of teaching experience, method of placement at the grade level, and number of non-credit courses taken in the past three years.

Selection of Teacher Behavior and Belief Variables

Self-report data about instructional behaviors and professional beliefs were obtained from 34 of the 38 teachers using the questionnaire described earlier. The questionnaire included 17 multiple choice items dealing with preferences for teaching particular socio-economic and ability levels of students as well as ratings of the ability and effort of the students actually taught. Other items covered instructional practices such as pre-testing, homework, use of competition, grading and discipline. Teachers' professional beliefs about a wide range of areas including the purpose of schooling, the roles of teachers and students, instructional techniques, and classroom management were probed using 41 items and a five-point Likert scale response set.

There were three general stages in the process of reducing the number of variables to be retained for additional analysis: (1) factor analysis to indicate whether the data were potentially amenable to cluster analysis; (2) cluster analysis to select representative variables for preliminary regressions; and (3) preliminary regressions on student achievement in reading and mathematics of the selected personal characteristics and the representative behaviors and beliefs.

Initially, a factor analysis was performed to obtain a preliminary notion of the relationships among variables and to estimate whether the data were amenable to cluster analysis. The factor analysis provided support for using a cluster analysis procedure as well as identifying certain "seed" variables for the cluster analysis.

The subsequent oblique principal component cluster analysis identified 13 variable clusters with each of them containing from 3 to 8 variables. Each cluster was examined and the clusters were judged to be reasonable

from a substantive point of view, although there were some instances where individual variables had no intuitively obvious relationship to other variables in the cluster. For 11 of the 13 clusters a single variable was selected to represent the cluster because it had the highest R^2 with its own cluster and a relatively low R^2 with the cluster where it had its next highest relationship. In several clusters two or more variables had very similar R^2 values. In these situations the nature of the question and the variability exhibited in the response set were considered before making the final choice. In two instances (Cluster 8 and Cluster 11) two variables were retained to represent the cluster because it was not evident which variable best captured the content of the cluster. The results of the cluster analysis procedure and the variables retained for further analysis are shown in Table 13. Six of the variables retained for further analysis (Q14-Q27 and Q67) dealt with teachers' attitudes toward students and instructional practices; the remaining 9 questions dealt with teachers' attitudes and beliefs.

/Insert Table 13 here/

Regression Analyses

A preliminary series of correlation and regression analyses were performed and five additional variable were eliminated. Age and years of teaching experience were highly correlated (.7 to .9) and, since years of teaching experience was deemed more relevant, it was retained. Further examination revealed that most teachers belonged to only one union or educational association and this variable was dropped. The other remaining variables were similarly re-examined and it was decided to retain

sex, graduate degree status, gradute credits earned in the last 24 months and number of professional magazines and journals, the latter two as proxies for professional development activities. In addition, a measure of general satisfaction with teaching obtained from the Purdue Teacher Opinionnaire was added to the data base at this time.

Regression analyses were then employed to ascertain relationships between student academic achievement in reading and mathematics and the selected variables related to teacher personal characteristics, and the teachers' attitudes, beliefs and behaviors described in the preceding sections. Standardized student achievement scores in reading and mathematics were regressed on each set of variables both separately and in combination. The following regression models were applied for both reading and mathematics achievement scores: (1) teacher personal characteristics, (2) teacher attitudes, beliefs and behaviors, (3) teacher personal characteristics followed by teacher attitudes, beliefs and behaviors, (4) teacher attitudes, beliefs and behaviors followed by teacher personal characteristics, (5) teacher personal characteristics followed by teacher attitudes, beliefs and behaviors entered step-wise, (6) teacher attitudes, beliefs and behaviors followed by teacher personal characteristics entered step-wise, (7) reading scaled score with the student's previous year's scaled score as a base variable (to control for previous academic achievement) followed by teacher personal characteristics and teacher attitudes, beliefs and behaviors. Separate regressions were computed for scaled scores in reading and mathematics obtained at the end of the fourth grade and fifth grade years.

Teacher personal characteristics alone produced R^2 values of .33 with both reading and mathematics scaled scores. The teacher attitude, belief

and behavior variables alone produced R^2 ranging from .28 to .40 in reading and mathematics scaled scores. When teacher personal characteristics and teacher attitudes, beliefs and behaviors were combined, R^2 values of .38 and and .50 were obtained for reading scaled scores in grades 4 and 5 and R^2 values of .58 and .56 were obtained with mathematics scaled scores in grades 4 and 5. When the student's previous achievement in reading or mathematics was controlled by including the student's scaled score in that subject for the preceding school year, the value of R^2 increased to .57 and .69 with reading scaled scores in grades 4 and 5 and to .71 and .87 with mathematics scaled scores in grades 4 and 5. Although relatively high values of R and R^2 were obtained in these regression equations, the standardized regression coefficients were so unstable that literal interpretation of the standardized regression coefficients produced results that were not sensible.

From the results of the preceding analyses, (e.g., the order of entry of variable in step-wise regressions and the magnitude of partial correlations), as well as arbitrary (but hopefully informed)judgments on the part of the investigators, it was possible to further reduce the array of variables in each category. In selecting the variables to be retained we considered the nature and quality of the data, results obtained by other investigators, and intuitively logical relationships between and among variables. As noted previously, six variables describing teacher personal characteristics were retained: (1) satisfaction with teaching, (2) sex, (3) graduate degree status, (4) number of graduate credits earned in the past 24 months, (5) number of professional magazines and journals read regularly, and (6) years of experience in teaching. Six variables relating to teacher attitudes, beliefs and behaviors also were retained: (1) Q21--on the average, how much homework do you assign per day? (2) Q30--the

primary purpose of education should be to teach people what to think, (3) Q41--making a lesson dramatic often results in students missing the point of the lesson, (4) Q42--teachers should talk to students just as they would to an adult, (5) Q47--a teacher generally ought to engage in a fair amount of sheer repetition, and (6) Q55--even at the risk of boring some students, the teacher should take pains to explain things thoroughly. The response set for Q21 ranged from 0 to more than 2 hours per day with half hour intervals; the response set for the remaining 5 variables was a 5-point Likert scale ranging from "strongly agree" to "strongly disagree".

Findings

Tables 14 and 15 summarize the results of the final stepwise regression equations in which student scaled scores in mathematics and reading were regressed on variables relating to teacher personal characteristics, atttitudes, behaviors and beliefs. Separate regression equatio: were computed for the third, fourth and fifth grade years in both mathematics and reading. Table 14 identifies the variables entering into the equation during each year and the step in which each variable entered.

/Insert Table 14 and Table 15 here/

The regressions using student scaled score in mathematics as the dependent variable produced multiple correlations of .68, .72 and .57 for third, fourth and fifth grade, respectively. Corresponding values of the coefficient of determination (R^2) were .46, .52, and .32, respectively. Years of teaching experience entered the equation in each of the three years, entering first in grades 3 and 5 and seventh in grade 4. However, the relationship between years of teaching and academic achievement in

mathematics was quite unstable, with standardized regression coefficients of .62, -.17, and -.49. Question 42 (teachers should talk to students just as they would to an adult) also entered the equation during each of the three years, entering sixth in third grade and third in fourth and fifth grades. It also was rather unstable, with standardized regression coefficients of .15, -.25, and .20 during the three years, respectively.

Three other variables each appeared in the final regression in two of the three years. Graduate credits completed within the past 24 months entered fifth in third grade and second in fourth grade. The standardized regression coefficient was negative in both grade 3 and grade 4. Number of professional magazines and journals read regularly entered fourth in grade 3 and second in grade 5 with positive standardized regression coefficients each year (1.36 and .26). Question 30 (the main purpose of education should be to teach people what to think) entered the equation third in grade 3 and first in grade 4. In both instances the standardized regression coefficient was positive, although the large coefficient in third grade is disconcerting. Of the 12 variables considered, only one (question 41) did not enter the final stepwise regression equation in any of the three years.

With regard to reading, the final stepwise regression equation produced a multiple correlation of .67 in grade 3, .61 in grade 4, and .67 in grade 5. The corresponding values of R^2 were .45, .38, and .45, respectively. Three variables entered the final regression equation in each of the three years. Number of graduate credits completed within the past 24 months entered first in grade 3 but not until 11th in grade 4 and 12th in grade 5. The standardized regression coefficient was negative in grade 3 but positive in grades 4 and 5. Number of professional magazines and journals read regularly entered seventh in grade 3, third in grade 4,

and tenth in grade 5. The standardized regression coefficient was positive in each of the three years and the values were similar. Question 47 (a teacher generally ought to engage in a considerable amount of sheer repetition) entered tenth in grade 3, seventh in grade 4, and ninth in grade 5. The standardized regression coefficient was negative in two of these three years.

Seven variables each entered the final regression equation during two of the three years. Teacher gender was the second variable entered in grade 3 and grade 4 with a negative standardized regression coefficient in each year. Graduate degree status entered ninth in grade 4 and second in grade 5 with a small positive value in grade 4 and a large negative value in grade 5. Years of teaching experience entered eighth in grade 3 and third in grade 5 with positive standardized regression coefficients in each year (but with widely disparate values). Question 71 (on the average, how much homework do you assign per day?), entered third in grade 3 (but the left the equation in step eleven) and entered eighth in grade 4 and grade 5. The standardized regression coefficient was negative in grade 4 and positive in grade 5. Question 30 (the main purpose of education should be to teach people what to think) entered fifth in grade 3 and eleventh in grade 5 with positive standardized regression coefficients each year. Question 41 (making a lesson dramatic often results in students missing the point of the lesson) entered fourth in grades 3 and 4 and entered first in grade 5 (but was removed at step six). In both grade 3 and grade 4 the standardized regression coefficient was positive and of similar size. Question 42 (teachers should talk to students just as they would to an adult) entered sixth in grade 3, entered fifth in grade 4 (but was removed from the equation at the tenth step), and entered seventh in grade 5. The standardized regression coefficient was positive at grade 3 and negative

at grade 5 with vary disparate values in the two years in which it remained in the equation. Question 55 (even at the risk of boring some students, the teacher should take pains to explain things thoroughly) entered ninth in grade 3, entered first in grade 4 (but was removed from the equation at step six), and entered fourth in grade 5. In both grade 3 and grade 5 the standardized regression coefficient was positive and similar in value.

In summary, the results of the stepwise regression analyses described above are a bit disheartening. The few variables which consistently entered the final regression equation tended to be quite unstable, showing positive standardized regression coefficients in some years and negative coefficients in other years. Four variables--graduate credits earned in the past 24 months, number of professional magazines and journals read regularly, years of teaching experience, and question 42 dealing with whether teachers should talk to students just as they would to an adult--entered and remained in the final regression equation in five of the six cases. Of these variables, only the number of professional magazines and journals read regularly displayed a relatively stable standardized regression coefficient. Each of the other three variables exhibited both positive and negative standardized regression coefficients and disparate values for the standardized regression coefficients.

Two other variables--question 30 dealing with whether the main purpose of education should be to teach people what to think and question 47 dealing with whether a teacher generally ought to engage in a considerable amount of sheer repetition--each entered and remained in the final regression equation in four of six cases. All standardized regression coefficients for question 30 were positive but varied widely while those for question 47 showed both positive and negative values.

The variables entering the final regression equation in mathematics for the three years accounted for between 32 and 52 percent of the variance in mathematics scaled scores. Similarly, the final regression equations in reading explained from approximately 38 to 45 percent of the variance in reading scaled scores in the three years. Thus, a substantial amount of unexplained variance remains. Furthermore, the analyses did not reveal a set of teacher-related variables with consistent, stable relationships to student scaled scores in mathematics and reading.

The same regression procedures also were employed with the student's scaled score at the close of the preceding school year included as a control. The results of the final stepwise regression equations when the student's previous scaled score is controlled are shown in Tables 16 and 17. Since the student's scaled score at the end of grade 2 was not available, this analysis could be performed only for grades 4 and 5. Including the student scaled score at the close of the previous school year substantially increased the coefficient of multiple correlation in both mathematics and reading. The values of R in fourth grade were .85 and .72, and the values for fifth grade were .87 and .76. The previous scaled score always was the first variable entered and it alone accounted for from 60 to 73 percent of the variance in mathematics scaled scores and from 48 to 62 percent of the variance in reading scaled scores. As will be noted from the data presented in Table 17, the teacher-related variables which entered the equation accounted for an additional 11 percent of the variance in mathematics scaled scores at fourth grade but only an additional 3 percent at fifth grade. In reading, the teacher-related variables explained an additional 3 percent of the variance in reading scaled scores at fourth grade and an additional 4.5 percent at fifth grade.

/Insert Table 16 and Table 17 here/

Only one teacher-related variable, graduate credits in the past 24 months, entered the final equation in both years in mathematics. It was the third variable entered in both fourth and fifth grade, with a negative standardized regression coefficient at fourth grade and a positive coefficient at fifth grade. Graduate degree status was the only variable entering the final equation during both years in reading. It entered at the fourth step in each year with a negative standardized regression coefficient each year. Years of teaching experience entered in the fifth grade equation in both mathematics and reading with a negative standardized regression coefficient in mathematics and a positive coefficient in reading. Question 30 (the main purpose of education should be to teach people what to think) entered the fourth grade equation in both mathematics and reading, but with a positive standardized regression coefficient in mathematics and a negative coefficient in reading. Three variables did not enter the final regression equation in mathematics in either of the two years--number of professional magazines and journals read, question 41 (making a lesson dramatic often results in students missing the point of the lesson), and question 55 (even at the risk of boring some students, the teacher should take pains to explain things thoroughly). Six variables did not enter the reading regression equation in either year. They included satisfaction with teaching, sex, graduate credits in the last 24 months, and questions 21, 41, 42, and 47.

The availability of data concerning the percentage of time students were on task in reading and in mathematics provided a direct measure of the

instructional behavior of teachers in the sample. The average percentage of time each student was on-task in reading (and in mathematics) was computed and used as an additional variable in regressions with the variables described previously. The "best" regression equation was ascertained together with other regression equations using variables drawn from the same set that provided solutions nearly as good as the the "best" equation. The results confirmed the previous finding that no single set of variables describing teacher personal characteristics, attitudes, behaviors and beliefs was consistently superior to any other in accounting for variation in student scaled scores.

Table 18 provides standardized regression coefficents for the variables included in 14 equations in which student reading achievement in grade five was regressed on teacher personal characteristics, attitudes, behaviors and beliefs. The "best" equation produced a multiple correlation coefficient of .558; the "poorest" of the 14 equations produced a multiple correlation coefficient of .526. Five of the thirteen variables did not enter any of the 14 equations. Two variables, graduate degree status and years of teaching experience, entered each of the 14 equations. Percent of time students were on task entered 10 of the 14 equations, including each of the six "best" equations. The standardized regression coefficients were quite stable. Graduate degree status, for example, was consistently negative and the values were quite similar. The coefficients for years of teaching experience were consistently positive, as were those for percentage of time on-task.

/Insert Table 18 here/

As was expected from the results reported earlier, similar analyses for reading in grade 3 and grade 4 resulted in different sets of variables entering the equation and even when the same variables entered, their signs and values were not consistent with those obtained for grade 5.

Discussion

It perhaps goes without saying, but one must nevertheless caution that broad generalizations based on the results of the analyses described in this paper are not warranted. First, the sample of teachers is small (from 10 to 17 depending upon the subject and year). Second, the sample of teachers was not randomly selected; it consisted of teachers who taught the particular grade and subject in the sample schools and thus may be biased in unknown fashion. Third, the students involved were predominantly from white, Anglo-Saxon, middle and lower middle class homes in small and medium sized cities in one midwestern state. Finally, it should be noted that we were seeking insights into how human resources, in this instance, the qualities and characteristics of teachers, might bear upon the academic achievement of these students; we were not attempting to either predict student achievement or to ascribe cause and effect relationships.

Having noted these caveats, it is somewhat discouraging to find that no single set of teacher-related variables showed consistently stable relationships with student achievement across grade levels and subjects. Rather, we found that one subset of variables was about as good as another, at least in terms of the multiple correlation coefficients they produced. This finding may be due to any one (or a combination) of factors.

It is possible, for example, that the way in which teacher personal characteristics, attitudes and beliefs bear upon academic achievement of

their students does vary from grade to grade and from subject to subject. (We have other data that show the strength of teacher affiliation declined greatly as these students progressed from third to fourth to fifth grade.) It is also possible that the variables we used did not capture the crucial attributes that effect student learning, either because we selected the wrong variables or because our instruments were not sufficiently sensitive. Another possibility is that each teacher-student dyad is so unique that aggregated data are not useful, or perhaps that certain teacher attributes are especially important in dealing with certain types of students and that such relationships are "washed out" when aggregated data are used.

Although the relationships were not as consistent and stable as would be desirable, certain variables did appear in the final step-wise regression equations quite consistently. Years of teaching experience entered the equation frequently, generally was one of the first variables to enter, and usually produced standardized regression coefficients with positive values. The number of professional magazines and journals read regularly also proved to be a useful variable. It appeared in the final step-wise regressions frequently, usually entered quite early, and produced stable standardized regression coefficients. On the other hand, several variables seldom entered the final stepwise regression equations, or entered late and contributed little to the multiple correlation coefficient. Satisfaction with teaching, for example, was not very useful and some of the attitude and belief questions contributed little additional information.

One may view the results of these analyses as similar to a glass that is either half full or half empty, depending on one's point of view. That is, the variables consistently produced multiple correlation coefficients

larger than .50 with some as high as .72. Thus, these teacher-related variables did account for a substantial amount of the variance in student achievement scores in reading and mathematics. When the student's previous academic achievement in the subject is taken into account, however, it is evident that teachers are working at the margin in terms of their effect on student achievement. While teachers do make a difference, the difference is likely to vary from student to student and from grade to grade, and is constrained by numerous factors beyond the control of the teacher or school. As to the particular teacher-related variables that are most directly and consistently associated with student academic achievement, one is tempted to say "pay your money and take your choice!" That is, numerous combinations of variables seem to be about equally efficient in describing the association between teacher-related variables and student academic achievement in reading and mathematics.

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Table 1

CHARACTERISTICS OF COMMUNITIES IN WHICH SAMPLE SCHOOLS WERE LOCATED[1]

School	Community population	Type of area and geographic location	High school graduates[2] (%)	4+ years college[2] (%)	1979 median family income	1979 family income below poverty level (%)
1	51,500	Medium city, light industry, northwestern Wisconsin	77.3	20.4	$19,135	7.1
2	4,100	Small town/rural, large industry nearby, southern Wisconsin	78.0	14.6	21,181	3.2
3	10,000	Small city, light industry, southern Wisconsin	66.9	14.3	20,648	3.6
4	53,000	Medium city/ urbanized area, light industry, north central Wisconsin	68.1	14.6	20,770	4.8
Wisconsin	4,705,800		69.6	14.8	20,915	6.3

[1]Data from 1980 Census.

[2]Persons 25 years and older.

Table 1A

OCCUPATIONAL STATUS BY MAJOR CATEGORIES IN THE COMMUNITIES IN WHICH SAMPLE SCHOOLS WERE LOCATED[1]

School (Community)	Managerial, professional (%)	Technical, sales, administrative support (%)	Service (%)	Farming, forestry, fishing (%)	Precision production, crafts, repair (%)	Operators, fabricators, laborers (%)
1	24.6	33.6	18.6	.9	8.3	14.0
2	17.9	35.4	15.4	.4	10.3	20.6
3	22.6	29.5	13.5	1.8	13.4	19.1
4	21.9	33.4	14.6	.7	10.1	19.2
Wisconsin	20.1	27.4	14.1	5.5	12.1	20.9

[1]Data from 1980 Census for employed persons over 16 years of age.

Table 2

COMPARISON OF SAMPLE SCHOOL DISTRICTS WITH OTHER WISCONSIN SCHOOL DISTRICTS SERVING COMMUNITIES OF SIMILAR SIZE OR HAVING SIMILAR AVERAGE DAILY MEMBERSHIP (ADM)

Variable	School District 1	Other school districts serving communities of similar population size (N = 7)		School District 2	School District 3	Other school districts with ADM of 1,500 to 3,000 students (N = 70)		School District 4	Other school districts with ADM of 3,000 to 5,000 students (N = 25)	
		Mean	S.D.			Mean	S.D.		Mean	S.D.
Total ADM	9,767	9,702	2,103	2,471	2,692	2,044	381	4,621	3,699	435
Total pupil/ teacher ratio	17:1	16.76:1	1.55	17.1:1	15.9:1	16.54:1	1.79	17.3:1	16.83:1	.85
Minority enrollment	203	335	271	11	20	56	70.53	80	80	52
Contract salary average	17,756	17,020	1,208	14,591	15,034	14,551	2,582	15,035	16,581	1,127
Teachers' average experience (in years)										
Local	10.4	11.4	1.22	7.7	10.5	9.3	2.32	8.3	9.94	1.47
Total	13.9	14.07	1.64	9.3	12.3	12.0	2.73	11.2	12.65	1.55
Cost/member	2,469	2,458	333	2,117	2,350	2,305	226	2,197	2,417	191.45
Cost/member less transportation	2,357	2,409	327	1,993	2,226	2,135	201	2,048	2,314	234.08
Equalized valuation/ member	93,254	117,260	39,001	82,308	113,360	92,143	25,214	83,619	94,148	26,143

Table 3

CHARACTERISTICS OF THE FOUR SCHOOLS IN WHICH THE STUDY WAS CONDUCTED

	School 1	School 2	School 3	School 4
Days of Instruction				
Year 1	176	180	179	178
Year 2	177	180	179	180
Year 3	175	178	179	180
Enrollment				
Year 1	577	484	512	456
Year 2	607	454	493	476
Year 3	553	363	481	440
Grades enrolled	K-6	K-6	K-6	K-6
Physical plant	traditional, self-contained classrooms, except for new open space gr. 5-6 wing	traditional, self-contained classrooms	open space	open space
Organizational pattern	primary unit (gr. K-2) intermed. unit (gr. 3-4) upper unit (gr. 5-6)	K-6, graded	primary unit (gr. K-3) intermed. unit (gr. 3-5) upper unit (gr. 5-6)	kindergarten, graded primary unit (gr. 1-2) intermed. unit (gr. 3-4) upper unit (gr. 5-6)
Other	Art, music, and physical education are taught by regular classroom teachers, not special teachers.			

Table 4

BACKGROUND CHARACTERISTICS OF STUDENT SAMPLE

	School 1	School 2	School 3	School 4	Total
Entry Characteristics					
N	88	63	51	79	281
Age in months, fall, 1979 ($\bar{x}$)	102	101	102	103	102
Males (%)	51	51	63	54	54
Nonwhite (%)	5	3	2	0	3
Preschool attendance (%)	20	39	28	27	28
Aptitude ($\bar{x}$)	116	104[a]	116	115	113
By-Year Characteristics					
N					
Year 1	74	56	43	70	243
Year 2	78	55	47	69	249
Year 3	61	50	45	61	217
Special services enrollment (%)[b]					
Year 1	18	18	16	6	14
Year 2	14	13	19	4	12
Year 3	5	8	9	3	6
Days present ($\bar{x}$)					
Year 1	168	174	172	172	171
Year 2	170	175	173	173	173
Year 3	167	173	174	175	172

[a]Data are from the Test of Cognitive Skills (1982), given in fall, 1983, when students were in sixth grade; for the other three schools, scores are from a grade 2 administration of the Otis-Lennon Mental Ability Test (1973).

[b]A student is counted once, regardless of the number of special programs in which s/he was enrolled.

Table 5

BACKGROUND CHARACTERISTICS OF TEACHERS
OF REGULAR ACADEMIC SUBJECTS

School	Year	N[a]	Female	Master's degree held	Age			Years of Experience		
					Mean	S.D.	Range	Mean	S.D.	Range
1	1	4	4	0	45.0	15.8	29-61	11.7	6.6	6-18
	2	3/1	3	0	44.7	16.4	26-57	9.7	8.0	2-18
	3	5	1	5	44.5	13.0	33-63	14.4	8.8	8-29
2	1	2	2	0	47.5	10.6	40-55	11.0	5.7	7-15
	2	4[b]	2	1	35.0	7.3	25-42	7.5	4.6	2-13
	3	3/1	2	2	42.3	4.2	39-47	14.0	3.5	10-16
3	1	5	4	0	34.6	13.6	25-58	10.2	10.2	3-28
	2	6/3	4	2	41.7	15.6	25-59	14.0	11.4	1-29
	3	11/5	7	3	39.8	12.7	26-60	11.3	9.8	2-30
4	1	6	4	4	33.8	3.8	31-41	8.7	3.3	6-14
	2	6/6	4	4	34.8	3.8	32-42	9.7	3.3	7-15
	3	4	2	1	34.7	5.0	30-40	8.7	6.2	5-18
Total[c]	1	17	14	4	38.3	11.8	25-61	10.1	6.4	3-28
	2	19/10	13	7	38.6	11.3	25-59	10.6	7.5	1-29
	3	23/6	12	11	40.1	10.7	26-63	11.9	8.3	2-30

[a]Numbers to the right of the slashes indicate the number of teachers who had been present the previous year; for example, 1 of the 3 teachers from School 1 in Year 2 had participated in the study in Year 1.

[b]Data were not available for a fifth teacher who participated.

[c]Data are available for 43 of the 44 academic subject teachers who took part in the study. Because some of the teachers participated for two or three years, the apparent number of participating teachers over the three years is 59.

Table 6

INSTRUMENTATION AND SCHEDULE OF DATA COLLECTION

Instrument	Administration Schedule
Student Variables	
Student Personal Background Record	once upon entry, updated annually
Parent Interview	once, one-third of the families each year
Student Classroom Observations	three classes annually per student per academic subject (reading, language arts, mathematics, science, social studies); as time permitted, classes in other subjects (art, music, physical education, special services)
Stanford Achievement Test	annually, end of year
Self-Observation Scales	annually, end of year
Teacher Variables	
Teacher Personal Background Record	once upon entry, updated annually if teacher participated for more than one year
Teacher Background, Preferences, and Opinions Questionnaire	once
Purdue Teacher Opinionaire	once
Teacher Time Allocation Record	three weeks annually

(Table continued)

Table 6

INSTRUMENTATION AND SCHEDULE OF DATA COLLECTION

Instrument	Administration Schedule
Student Variables	
Student Personal Background Record	once upon entry, updated annually
Parent Interview	once, one-third of the families each year
Student Classroom Observations	three classes annually per student per academic subject (reading, language arts, mathematics, science, social studies); as time permitted, classes in other subjects (art, music, physical education, special services)
Stanford Achievement Test	annually, end of year
Self-Observation Scales	annually, end of year
Teacher Variables	
Teacher Personal Background Record	once upon entry, updated annually if teacher participated for more than one year
Teacher Background, Preferences, and Opinions Questionnaire	once
Purdue Teacher Opinionaire	once
Teacher Time Allocation Record	three weeks annually

(Table continued)

Table 6 (Continued)

Instrument	Administration Schedule
School and School District Variables	
Principal Personal Data Questionnaire	once, updated annually
Leade Behavior Description Que..ionnaire	once
School Data Questionnaire	once, updated annually
Instruction and Instruction Related Expenditures Form	annually (for each school staff member)
FTE/Pupil Count for Instructional/ Noninstructional Personnel Form	annually
Individual Student FTE Assignments and Costs Form	annually
Gross and Operating Expenditure Data Form for Wisconsin/Non-Wisconsin School Districts	annually
Material, Equipment, and Physical Resources Form	annually (for each building)

Table 7

ACHIEVEMENT, ATTITUDE, AND APTITUDE TESTS FOR THE STUDY

Year of Study	School	Test	Test Date	Norms	Administrators	Notes
Baseline	1	Stanford Achievement Test Primary Level II, Form A	March, 1979	end of grade 2	local staff	
	2	Comprehensive Tests of Basic Skills Level B, Form S	Feb., 1978	mid grade 1	local staff	
	3	Stanford Achievement Test Primary Level II, Form A	Sept., 1979	beg. grade 3	local staff	Scores were converted to end of grade 2 norms.
	4	Stanford Achievement Test Primary Level I, Form A	Oct., 1978	beg. grade 2	local staff	
1	1, 2, 4	Stanford Achievement Test Primary Level III, Form A	April/May, 1980	end grade 3	project staff	
	3	Stanford Achievement Test Primary Level III, Form A	Sept., 1980	beg. grade 4	local staff	Scores were converted to end of grade 3 norms.
2	1, 2, 4	Stanford Achievement Test Intermed. Level I, Form A	May, 1981	end grade 4	project staff	
	3	Stanford Achievement Test Intermed. Level I, Form A	Sept., 1981	beg. grade 5	local staff	Scores were converted to end of grade 4 norms.
3	1-4	Stanford Achievement Test Intermed. Level II, Form A	April, 1982	end grade 5	project staff	

(Table continued)

Table 7 (Continued)

Year of Study	School	Test	Test Date	Norms	Administrators	Notes
1-3	1-4	Self-Observation Scales (SOS), Form A (Yrs. 1 and 3) Form C (Yr. 2)	April/May, 1980 (Yr. 1) May, 1981 (Yr. 2) April, 1982 (Yr. 3)	NCS national norms for the Intermediate level of the test	project staff	
Baseline	1	Otis-Lennon Mental Ability Test (OLMAT)	March, 1979	Per chronological age	local staff	If data were not available for the baseline test date (e.g., students were absent, or students entered the study the second year), then whatever recent aptitude data were available were coded.
	2	CTB Test of Cognitive Skills, Level 3, 1981	October, 1982[a]	"	local staff	
	3	Otis-Lennon Mental Ability Test (OLMAT)	January, 1979	"	local staff	
	4	Otis-Lennon Mental Ability Test (OLMAT)	February, 1979	"	local staff	

[a]School 2 had declared a moratorium on aptitude testing until fall, 1982. These data were used because they were the only scores available.

Table 8

CORRELATIONS AMONG ACHIEVEMENT TEST SCALE SCORES FOR THE STUDY SAMPLE AND STANDARDIZATION SAMPLE[1]

	Year 1		Year 2		Year 3	
	Study	Standard.	Study	Standard.	Study	Standard.
READING						
Comprehension/Study Skills	.67	.78	.61	.69	.63	.73
Comprehension/Total Reading	.88	.96	.86	.93	.90	.94
Study Skills/Total Reading	.94	.93	.93	.91	.91	.92
MATHEMATICS						
Concepts/Computation	.61	.69	.66	.72	.72	.77
Concepts/Applications	.72	.76	.72	.76	.76	.79
Computation/Applications	.63	.68	.68	.68	.77	.76
Concepts/Total Math	.89	.91	.91	.90	.90	.91
Computation/Total Math	.83	.88	.86	.89	.90	.92
Applications/Total Math	.91	.91	.90	.91	.93	.93

[1]Source: Technical Manual, Stanford Achievement Tests (1973).

Table 9

NUMBER OF TEACHER-STUDENT DYADS FOR EACH REGULAR CLASSROOM TEACHER BY YEAR IN READING AND MATHEMATICS

READING

School		Year 1 Teacher ID	N	Year 2 Teacher ID	N	Year 3 Teacher ID	N
1		11	17	18	30	56	16
		12	32	19	19	57	21
		13	18			58	21
	Total	3	67	2	49	59 4	58
2		21	29	20	23	61	17
		22	27	27	25	64	24
	Total	2	56	2	48	2	41
3		31	16	73	5	74	6
		32	9	76	9	76	2
		33	17	96	7	90	10
						92	2
						94	7
	Total	3	42	3	21	96 6	1 28
4		40	21	40	7	87	19
		41	15	41	5	88	21
		42	6	42	13	97	19
		43	9	43	11		
		44	1	44	21		
	Total	5	52	46 6	3 60	3	59

(Continued on next page)

Table 9, Continued

School		Year 1 Teacher ID	N	Year 2 Teacher ID	N	Year 3 Teacher ID	N
			MATHEMATICS				
1		11	26	18	31	56	22
		12	25	19	36	57	11
		13	15			58	16
	Total	3	66	2	67	59 4	10 59
2		21	31	20	24	61	22
		22	25	27	4	63	7
	Total	2	56	61 3	4 32	64 3	16 45
3		31	2	73	5	74	1
		33	18	76	1	76	5
						91	4
						92	2
						94	4
	Total	2	20	2	6	95 6	4 20
4		40	23	43	19	86	0
		41	28	44	16	87	15
		42	17	46	22	88	3
	Total	3	68	3	57	97 4	3 30

Table 10

PERCENT OF THE TOTAL STUDENT POPULATION REPRESENTED BY THE TEACHER-STUDENT DYADS

Year	School	Total number of students observed	Number of teacher-student dyads with complete data	Percent of teacher-student dyads
		READING		
1	1	75	64	85
	2	57	51	89
	3	43	37	86
	4	71	50	70
		246	202	
2	1	79	48	61
	2	55	46	84
	3	47	19	40
	4	71	58	82
		252	171	
3	1	58	57	98
	2	50	41	82
	3	44	28	64
	4	59	57	97
		211	183	
		MATHEMATICS		
1	1	73	63	86
	2	56	52	93
	3	43	17	39
	4	71	66	93
		243	198	
2	1	79	64	81
	2	54	31	57
	3	47	6	13
	4	71	55	77
		251	156	
3	1	61	58	95
	2	49	45	92
	3	44	20	45
	4	61	27	44
		215	150	

Table 11

READING ACHIEVEMENT BY SCHOOL FOR THE TOTAL STUDENT POPULATION AND FOR TEACHER-STUDENT DYADS

	Total Population					Teacher-Student Dyads			
		Scaled Score					Scaled Score		
	N	Mean	S.D.	Range		N	Mean	S.D.	Range
Year 1					Year 1				
School 1	72	153.0	17.1	119-198	School 1	64	154.0	17.3	119-198
School 2	52	143.4	15.1	116-172	School 2	51	141.2	15.1	116-170
School 3	38	154.2	13.1	134-181	School 3	37	154.0	13.3	134-181
School 4	69	152.8	10.8	133-179	School 4	50	151.5	10.0	133-176
Totals	231	151.0	14.9	116-198	Totals	191	150.7	15.2	116-198
Year 2					Year 2				
School 1	75	162.7	18.9	124-221	School 1	48	152.5	12.7	124-172
School 2	52	154.7	19.6	123-197	School 2	46	157.0	18.7	123-197
School 3	45	167.7	19.7	119-215	School 3	19	172.6	22.1	143-215
School 4	69	158.6	20.3	107-215	School 4	58	158.8	21.4	107-215
Totals	241	160.7	20.0	107-221	Totals	171	158.1	19.4	107-215
Year 3					Year 3				
School 1	57	172.7	16.5	143-215	School 1	57	172.7	16.5	143-115
School 2	49	164.8	20.2	131-211	School 2	41	166.2	19.7	133-211
School 3	44	175.7	16.9	146-215	School 3	28	174.9	17.5	146-212
School 4	55	174.9	17.3	127-221	School 4	57	174.9	17.0	127-221
Totals	205	172.0	18.1	127-221	Totals	183	172.3	17.8	127-221

Table 12

MATHEMATICS ACHIEVEMENT BY SCHOOL FOR THE TOTAL STUDENT POPULATION AND FOR TEACHER-STUDENT DYADS

	Total Population					Teacher-Student Dyads			
		Scaled Score					Scaled Score		
	N	Mean	S.D.	Range		N	Mean	S.D.	Range
Year 1					Year 1				
School 1	72	149.3	13.2	119-180	School 1	63	149.4	13.1	119-180
School 2	52	144.1	13.2	114-176	School 2	52	144.1	13.2	114-176
School 3	38	147.9	9.7	134-183	School 3	17	142.3	7.8	134-167
School 4	69	147.4	10.2	122-173	School 4	66	146.8	9.6	122-168
Totals	231	147.3	11.9	114-183	Totals	198	146.5	11.8	114-180
Year 2					Year 2				
School 1	75	166.8	14.6	128-203	School 1	64	170.3	12.2	147-203
School 2	52	158.0	16.0	124-192	School 2	31	156.8	15.5	124-188
School 3	45	163.2	14.5	129-203	School 3	6	163.3	12.0	152-184
School 4	69	161.1	16.1	124-203	School 4	55	158.2	16.4	124-203
Totals	241	162.3	15.6	124-203	Totals	174	162.4	15.7	124-203
Year 3					Year 3				
School 1	60	174.6	16.1	133-208	School 1	58	174.9	16.2	133-208
School 2	49	167.0	18.1	131-206	School 2	45	166.9	19.4	131-206
School 3	44	173.7	16.3	142-220	School 3	20	175.6	19.9	142-220
School 4	57	171.8	15.3	145-206	School 4	27	165.1	15.6	145-206
Totals	210	171.9	16.7	131-206	Totals	150	170.8	18.0	131-220

Table 13

TEACHER BEHAVIOR AND BELIEF VARIABLES CHOSEN TO REPRESENT CLUSTERS

Cluster	Number of members	Representative Variable		
		Variable*	R^2 with cluster	R^2 with next highest cluster
1	5	Q 14	.77	.26
2	6	Q 41	.64	.08
3	4	Q 42	.68	.13
4	8	Q 67	.61	.11
5	4	Q 45	.68	.17
6	3	Q 30	.61	.08
7	4	Q 55	.69	.17
8	4	Q 37	.56	.11
		Q 20	.60	.06
9	5	Q 39	.70	.23
10	6	Q 47	.44	.03
11	5	Q 27	.48	.08
		Q 24	.52	.10
12	7	Q 21	.73	.17
13	3	Q 58	.77	.14

*Variables:

Q 14--How would you rate students in your school on how hard they try?
Q 20--How strict do you feel you are in class?
Q 21--On the average, how much homework do you assign per day?
Q 24--Which group do you pitch your instruction toward (high, middle, low)?
Q 27--To what extent do you consider effort when you assign grades?
Q 30--The main purpose of education should be to teach people what to think.
Q 37--The primary function of examinations is to help students evaluate their own learning.
Q 39--Nowadays, schools too often develop everything about the student but his mind.
Q 41--Making a lesson dramatic often results in students missing the point of the lesson.
Q 42--Teachers should talk to students just as they would to an adult.
Q 45--Students learn much from interaction with other students; therefore the teacher should provide abundant opportunity for small-group discussions in the classroom.
Q 47--A teacher generally ought to engage in a fair amount of sheer repetition.
Q 55--Even at the risk of boring some students, the teacher should take pains to explain things thoroughly.
Q 58--Good teaching and genuine affection for students are two separate things and have little, if anything, to do with each other.
Q 67--Suppose a student were to do a project for extra credit. How likely is it (very, somewhat, not very) that you would give the student a better grade if you knew that the student worked on the project in his/her spare time?

Table 14

SUMMARY OF FINAL STEPWISE REGRESSION OF VARIABLES RELATING TO TEACHER PERSONAL CHARACTERISTICS, ATTITUDES, BEHAVIORS, AND BELIEFS, AND STUDENT SCALED SCORES IN MATHEMATICS AND READING

	MATHEMATICS				READING			
	Stand. Regr. Coefficient	Partial Corr.Coef.	Sig. Level	Step Entered	Stand. Regr. Coefficient	Partial Corr.Coef.	Sig. Level	Step Entered
Satisfaction w/teaching								
3rd grade								
4th grade	-.290	-.270	.000	6				
5th grade					.263	.171	.024	5
Male/Female								
3rd grade								
4th grade	.349	.390	.000	4	-.446	-.450	.000	2
5th grade					-.767	-.540	.000	2
Graduate degree								
3rd grade								
4th grade								
5th grade	.136	.111	.183	5	.203	.166	.033	9
					-2.405	-.455	.000	2
Graduate credits w/24 mos.								
3rd grade	-.453	-.381	.000	5	-.865	-.537	.000	1
4th grade	-.454	-.270	.000	2	.110	.105	.179	11
5th grade					.227	.146	.055	12
Profes. Mag. & Jrnl.								
3rd grade	1.356	.515	.000	4	.859	.404	.000	7
4th grade					.830	.423	.000	3
5th grade	.256	.210	.011	2	.928	.363	.000	10
Yrs. of teaching								
3rd grade	.616	.389	.000	1	.272	.239	.000	8
4th grade	-.171	-.151	.065	7				
5th grade	-.491	-.479	.000	1	1.682	.450	.000	3

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Table 14, Continued

	MATHEMATICS				READING			
	Stand. Regr. Coefficient	Partial Corr.Coef.	Sig. Level	Step Entered	Stand. Regr. Coefficient	Partial Corr.Coef.	Sig. Level	Step Entered
Q 21								
3rd grade								In 3
								Out 11
4th grade	.182	.234	.003	5	-.632	-.386	.000	8
5th grade					.754	.412	.000	8
Q 30								
3rd grade	2.044	.556	.000	3	.881	.430	.000	5
4th grade	.465	.407	.000	1				
5th grade					.463	.222	.003	11
Q 41								
3rd grade					.907	.495	.000	4
4th grade					.774	.452	.000	4
								In 1
5th grade								Out 6
Q 42								
3rd grade	.151	.138	.055	6	.610	.370	.000	6
4th grade	-.247	-.184	.024	3				In 5
								Out 10
5th grade	.205	.235	.004	3	-1.258	-.396	.000	7
Q 47								
3rd grade	-1.840	-.602	.000	2	-.626	-.315	.000	10
4th grade					-.574	-.368	.000	7
5th grade					.606	.195	.010	9
Q 55								
3rd grade					.584	.426	.000	9
4th grade								In 1
								Out 6
5th grade	.155	.179	.030	4	.418	.239	.001	4

	R	R^2	R	R^2
3rd grade	.6814	.4643	.6711	.4504
4th grade	.7223	.5217	.6126	.3753
[illegible] grade	.5651	.3193	.6684	.4468

Table 15

SUMMARY OF STEPS, STEPWISE REGRESSION OF MATHEMATICS AND READING SCALED SCORES ON TEACHER PERSONAL CHARACTERISTICS, ATTITUDES, BEHAVIORS, AND BELIEFS

Step No.	Variable	In/Out	R	R^2	Change in R^2	Sig. Level
		Mathematics--3rd Grade				
1	YRSTEACH	In	.250	.0626	.0626	.000
2	Q 47	In	.315	.0992	.0366	.005
3	Q 30	In	.425	.1809	.0817	.000
4	NMAGJRNL	In	.610	.3723	.1914	.000
5	NGRAD24	In	.674	.4538	.0815	.000
6	Q 42	In	.6814	.4643	.0105	.055
		Mathematics--4th Grade				
1	Q 30	In	.506	.2561	.2561	.000
2	NGRAD24	In	.593	.3515	.0954	.000
3	Q 42	In	.641	.4107	.0592	.000
4	MALEFEM	In	.671	.4502	.0394	.001
5	Q 21	In	.694	.4821	.0319	.003
6	SATWTCH	In	.714	.5105	.0284	.004
7	YRSTEACH	In	.722	.5217	.0112	.065
		Mathematics--5th Grade				
1	YRSTEACH	In	.345	.1188	.1188	.000
2	NMAGJRNL	In	.496	.2457	.1269	.000
3	Q 42	In	.528	.2789	.0332	.011
4	Q 55	In	.558	.3108	.0370	.010
5	GRADEGRE	In	.565	.3193	.0085	.183
		Reading--3rd Grade				
1	NGRAD24	In	.350	.1228	.1228	.000
2	MALEFEM	In	.465	.2165	.0937	.000
3	Q 21	In	.518	.2680	.0515	.000
4	Q 41	In	.544	.2959	.0279	.006
5	Q 30	In	.582	.3385	.0427	.000
6	Q 42	In	.615	.3781	.0396	.001
7	NMAGJRNL	In	.642	.4115	.0334	.001
8	YRSTEACH	In	.659	.4345	.0230	.006
9	Q 55	In	.664	.4416	.0070	.121
10	Q 47	In	.673	.4532	.0116	.045
11	Q 21	Out	.6711	.4505	-.0028	.324

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Table 15, Continued

Step No.	Variable	In/Out	R	R^2	Change in R^2	Sig. Level
			Reading--4th Grade			
1	Q 55	In	.272	.0737	.0737	.000
2	MALEFEM	In	.373	.1390	.0653	.000
3	NMAGJRNL	In	.436	.1901	.0510	.001
4	Q 41	In	.505	.2548	.0647	.000
5	Q 42	In	.527	.2775	.0227	.024
6	Q 55	Out	.527	.2772	-.0003	.791
7	Q 47	In	.556	.3088	.0316	.007
8	Q 21	In	.598	.3578	.0490	.001
9	GRADEGRE	In	.6081	.3698	.0120	.079
			Reading--5th Grade			
1	Q 41	In	.258	.0663	.0663	.000
2	GRADEGRE	In	.447	.1998	.1336	.000
3	YRSTEACH	In	.494	.2436	.0438	.002
4	Q 55	In	.514	.2639	.0203	.028
5	SATWTCH	In	.541	.2928	.0289	.008
6	Q 41	Out	.539	.2905	-.0023	.453
7	Q 42	In	.558	.3117	.0212	.021
8	Q 21	In	.579	.3355	.0238	.013
9	Q 47	In	.601	.3616	.0261	.008
10	NMAGJRNL	In	.631	.3980	.0364	.001
11	Q 30	In	.659	.4347	.0368	.001
12	NGRAD24	In	.668	.4468	.0120	.055

Table 16

SUMMARY OF FINAL STEPWISE REGRESSION OF STUDENT SCALED SCORES IN MATHEMATICS AND READING ON TEACHER PERSONAL CHARACTERISTICS, ATTITUDES, BEHAVIORS, AND BELIEFS, CONTROLLING FOR STUDENT'S SCALED SCORES AT CLOSE OF PREVIOUS SCHOOL YEAR

	MATHEMATICS				READING			
	Stand. Regr. Coefficient	Partial Corr.Coef.	Sig. Level	Step Entered	Stand. Regr. Coefficient	Partial Corr.Coef.	Sig. Level	Step Entered
Satisfaction w/teaching								
4th grade	-.155	-.209	.010	5				
5th grade								
Male/Female								
4th grade	.227	.344	.000	2				
5th grade								
Graduate degree								
4th grade	.199	.223	.006	6	-.090	-.122	.116	4
5th grade					-.246	-.239	.001	4
Graduate credits w/24 mos.								
4th grade	-.160	-.246	.002	3				
5th grade	.063	.123	.138	3				
Profes. Mag. & Jrnl.								
4th grade								
5th grade					-.080	-.105	.160	2
Yrs. of teaching								
4th grade								
5th grade	-.138	-.254	.002	2	.236	.259	.000	3

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Table 16, Continued

	MATHEMATICS				READING			
	Stand. Regr. Coefficient	Partial Corr.Coef.	Sig. Level	Step Entered	Stand. Regr. Coefficient	Partial Corr.Coef.	Sig. Level	Step Entered
Q 21								
4th grade	-.132	-.142	.083	7				
5th grade								
Q 30								
4th grade	.191	.238	.003	4	-.144	-.195	.011	3
5th grade								
Q 41								
4th grade								
5th grade								
Q 42								
4th grade								
5th grade	.088	.158	.057	4				
Q 47								
4th grade								
5th grade	-.064	-.116	.164	5				
Q 55								
4th grade								
5th grade					.144	.193	.012	2
Previous Scaled score								
4th grade	.613	.648	.000	1	.649	.673	.000	1
5th grade	.816	.843	.000	1	.718	.755	.000	1

	R	R^2	R	R^2
4th grade	.8476	.7185	.7213	.5202
5th grade	.8725	.7612	.8135	.6618

Table 17

SUMMARY OF STEPS, STEPWISE REGRESSION OF MATHEMATICS AND READING SCALED SCORES ON TEACHER PERSONAL CHARACTERISTICS, ATTITUDES, BEHAVIORS AND BELIEFS, CONTROLLING FOR STUDENT'S SCALED SCORE AT CLOSE OF PREVIOUS SCHOOL YEAR

Step. No.	Variable	In/Out	R	R^2	Change in R^2	Sig. Level
		Mathematics--4th Grade				
1	PREVSS	In	.779	.6073	.6073	.000
2	MALEFEM	In	.813	.6605	.0531	.000
3	NGRAD24	In	.830	.6893	.0288	.000
4	Q 30	In	.834	.6953	.0060	.087
5	SATWTCH	In	.838	.7031	.0078	.049
6	GRADEGRE	In	.844	.7127	.0096	.027
7	Q 21	In	.848	.7185	.0058	.083
		Mathematics--5th Grade				
1	PREVSS	In	.855	.7303	.7303	.000
2	YRSTEACH	In	.865	.7479	.0176	.002
3	NGRAD24	In	.868	.7543	.0064	.053
4	Q 42	In	.871	.7580	.0037	.140
5	Q 47	In	.872	.7612	.0032	.164
		Reading--4th Grade				
1	PREVSS	In	.693	.4806	.4806	.000
2	Q 55	In	.706	.4982	.0177	.016
3	Q 30	In	.716	.5130	.0148	.026
4	GRADEGRE	In	.721	.5202	.0072	.116
		Reading--5th Grade				
1	PREVSS	In	.785	.6166	.6166	.000
2	NMAGJRNL	In	.796	.6345	.0178	.003
3	YRSTEACH	In	.801	.6413	.0069	.066
4	GRADEGRE	In	.814	.6618	.0205	.001

Table 18

STANDARDIZED REGRESSION COEFFICIENTS AND R VALUE FOR FOURTEEN EQUATIONS REGRESSION STUDENT READING ACHIEVEMENT SCORES AT GRADE 5 ON TEACHER PERSONAL CHARACTERISTICS, ATTITUDES, BEHAVIORS, AND BELIEFS

	Equation Number													
Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SATWTCH														
Q 21														
Q 30	.149	.161	.169				.115	.130	.116	.136	.101			.202
Q 41			-.006	.146	.180			-.046	.210	-.016	.228	.317	.106	
Q 42														
Q 47														
Q 55	.255	.222	.218	.228	.174	.303	.293	.318		.256			.273	
MALEFEM	.066			.086		.117	.087	.112	-.052			-.037	.102	-.091
GRADEGRE	-.670	-.632	-.641	-.671	-.618	-.702	-.726	-.751	-.541	-.680	-.555	-.543	-.722	-.511
NGRAD24		.035			.043	.010	.035			.079	-.012	.023	.033	.040
NMAGJRNL														
YRSTEACH	.561	.540	.534	.491	.440	.618	.636	.670	.353	.620	.360	.310	.582	.485
%ONTASK	.167	.171	.178	.148	.152	.137			.195		.191	.175		.203
R	.558	.556	.555	.545	.543	.541	.536	.536	.535	.533	.533	.528	.528	.526