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ABSTRACT

Questionnaires were sent to principals and teachers of second and sixth grade children who were part of an Educational Testing Service (ETS) study of compensatory reading programs; the data were combined and analyzed with the original ETS data to determine what effects instructional characteristics had on reading achievement. Within the constraints posed by the particular procedures used, instructional characteristics of reading programs were found to have an impact on reading achievement. The time spent in formal reading instruction is a particular variable that is likely to increase reading achievement. Specifically, the impact of time on achievement was greater for second graders than for sixth graders, for low socioeconomic status children than for middle or high socioeconomic status children, and in compensatory rather than regular reading programs. The types of instructional emphases (teaching specific skills) had less impact on achievement than instructional time did. (Discussion following presentation of the paper is included.) (RL)

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In elementary schools in the United States, reading instruction is a universal phenomenon. In nearly every school, teachers attempt to help children acquire fundamental reading processes and proficient reading practices. To a greater or lesser degree, teachers engage children in certain activities, the sole purpose of which is to teach them how to read (Chall, 1967). Yet we also know that at least some children can acquire reading proficiency without formal instruction. As Durkin has documented, a few children learn how to read before entering school (1966). In addition, as this report later points out, some schools commit such a small amount of time and resources to formal reading instruction that children who learn how to read must do so incidentally rather than by intention.

During the past decade many people have held a skeptical view about schools, due partly to the reports of Coleman (1966) and Jencks (1972). After reanalyzing the data from the equality of educational opportunity conducted by Coleman, Jencks states in reference to elementary schools that "school effects probably account for only two or three percent of the total variance...in verbal scores" (p. 124). He continues that "no measurable school resource or policy shows a consistent relationship to schools' effectiveness in boosting student relationship between student achievement and

such things as school size, class size, ability grouping and curriculum point to the same conclusion. Some show benefits, some show losses, and some no effect either way" (p. 96). His view about the importance of high schools is even more conservative, claiming that the average effect of a high school on its students scores in reading comprehension and math, controlling for SES and educational aspirations, accounts for about .0001 percent of the variance. Appearing in many locations, statements such as these have led too many people to conclude that the educational enterprise, including reading programs, have little effect on student achievement.

One criticism that may be raised is that Coleman and Jencks have not analyzed educational programs appropriately. In their approach, school effects are determined by examining achievement across a variety of schools using one school as a unit of analysis. However, a school is merely a place. The aggregation of teachers, students and materials in that place is primarily an administrative convenience. Educational events that occur within a place such as this are extremely variable and are likely to be critical to achievement. Consequently, the benefits of schools should not be determined on the basis of how schools differ from one another, but rather on how educational events within schools influence the achievement of children who share those events.

The fact that differences between schools account for a relatively small amount of variability in achievement does not imply that what goes on in schools is not important. In the Coleman report, schools are described in terms of such factors as: whether the school has a speech therapist, a librarian, a principal with an M.A. degree or higher, free textbooks, a large library, highly experienced teachers, and so forth. However, none of

these factors have any direct concrete bearing on what skills and capabilities children are taught, how children are taught, and what is learned. Instructional events and learning events that are most closely related to educational achievement are not necessarily influenced by these facts.

In the present study reading programs within schools were examined. Gains in achievement scores over the course of one year as revealed by the tests administered before and after the occurrence of a program were studied. This contrasts with Coleman and Jencks who analyzed the variables that related to achievement as reflected by one test score administered at one point in time. In addition, Coleman and Jencks refer to achievement at 6th, 9th, and 12th grade, whereas we have examined achievement at 2nd, as well as 6th grade. It is likely that the strongest schooling effects will appear early in the child's school history and will be associated with the teaching program in which he is placed.

Professionals in the field of reading, including both teachers and researchers, blissfully free of doubts raised by others, have not questioned whether reading instruction is beneficial in learning to read. Convinced that some form of reading instruction must be valuable, they often debate what type of teaching is most effective, and seldom (or never) whether instruction in reading is needed at all. For example, Chall (1967) does not make a systematic comparison of reading instruction vs. no instruction. In a review of 147 references on innovations in teaching beginning reading Wittick (1968) assumes that direct instruction increases achievement in reading; but provides no evidence or documentation. She searches strenuously, however, for the superior strategies. A similar viewpoint is held by Huus (1968)

regarding the teaching of reading at intermediate and junior high school levels. Beside pointing to a plethora of techniques for reading improvement she notes the paucity of evidence that any of them is superior to any others in producing reading achievement, but she does not raise questions about whether formal instruction in reading might be ineffective for this age group under some environmental conditions.

Exceptions to the optimism about teaching reading skills directly may be found among advocates of reading in the content areas. For example, Herber (1972) proposed that to teach both social studies content and reading skills (to children beyond the primary grades), instruction in the content area with an abundance of reading materials is likely to be optimal. Emphasis on reading skills in isolation, he suggested, is inefficient. His proposal is made for children beyond the primary grades, and leads to the notion that formal reading instruction may not be needed for normally achieving children in grades 4-12.

Evaluating the importance of reading instruction presents many dilemmas. Not the least of them is that, being nearly universal, the absence of instruction is notably absent. However, the amount of instruction in reading varies widely. The issue of whether instruction increases achievement may be addressed in terms of whether larger and smaller amounts of instruction are differentially effective.

The value of amount of instruction in education has been highlighted by Wiley and Harnischfeger (1974). In a reanalysis of Coleman's equality of educational opportunity survey, Wiley and Harnischfeger found that, controlling for socioeconomic status, exposure to instruction in terms of hours of schooling

per year is highly related to achievement. They reported that "in schools where students received 24% more schooling, they will increase their average gain in reading comprehension by two-thirds." (p. 9) Notwithstanding the facts that this account seems to exaggerate the impact of exposure to instruction, and that Karweit (1976) failed to replicate this analysis, the findings seem reasonable. A model is presented by these authors (Wiley and Harnischfeger, 1974) that suggests that achievement is determined by: 1) total time needed for a student to learn a task and 2) the total time the pupil spends learning the task. Support for this model in a study of reading instruction is reported by Harris and Serwer (1966). In twelve schools containing primarily disadvantaged children in New York City, Harris and Serwer found that the amount of time devoted to reading activities correlated .56 with achievement in word recognition and .55 with achievement in comprehension for first-grade children. Reading activities included work in basal readers, experience charts, sight-word drill and phonics activities. Supportive activities, such as writing, art, discussion, and dramatization, did not correlate significantly with achievement. Apparently, instruction must be targeted to reading related activities if it is to influence reading achievement.

Amount of exposure to instruction-like activities has been related to achievement by Ball and Bogatz in an evaluation of Sesame Street. They reported that disadvantaged children who viewed Sesame Street frequently (more than five times a week) showed more gain in achievement during one year than middle-class children who viewed Sesame Street less often (two to three times a week) (Ball and Bogatz, 1973). Although frequency of viewing Sesame Street increased achievement for both middle-class and disadvantaged children, quantity of instruction by this measure was more influential than socioeconomic background in facilitating cognitive growth that is relevant to

education. In view of these effects, amount of time was selected as a variable that could be used to study the impact of reading instruction.

Since it is possible that a reading program in which a large amount of time is invested may differ qualitatively from one in which a small amount of time is invested, we included one variable that represents differences in reading methods. To identify this variable we examined the largest single investigation of reading instruction, the first-grade studies (Bond and Dykstra, 1967). Although the report is difficult to interpret, some conclusions may be drawn tentatively based on decision rules that we developed. First, we examined the word reading and paragraph meaning subtests of the Stanford Achievement Test as the dependent variables. Second, analyses of variance were ignored and only the analyses of covariance were examined. We decided that if a given contrast, for example, between basal and a phonics/linguistic method, was significant on both analyses of covariance, it was reliable. Third, we looked for contrasts that did not vary across the different sites in the study or varied in the same direction across sites (ordinal interactions were accepted).

Using these guidelines, we concluded that children learned word recognition (SAT word reading) more readily by skills methods such as linguistics or phonics/linguistics than basal methods. Word recognition was also taught efficiently by a combination of phonics and basal in comparison to traditional basal approaches. Reading comprehension (SAT paragraph meaning) was not reliably facilitated by any one procedure except that adding a small skills component such as phonics or phonics/linguistics to a basal program in which considerable language stimulation is provided in

terms of basal stories seemed to have an edge in effectiveness. Since an emphasis on decoding seemed beneficial, at least for word recognition, we elected to examine whether amount of emphasis on skills influenced achievement in reading.

We decided to investigate the relationship of reading instruction and reading achievement since it has been underrated in sociological surveys and neglected in educational studies. Amount of instructional time in reading, a contrast of negligible and substantial amounts of time, was constructed as a realistic approximation of the presence and absence of formal reading instruction. To examine the association of instructional time in reading and reading achievement, we attempted to control the effects of several pupil characteristics including chronological age, previous reading achievement, sex and socioeconomic status. We attempted to avoid confounding instructional time with one prominent characteristic of instruction, emphasis on skills, by placing the latter as a separate independent variable.

Source of Evidence

The Data Base. This study consists of a reanalysis of data collected by Educational Testing Service under a contract titled, "A Descriptive and Analytic Study of Compensatory Reading Programs." In Phase I of the ETS study, a national sample of schools was constructed that was representative of the population of schools in the United States in terms of: average income, percent minority, geographic region, degree of urbanization, and school size. Thus, the findings from the present study are considered to be projectable on a national basis. A subsample of 264 schools and 57,694 children was drawn from the original population of 731 schools. The latter sample was given

performance tests in reading achievement and attitudes. Questionnaires were filled out by the principals and teachers of regular and compensatory programs. The present analysis was based on this subsample.

Many analyses of the effects of education are conducted at the school level. However, instructional variables are likely to differ from teacher to teacher and program to program within a given school. Consequently, the analysis of instructional conditions, unlike the analysis of organizational or administrative characteristics, should occur at the program rather than the school level. One might choose the individual child as the sampling unit. However, reading programs are seldom planned and implemented for the individual child. Instruction is provided in groups, although a substantial amount of individualization may sometimes occur. Therefore, we decided that a group of children designated by the school principal and teacher as the recipients of a distinct program should be the unit of analysis. Our sampling unit was an instructional group in reading.

The data received from ETS on Phase II of their study were culled for quality. Information that was inconsistent or incomplete was eliminated from the data base. Attendance records on each instructional group were used. Children were included only if they attended the instructional group to which they were assigned on 75% or more of the required meetings of the group. Children were eliminated from the sample if they did not have both Fall and Spring test scores on all of the tests and subtests that were administered to their age and reading level groups. Instructional groups were omitted from the data base in a few cases in which the questionnaire filled out by the teacher was not matched to the instructional group. An instructional

unit was omitted if the information on socioeconomic level, instructional time, or instructional emphasis on skills, was omitted from the questionnaire that was filled out by the teacher.

The original ETS sample had four categories of reading instruction: 1) compensatory only - consisted exclusively of children who were assigned to a reading group "because they were reading below their grade level." 2) compensatory mixed - a group of children who were behind in reading and also children who were normal in reading achievement and who received a reading program; 3) regular only - normally achieving children who received a distinct program; 4) regular mixed - a group of children with some regular and some compensatory readers who received a reading program. Groups 1 and 3 and 4 were used for the present analysis. The initial ETS sample included samples of second, fourth and sixth-grade children. For purposes of economy, the second and sixth-grade levels were selected for analysis in this survey. Instructional units that received a moderate amount of instructional time as defined in a later section were excluded in favor of units receiving maximum or minimum instructional time. After these exclusions there remained 931 sampling units that constituted our data base. The numbers of children included: compensatory second, 1086; regular second, 2833; compensatory sixth, 884; regular sixth, 3282; total 8085. To determine whether the sample after exclusions was similar to the original group, we compared scores on all measures that were used in the analyses of covariance. The raw score means differed by less than one point except for three instances, 1.38, 1.45, 1.35. These negligible differences lead us to believe that the exclusions did not produce any bias in the sample.

Achievement Tests. In the ETS study, reading tests were administered to the sample of 264 schools in the Fall of 1972 and the Spring of 1973. The tests included all of the items that are listed in Table 1. The tests were administered by classroom teachers with the supervision of Educational Testing Service staff. The materials provided to students were specially prepared booklets and answer sheets at the second grade level, while the normal forms and materials were used for sixth graders. The tests were scored, coded and the scores were transposed by Educational Testing Service.

Questionnaires. The questionnaires consisted of four units. A school principal questionnaire contained forty-nine items and elicited information about the school populations, the organization and implementation of programs, and other school level information. A teacher characteristics questionnaire was filled out by each teacher in the study. It contained sixteen items including demographic training and belief characteristics. A modest inventory of seventeen items was included regarding teachers' beliefs about compensatory reading children and programs. A regular class and program characteristics questionnaire was filled out by teachers. It contained forty-five items including the specification of goals, pupil characteristics and classroom activities. A compensatory class and program characteristics questionnaire was filled out by each teacher that had a compensatory instructional group. This questionnaire included forty-nine items very similar to the items on the regular class and program characteristics questionnaire that elicited information about teaching goals, pupil characteristics and classroom activities.

Socioeconomic Status. From these questionnaires were selected items that were used for analysis in the investigation. From the regular and compensatory program questionnaires an item was selected that reflects the socioeconomic status of the instructional groups. See Table 2. After perusing several questionnaires, we developed a r c system for combining the occupational categories and the percentages of occurrence. The numbers in parentheses were our coding system. For all responses to the item the vertical number was multiplied by the horizontal number and the products were summed for a final score for the instructional group. For example, if a teacher placed an X in the category "11-50%" skilled workers or farm workers, 3 was multiplied by 70; that equals 21. If the teacher also filled in the column 51-90% for unskilled or service workers, .7 was multiplied by 100, which is 70. These two numbers sum to 91, which was categorized as low socioeconomic status. The scale for this item runs from 1 - 100, representing high to low socioeconomic status.

The distribution of socioeconomic status in reading groups was examined with a broad population. Children from the initial ETS sample, including second, fourth and sixth graders in the four different instructional group categories previously described, were included. Results of this analysis are displayed in Table 3. The first 27.2% of the distribution, was designated as high SES; the next 47.7% of the population as middle SES; and the last 25.1% as low SES.

To determine whether the socioeconomic distribution within grade level and reading level categories was sufficient to permit analysis, the distribution was partitioned as shown in Table 4. It is apparent that within second grade compensatory programs the percentages of sampling units in the SES

categories were as follows: high SES, 15%; middle SES, 45.8%; low SES, 39.2%. In other words, there was a sufficient number of high SES sampling units to allow inclusion of this category in the statistical analyses for second grade compensatory programs. Similar conclusions can be drawn about the sixth grade compensatory programs and regular programs at both grade levels. It may be noted that there is a relatively low proportion of low SES children in regular sixth grade programs.

Instructional Time. The variable of instructional time was based on an item from the class and program characteristics questionnaire. Teachers described their programs in terms of minutes per period and periods per week. We multiplied these to obtain an estimate of minutes per week. Range in time was from eight to six hundred (or more) minutes per week of formal instructional time. As shown in Table 5, the allocation of instructional time to reading groups contains more variation than one might have supposed. The bottom 22.6% (approximately one quarter) contained eighty minutes per week or less of formal reading instruction. About two-thirds of this bottom group received thirty-one to forty minutes per week of instruction, which is to say an average of about six to eight minutes a day. At this point we have not analyzed the scheduling of this time over the course of a week. That is, forty minutes may appear in two twenty-minute periods or four ten-minute periods. Further analysis is necessary to make these distinctions. The upper quarter of the distribution (25.3% of the instructional group) consists of 221 - 600 minutes per week. About half of these units received 221 - 230 minutes per week, which is 45 minutes per day of reading instruction.

These descriptions were based on the entire distribution of regular and compensatory second, fourth and sixth graders. As Table 5 indicates, distribution of time in compensatory programs is remarkably similar. That is, 22.4% of the instructional groups received eighty minutes per week or less, and 26.1% of the instructional groups received 221 minutes per week or more of formal reading instruction. In other words, the amount of reading instruction for children varies noticeably in this sample which is presumably representative of variation in public schools.

Instructional Emphasis. The independent variable of instructional emphasis on skills was determined from a combination of four items from the class and program characteristics questionnaire. Represented in Table 6, these items were identical for compensatory and regular program questionnaires. The distributions of skill emphasis in compensatory and regular programs are presented in Tables 7 and 8. Emphasis on skills decreased markedly from second to sixth grade. Orientation to skills in teaching is about the same for compensatory and regular programs at second grade, and is similar for compensatory and regular programs at sixth grade. There is slightly, but not dramatically, more skill-oriented instruction in compensatory than regular reading programs.

Statistical Analyses

Design. The design included an array of pupil characteristics and instructional characteristics. See Table 9. A number of analyses of covariance were conducted. For example, one analysis of covariance was conducted for compensatory readers in second grade. The analysis included all

of the cells listed under these two headings in the table. In this analysis, the factors included 2(Sex) x 3(SES) x 2(Instructional time) x 2(Skill Emphasis). The dependent variable was the Spring Metropolitan Word Knowledge score and the covariate was the Fall Metropolitan Word Knowledge score for each instructional group. Analogous analyses of covariance were conducted for compensatory readers at sixth grade, regular readers at second grade, and regular readers at sixth grade. With this design it is apparent that the influence of instructional variables of time and skill emphasis are examined when pupil characteristics including previous achievement, reading level (compensatory vs. regular), grade level, socioeconomic status and sex are controlled. The number of sampling units included in these sets of analyses are: compensatory-second, 118; compensatory-sixth, 96; regular-second, 365; and regular-sixth, 352.

Rationale. In recent years there has been considerable controversy concerning the proper method(s) for analyzing change data. At this time, consensus is still lacking. Kenny (1975) and others (e.g., Campbell & Erlebacher, 1971) have stressed the importance of considering the various alternative approaches to analyzing "quasi-experimental" change data in order to minimize the effects of factors like regression and treatment by maturation interaction, especially in the evaluations of compensatory programs which seem to be susceptible in this regard. In particular, Kenny suggests that the decision to use (a) analysis of variance (ANOVA) with raw change scores, (b) ANOVA with standardized gain scores, (c) analysis of covariance (ANCOVA); or (d) ANCOVA with reliability correction ought to take into account the manner in which the selection of subjects into the various treatment groups takes place. The concerns of Kenny and others seem to have

been motivated primarily by the controversy emanating from past compensatory program evaluations which, for the most part, have indicated that the compensatory treatments, when compared to a nonequivalent control, tend to be ineffective or perhaps detrimental in its effect (e.g., see Campbell & Erlebacher, 1971). Since the analyses in the present study do not involve the types of comparison upon which their concerns are based (i.e., compensatory treatment vs. noncompensatory control), and because the sampling units are teacher/class means (computed separately for each level of student sex) rather than individual student scores, the effects of factors like those mentioned earlier would appear to be minimal. As a result, two reasonable approaches to data analysis in the present study are (a) ANOVA using raw change scores and (b) ANCOVA using pretest data. Primarily because of statistical power considerations, the latter was chosen.

In summary, a separate ANCOVA was run on each dependent variable of interest (cell n's were too small to permit multivariate analyses) using pretest data gathered using the same instruments as the covariate within each cell of a compensatory status (i.e., compensatory vs. noncompensatory) by grade level (i.e., 2nd vs. 6th) population stratification.

We now give some illustrative examples of how these analyses address the issues of the study. It was indicated at the outset that the point of this study is to examine the impact of instructional characteristics in reading programs on achievement in reading. However, such an analysis must include controls for characteristics of students in reading programs that may influence achievement. The most salient of these characteristics were thought to include previous achievement, general reading level, grade level, socioeconomic status, and sex. In addition, it is possible to analyze reading

achievement as word recognition or reading comprehension. For these purposes, the Word Knowledge subtest of the Metropolitan Achievement Test and the Reading subtest of the Metropolitan Achievement Test were analyzed separately. From this framework, it is apparent that a 2(sex) x 3(SES) x 2(IT) x 2(Skill Emphasis) analysis of covariance on Spring MAT Word Knowledge scores using Fall MAT Word Knowledge scores as the covariate for second grade compensatory programs will provide a suitable test. This analysis evaluates the impact of instructional time and skill emphasis on achievement in word knowledge by compensatory children during the course of second grade, controlling for previous achievement, sex, and socioeconomic level.

Preconditions. There are several statistical and psychometric preconditions that were thought to be important for interpreting the analyses of covariance. First, if ceiling effects were observed in a certain data set, analyses of covariance were not conducted on that set. This occurred for regular second grade Metropolitan Achievement Tests and regular sixth grade Metropolitan Achievement Test: Word Knowledge. Next we checked for: 1)comparability of pretreatment populations; 2) homogeneity of regression; and 3) adequate cell n. It was thought that these properties of the data should be satisfactory before a significant effect in an analysis of covariance could be interpreted confidently. Tables 10 and 11 contain summaries of these checks.

The precondition of comparable pretreatment populations refers to the degree of correlation between the covariate and the stratification or instructional variables. If equal populations are observed we may rule out a treatment by maturation interaction as a threat to the validity of the inferences. For every statistical test these conditions were examined.

Suppose we wish to evaluate the impact of instructional time, minimum versus maximum time conditions, for second grade compensatory programs on word knowledge. We wish to be certain that the children who are allocated maximum time do not differ in word knowledge achievement scores from children who were allocated minimum instructional time prior to the occurrence of the treatment. In this case, previous achievement would be confounded with instructional time as a variable that might account for differential gains in the two instructional time conditions. As Tables 10 and 11 show, the precondition of comparable populations occurred for the large majority of the analyses of covariance.

The precondition for homogeneity of regression refers to the requirement that the regression slopes for the dependent variable and the covariate be not significantly different across the cells of the analysis of covariance design. Since some of the cells in a number of analyses were empty or had a very small number of sampling units, tests of the parellelism assumptions in each case was based only on cells in which the number of sampling units was three or more.

The preconditions of adequate cell n refers to the need for stability in all of the cells of the analysis of covariance. In several analyses of compensatory program data there were cells with n's that were too low (less than 5) to permit interpretation of higher order interactions with confidence.

A large majority of the conditions were favorable. Exceptions to this include the presence of ceiling effects in the Metropolitan Achievement Test Word Knowledge and Reading subtests for second grade regular programs. The Metropolitan Achievement Test Word Knowledge also evidenced ceiling effects for sixth grade regular instructional groups. One violation of the equal

populations precondition occurred for regular sixth grade programs. Low SES children who were in maximum instructional time conditions had lower pretest scores than other groups such as low SES children in minimum time instruction or middle SES children in maximum instruction on the MAT Reading measure. Consequently, these low SES maximum time groups may be expected to make smaller gains than other groups. As a result, their relatively small achievement over the course of the year cannot be easily interpreted.

Procedures. The main purpose of these statistical analyses was to examine the effect of instructional variables on reading achievement. We wished to examine these effects while controlling for pupil characteristics of socioeconomic status and sex. The analyses of covariance included four factors: socioeconomic status, sex, instructional time, and skill emphasis. In analyzing balanced data, the order in which these variables are entered does not influence the significance of the outcomes. However, in unbalanced designs such as those in this study, the sum of squares associated with the variable will be larger if it is entered first than if it is entered last. We used a priori rules to establish that the blocking variables of sex and SES should be entered first and the instructional variables of time and emphasis should be entered last, to provide conservative estimates of the effects of the variables of primary concern. The order used for all of the analyses was sex, SES, instructional time, and instructional emphasis. We conducted exploratory reordering of these main effects and found the differences were negligible. Consequently, we assumed that the a priori rules were justifiable. One benefit of this analysis is that it provides a partitioning of the sum of squares which allows the calculation of percentage of variance accounted for by the different effects.

The principal means for reporting the outcomes of the analyses of covariance is the percentage of variance accounted for. The importance of different factors such as instructional time or socioeconomic status will be discussed in terms of the percentage of variance attributable to these factors. Other ways of reporting the results could have been used including gains in raw score units, gains in percentile points or gains in grade equivalent units. The use of raw scores was excluded, since different tests were used in second and sixth grade with different numbers of items and different scales for the tests. The use of grade equivalent units is limited in value for this study, primarily because two of the tests did not convert to grade equivalent units, the Cooperative Primary Test and the Sequential Test of Educational Progress. Another reason is that reports of gains in grade equivalent units must include both means and standard deviations for the different groups that are being described, and often comparisons of the magnitude of effects are difficult. It is expected that the combination of percentage of variance accounted for and changes in percentile scores will be appropriate. The percentile scores are derived from the means of the raw scores of groups.

One of the prime benefits of percentage of variance accounted for as a means of describing results is that it provides an estimation of the strength of association between the independent and dependent variables using the definitions particular to this study. It also allows the descriptive comparison of the effects of instructional variables across age, reading level, socioeconomic status and other characteristics of the students.

Several limits to this approach should also be noted. First, the strength of association that is reflected by the percentage of variance attributable, for example, to instructional time in a given study, may be interpreted only within the limits of the amounts of time used in that study. As Glass and Hakstian (1969) note, a percentage of variance attributable to instructional time or quantity of schooling can never be stretched to refer to a universal relationship between these variables. The relationship is particular to the specific levels and ranges of the dependent and independent variables in the study.

A second caution is that the index used in the present study is one of many indices. We used epsilon squared, which is very similar to omega squared (Glass & Hakstian, 1969). However, slightly different approximations of strength of association are given by these two formulas. Third, the unequal n analyses that were conducted here yield estimations of the percentage of variance accounted for that are partially a function of the ordering of factors. Due to these limitations, the percentage of variance accounted for reported in this study should be regarded as an approximation of a relationship between two variables; the figures should not be interpreted in an absolute sense.

Results

Instructional Impacts in Compensatory Programs. The outcomes for children in compensatory reading programs will be outlined first. In second grade compensatory reading programs, amount of instructional time had a significant effect on the Word Knowledge subtest of the Metropolitan Achievement Test ($p < .01$). The difference between minimal instructional time, which was about five minutes a day, and maximum instructional time, which was about

45 minutes a day or more, accounted for about 4% of the variance. Children who received maximum time in compensatory reading programs made larger gains than children who received minimum instructional time. See Table 12.

A second effect of instructional variables on children in second grade compensatory reading programs was an interaction between instructional time and instructional emphasis. This effect occurred on the Cooperative Primary Reading Test. This interaction was significant at $p < .03$ and accounted for about 3% of the variance. About one-third of the items on the Cooperative Primary Test might be said to be primarily measures of word knowledge; however, most of the items require sentence and paragraph comprehension and the measure may be viewed as a test mainly of reading comprehension.

The meaning of the significant interaction is as follows. For compensatory programs in which a high-skill emphasis occurred, amount of instructional time did not influence gains in reading comprehension during the second grade year. However, in programs in which low skill emphasis occurred, amount of instructional time had a distinct impact. Maximum time produced larger gains than minimum time.

For sixth grade compensatory reading programs, instructional time was found to have a significant effect on reading comprehension as measured by the Sequential Test of Educational Progress. This effect was significant at $p < .03$ and accounted for about 3% of the variance. However, interpretation of this effect is not clear, since instructional time interacted with socioeconomic status on the Sequential Test of Educational Progress. In other words, the effects of time do not occur similarly across different socioeconomic levels. As the table reveals, the interaction of instructional

time and socioeconomic status accounted for 8% of the variance on the STEP test, ($p < .01$). In brief, this effect suggests that more instructional time had a beneficial effect on children of low socioeconomic status, but this benefit did not occur for children in middle and high socioeconomic levels.

One view of this interaction may be obtained by considering changes in percentile scores. (Table 13) For low SES children who received minimum instructional time in compensatory programs, there was no change in their raw score from Fall to Spring and this represents a loss of six percentile points. For low SES children in maximum instructional time, a considerable gain in raw score points was observed, but it was not sufficient to increase their percentile score; they lost two percentiles. Thus, while low SES children in compensatory programs tend to lose ground on their peers, maximum instructional time tends to reduce the loss and is consequently beneficial, at least relative to minimum instructional time. On the contrary, middle and high SES children who received minimum instructional time in compensatory programs, gained a considerable number of raw score points and a few percentile points, three percentiles for high SES and four percentiles for middle SES. On maximum instructional time, both groups made smaller raw score gains and lost percentile points. They both lost five percentile points. This suggests that smaller gains in reading comprehension were made under conditions of maximum time than under conditions of minimum time for middle and high SES children. If this effect is replicable, it warrants further research. Several plausible hypotheses could be developed to account for this result and should be examined in future investigations.

A significant interaction between instructional time and socioeconomic level was also observed for the Word Knowledge subtest of the Metropolitan

Achievement Test. This effect was significant at $p < .005$ and accounted for 9% of the variance. The interaction is very similar to the one described in a previous paragraph. Parallel to their performance in reading comprehension, low SES children benefited from more instructional time in their acquisition of word recognition. Under conditions of minimum instructional time, low SES children made negligible progress, but under conditions of maximum instructional time, low SES children made substantial gains on the Word Knowledge subtest. For middle SES children, on the other hand, maximum instructional time produced slightly smaller gains than minimum instructional time. One puzzling outcome of this analysis was that high SES children performed more like low SES than middle SES, showing higher gains in maximum instructional time than minimum instructional time. Quite why this latter effect occurred is not immediately apparent. What is both reasonably clear from the statistical analyses and fairly important for education is that instructional time benefited low SES children at the sixth grade level in both word recognition and comprehension. In contrast, increasing amounts of time did not benefit middle socioeconomic groups and had an inconsistent impact on high SES children.

The relative benefits of compensatory programs for second graders compared to sixth graders may be judged by examining the changes in percentile scores (Table 14). The children in second grade compensatory programs gained eleven percentile points, from 16 in the Fall to 27 in the Spring; whereas children in sixth grade lost one percentile point from 22 in the Fall to 21 in the Spring. Apparently, compensatory reading programs had more impact on reading achievement in second than sixth grade.

Instructional Impacts in Regular Programs. Results of the statistical analyses in regular reading programs are presented in a form parallel to those for compensatory reading programs. See Table 15. At second grade, the Metropolitan Word Knowledge and Reading subtests exhibited ceiling effects and consequently, analyses of covariance were not conducted on them. On the Cooperative Test for second graders, there were no significant effects observed.

In sixth grade regular programs, there were a number of significant effects that accounted for relatively small percentages of variance. The effect for sex on Metropolitan Achievement Reading, accounting for 1% of the variance, was that girls had higher gains than boys. However, sex interacted with SES on STEP ($p < .03$), accounting for 1% of the variance. The smallest gains were made by low SES girls and high SES boys; other groups consisting of high SES girls and low SES boys made relatively larger gains. The instructional time by instructional emphasis interaction for the STEP revealed that amount of time made little difference for low skill emphasis. The largest gains were under the conditions of minimum time-high skill emphasis; the smallest gains occurred for maximum time-high skill emphasis.

The most pronounced effect in the regular programs at sixth grade was an interaction between instructional time and socioeconomic status that accounted for about 3% of the variance ($p < .001$). This effect is attributable to the fact that instructional time influenced low SES but not middle and high SES groups. However, the impact of larger amounts of instructional time on low SES children was negative. Maximum time produced lower gains than minimum time for low SES in comprehension, as measured by the Sequential Test of Educational Progress.

(Table 16) For low SES children, minimum instructional time produced a gain of six percentile points; but maximum instructional time produced a loss of nine percentile points for middle and high SES, the changes in percentile points ranged from 0 to +3. It should be noted that the low SES children in minimum instructional time were slightly lower in the Fall percentile points than low SES in maximum instructional time. It should also be noted that this was not a statistically significant difference. Under both conditions of instructional time, low SES have lower achievement entering sixth grade than middle and high SES groups.

One possible reason for this interaction is that if a teacher commits a large amount of time to formal reading instruction and the low SES children in the class are having difficulty coping with the materials and activities, they learn very little. This may be due to the fact that the instructional demands exceed their capacity for performance and make learning difficult. Likewise, it is possible that low SES children under minimum instructional time may be in a situation where they can direct themselves to interesting materials at an appropriate difficulty level from which they may learn at least something of reading comprehension.

It may be noted that the interaction between instructional time and socioeconomic status described in the previous paragraph also occurred for the Metropolitan Achievement Test, Reading. However, in this case, the assumption of equal populations was violated. On the pretest the low SES children in maximum time conditions had a lower mean than low SES children in minimum time conditions or middle and high SES children in maximum time conditions. They also showed the least amount of gain from pretest to posttest. Consequently, the low gains of the low SES children in maximum time cannot be attributable either to time or previous achievement taken separately.

Finally, there was a significant interaction between instructional conditions and socioeconomic level on Metropolitan Achievement Test Reading. The degree of emphasis on skills interacted with SES, accounting for 2% of the variance ($p < .009$). This effect may be taken to mean that for low SES children, a high skill emphasis was superior to a low skill emphasis in producing gains in comprehension. However, skill emphasis did not differentially affect middle SES and high SES groups. In this case, as in others, instructional variation appeared to influence achievement of low SES children, but seemed to have less impact on middle and high SES groups. More will be said about this in the discussion section.

Qualifications. There are several limitations and cautions that should be attached to the findings of this study. A primary limitation is the precision of the independent variables. Instructional time and emphasis were based on teacher self reports and were not verified by independent observers. This may increase random error, but probably does not bias the results. The items from the questionnaire on which these variables were based were relatively few in number and lacking in detail. With more precise observations of these instructional characteristics, stronger relationships to achievement are likely to be observed.

For both second and sixth grades, there were two tests that provided measures of reading comprehension. In second grade, the Metropolitan Achievement Test Reading and the Cooperative Primary Reading Test were used; and in sixth grade, the Metropolitan Achievement Test Reading and the STEP were included. As you may have noticed, effects of instructional variables were sometimes noted on one measure of comprehension for a given grade, and sometimes on the other measure of comprehension, and in some cases, the effects

occurred for both measures. We do not have an immediate explanation for why an instructional effect should occur on one test of comprehension but not on a different test. From a conservative viewpoint, this indicates that an effect could not be replicated and consequently, should not be seriously regarded. From another perspective, it indicates that comprehension tests may vary in their demands on the children and the nature of the measures and their sensitivity to instructional impacts should be studied closely. It may also be added that while these tests are widely accepted measures of reading, they do not contain a heavy reliance on critical thinking, nor do they assess the functional uses of reading nor attitudes toward reading. There are many important goals of reading instruction that are not measured by these tests.

The use of percentage of variance as a primary vehicle for reporting the outcomes seemed to be the most appropriate technique available, but some caveats for this procedure are called for. As indicated previously, any estimate of percentage of variance accounted for by a given independent variable is influenced by the range of values, the distributions of scores, stratification system, and a particular formula used to estimate this statistic. For example, we compared instructional time that represented the upper 25% of the distribution against instructional time that represented the bottom 25% of the distribution. This was justified on the grounds that the two levels that were included, that is, about 45 minutes a day or more, and about five minutes a day or less, are inherently valuable categories that represent distinctly different but realistic variations in instructional programs. Had we stratified this independent variable in a different manner,

the percentage of variance that it accounted for might have been slightly different.

We may note that the magnitude of the instructional effects observed in this investigation was moderate. We could account for about 3 - 9% of the variance in reading achievement over the course of one year by instructional characteristics of reading programs. Notwithstanding variance that is attributable to pupil characteristics and error of measurement, there is likely to be room left for the impact of other program characteristics. There are bound to be other instructional qualities that influence achievement. However, the impacts of instructional time as it occurred alone, in combination with instructional emphasis, and in combination with socioeconomic level were noteworthy. It seems that these variables have a place in the psychology of reading instruction and the development of reading programs for the benefit of elementary school children.

Conclusions. At the outset of the study, two major problem areas were posed: 1) to what degree do characteristics of instructional programs, such as emphasis on skills and language or amount of instructional time, influence achievement of pupils? 2) to what degree are these effects dependent upon previous achievement, age, SES, reading level, and sex of the pupils?

Within the constraints of the present investigation, instructional characteristics of reading programs were observed to have an impact on reading achievement. The findings suggest that time in formal reading instruction is an educational variable that is likely to increase achievement in reading.

Maximum instructional time influenced some types of children more than others. Instructional time in formal reading instruction had the

greatest impact on children in second grade compensatory programs. The impact of time on achievement appears to be greater in second than sixth grade, and in compensatory than regular reading programs.

Instructional time seemed to influence low SES children more than middle and high SES children at the sixth grade level. At second grade, the combination of time and SES was not important. Among sixth graders, low SES children benefited from larger amounts of instructional time but time did not have an impact on achievement from middle and high SES groups. While this effect occurred for compensatory programs, a different interaction occurred in regular reading programs. Larger amounts of instructional time had a slightly negative effect on achievement of low SES children, and a negligible impact on middle and high SES groups in regular programs.

The types of instructional emphasis that are provided in reading programs had less impact on achievement than amount of instructional time. However, in second grade compensatory reading programs, low instructional emphasis on skills combined with a maximum amount of time produced larger gains in comprehension than a high instructional emphasis on skills combined with the maximum amount of instructional time.

Pupil characteristics of socioeconomic level and sex did not influence gains over the course of one year. Exceptions to this occurred only in terms of the interactions with program characteristics that were described previously. Considered apart from instructional characteristics, sex and socioeconomic level did not influence gains in achievement over one year. From this investigation it appears that instructional characteristics have more impact than pupil characteristics on reading achievement; and instructional time is more well invested in children who are relatively young and

relatively low in reading achievement than in other groups. Among older children, instructional time had a positive impact on low SES groups but did not influence middle and high SES children in reading achievement.

Discussion

One of our findings was that the amount of formal instruction in reading that was given to children in compensatory reading programs at the second grade level accounted for about four percent of the variance in achievement gains over one year. Compensatory reading programs in which 45 minutes per day or more were spent in teaching reading were clearly more effective than programs in which six to seven minutes per day were spent in formal reading instruction. This outcome confirms the general model of schooling proposed by Wiley and Harnischfeger (1974) which holds that a high quantity of schooling increases achievement, particularly for children with lower aptitudes. It also validated one feature of many exemplary reading programs, a considerable devotion of time to teaching the basics of reading. It should be recognized that it is not time itself that influenced achievement. It was the events that occurred in time. As Harris and Serwer (1966) have shown, instructional time influences reading achievement only if children are engaged specifically in reading activities. Time that is spent in management, general discussion, or such activities as art that are irrelevant to reading processes do not influence reading achievement.

Although the impact of instructional time on reading achievement appears to be generalizable across our national sample and is likely to be repeatable, the magnitude of the effect seems moderate. The importance of the relationship between instructional time and achievement may be considered from several viewpoints. First, instructional time is one component in a multicomponent

system. As reflected in a variety of reports of exemplary reading programs, there are many components of successful programs including: strong leadership, clear objectives, structured curricula, individualization of instruction, administrative support, a variety of materials, support personnel, and so forth, as well as the investment of substantial amounts of time in teaching reading. While instructional time is not the only ingredient of a good program, it is clearly one that should not be neglected.

The magnitude of these results may be compared to the analysis of classroom instruction in follow-through programs. In one study of thirty first-grade classrooms it was found that 16% of the variance in reading and math achievement at the end of first grade was explained by classroom process variables, controlling for initial ability (Cooley & Emrick, 1974). The process variables included: time spent on reading and math, praise and encouragement from the teacher, amount of individual instruction and amount of teacher-pupil interaction. Our finding that 4-9% of the variance in reading achievement was attributable to instructional time is consistent with the study of follow-through since instructional time is approximately one out of four classroom instruction variables that were examined in that investigation.

The impact of instructional time on achievement may also be compared with the impact of socioeconomic status on achievement. We found that socioeconomic status acting alone did not influence gains in reading at second or sixth grade, for regular or compensatory programs. Socioeconomic status had its primary influence by interacting with instructional time for sixth grade compensatory programs. That is, a large amount of instructional time benefited children from low socioeconomic status groups, but did not affect children

from middle and high SES groups. In second grade instructional time influenced gains in achievement, but socioeconomic status did not relate to achievement gains. These findings confirmed the observation of Ball and Bogatz that amount of time spent viewing Sesame Street was more important than socio-economic status in influencing cognitive development in five and six-year-old children.

Jencks (1972) reported that for sixth graders differences in socio-economic status accounted for about 9% of the variance in achievement scores while differences between schools accounted for about 2-3% of the variance in achievement scores. By his analysis, socioeconomic status plays a bigger part than school in producing reading achievement. However, it should be recognized that his analysis neglects important instructional events. Since he only examines the association of achievement tests given at one point in time with school characteristics such as size of the library and per pupil expenditure the pedagogic properties of the institution are omitted. As a result he underestimated, sometimes drastically, the role of instruction in reading achievement. We believe our results are more realistic; and, more positive for instruction. The impact of socioeconomic status was estimated by Coleman and Jencks at the sixth grade. Our findings are that the impact is less at second than sixth grade. We found no influence of SES on gains during second grade for regular or compensatory groups, and no interactions with instructional time. At sixth grade, however, we observed significant interactions between SES and instructional time, showing the increasing role of SES in achievement as children progress through school.

One important outcome of this investigation was that amount of instructional time interacted with socioeconomic status in sixth grade. For compensatory programs, amount of formal instruction in reading increased achievement among low SES groups but did not make a difference for middle and high SES groups. One possible explanation for this result is that the amount of time that middle SES and high SES children spend in reading activities outside of formal instruction is substantial. The amount of time spent reading and learning in formal reading classes is minor by contrast. However, for low SES children the amount of time reading outside of formal lessons is relatively low. Consequently, the necessary interactions between the child and written language, from which complex operations needed for reading may be acquired, occur for low SES children primarily during formal instruction but occur for middle SES children in other circumstances as well. The implication is that the investment of instructional time in reading at the sixth grade level is particularly important for low SES children. Apparently, a primary agent of change in reading for older low-achieving children from lower socioeconomic backgrounds is instruction in reading.

In the introduction we noted that reading teachers and specialists implicitly assume that at least some form of direct reading instruction is likely to increase achievement. Our findings substantiate this belief in part. Teaching reading directly, as reflected in the amount of formal instructional time, is valuable for young, primary aged children who have not learned to read as proficiently as their peers. Direct instruction that is designed to impart reading skills is also beneficial for older elementary children from lower socioeconomic backgrounds. On the other hand, for normally

developing elementary school children we have little positive evidence that substantial investments of time in formal reading instruction are necessary for achievement. In beginning reading, at least at second grade, our lack of support for this belief is less compelling than in sixth grade, since the former is based on one reading test, the Cooperative, whereas the latter is based on two, the STEP and the Metropolitan.

It is likely that reading achievement is primarily facilitated by the amount of time children spend reading and learning the processes of reading. Probably, there is a high correlation between instructional time in reading and learning time in reading, allowing the relationship between instructional time and achievement to be observed. The relationship between learning time and reading achievement has been documented by several investigators (Samuels & Turnure, 1974; Lahaderne, 1968). Measures were taken of how much time children spent on the tasks assigned by the teacher during reading lessons. These tasks varied from workbooks, basal readers, and word discriminations made by other children. The correlation of these measures of reading achievement and attention to reading tasks were .44 and .51 with initial ability partialed out. Instructional time is also probably an approximation of the intensity of teaching, or instruction. In the future we should attempt to improve this measure of instructional intensity by quantifying the cognitive/language events that occur in terms of the teacher and student that are relevant to reading. Right now our best measure of intensity is amount of instructional time and amount of learning time; and intensity is apparently related to the acquisition of reading.

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TABLE 1

TESTS ADMINISTERED AS PART OF THE STUDY

OF COMPENSATORY READING PROGRAMS

	Fall, 1972	Spring, 1973
Grade 2	Cooperative Primary Tests, 12A *Metropolitan Achievement Tests Primary I, G Attitudes Toward Reading, Grade 2	Cooperative Primary Tests, 12B *Metropolitan Achievement Tests Primary I, F Attitudes Toward Reading, Grade 2
Grade 4	Cooperative Primary Tests, 23A *Metropolitan Achievement Tests Elementary, G Attitudes Toward Reading, Grades 4 & 6	Cooperative Primary Tests, 23B *Metropolitan Achievement Tests Elementary, F Attitudes Toward Reading, Grades 4 & 6
Grade 6	Sequential Tests of Educational Progress, Series II, 4A *Metropolitan Achievement Tests Elementary, G Attitudes Towards Reading, Grades 4 & 6	Sequential Tests of Educational Progress, Series II, 4B *Metropolitan Achievement Tests Elementary, F Attitudes Toward Reading, Grades 4 & 6

*Word Knowledge and Reading Subtests

TABLE 2

ITEM DESCRIBING SOCIOECONOMIC STATUS OF INSTRUCTIONAL GROUPS FROM CLASS AND PROGRAM CHARACTERISTICS QUESTIONNAIRE

Estimate the percentage of pupils in your compensatory reading class whose family incomes are derived from each of the following occupational categories.

		None	1-10% (.05)	11-50% (.30)	51-90% (.70)	91-100% (.95)
(100)	(a) Unskilled or service workers		___	___	___	___
(70)	(b) Skilled workers or farm owners		___	___	___	___
(30)	(c) White collar workers (clerks, salespeople, etc.)		___	___	___	___
(5)	(d) Business owners or managers		___	___	___	___
(1)	(e) Professionals (doctors, lawyers, etc.)		___	___	___	___
(100)	(f) Unemployed		___	___	___	___
*	(g) Don't know		___	___	___	___

TABLE 3

Distribution of Socioeconomic Status Among Regular and Compensatory

2nd, 4th and 6th grade Instructional Groups

	Socioeconomic Status									
	High			Middle				Low		
Regular and Compensatory	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100
Absolute Frequency (%)	253	239	269	380	266	344	347	189	183	330
Relative Frequency (%)	9.0	8.5	9.6	13.6	9.5	12.3	12.4	6.8	6.5	11.8
Cumulative Frequency(%)	9.0	17.6	27.2	40.7	50.2	62.5	74.9	81.7	88.2	100.0

Note: High SES is generally associated with occupational categories of: white collar workers, business owners or managers and professionals.

Middle SES is generally associated with occupational categories of: white collar and skilled workers.

Low SES is generally associated with occupational categories of: unskilled or service workers or unemployed.

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TABLE 4

Frequency of Instructional Groups
According to SES and Reading Level
at Second and Sixth Grades

SES		Second Grade		Sixth Grade		Total Group
		Compensatory	Regular	Compensatory	Regular	
HIGH	Frequency	16	103	10	115	244
	Column Percent	15.0	24.3	11.6	29.2	24.1
MIDDLE	Frequency	49	231	46	213	539
	Column Percent	45.8	54.5	53.5	54.1	53.3
LOW	Frequency	42	90	30	66	228
	Column Percent	39.2	21.2	34.9	16.7	22.6

Note: Column percents are percentages of the cell over the total for its column. The frequency of 16 is 15% of 107, the sum of 16, 49 and 42.

TABLE 5

Distribution of Instructional Time
for Formal Reading Instruction
in Regular and Compensatory
Programs

Regular and Compensatory Combined				Compensatory			
Min./week	Absolute Frequency	Rel. Freq. (%)	Cum. Freq. (%)	Min./week	Absolute Frequency	Rel.Freq. (%)	Cum. Freq. (%)
0 - 10	50	1.8	1.8	0 - 10	29	2.0	2.0
11 - 20	45	1.6	3.4	11 - 20	24	1.6	3.6
21 - 30	1	0.0	3.4	21 - 30	0	0	3.6
31 - 40	396	14.1	17.6	31 - 40	202	13.7	17.3
41 - 50	125	4.5	22.0	41 - 50	66	4.5	21.8
71 - 80	15	0.5	22.6	71 - 80	9	0.6	22.4
91 - 100	522	18.6	41.2	91 - 100	282	19.2	41.6
111-120	15	0.5	41.8	111-120	7	0.5	42.1
131-140	131	4.7	46.4	131-140	63	4.3	46.4
141-150	323	11.5	58.0	141-150	165	11.2	57.6
161-170	6	0.2	58.2	161-170	6	0.4	58.0
181-190	408	14.6	72.8	181-190	205	13.9	71.9
191-200	2	0.1	72.8	191-200	1	0.1	72.0
211-220	53	1.9	74.7	211-220	28	1.9	73.9
221-230	372	13.3	88.0	221-230	191	13.0	86.9
271-280	127	4.5	92.5	271-280	72	4.9	91.8
331-340	93	3.3	95.9	331-340	59	4.0	95.8
391-400	66	2.4	98.2	391-400	36	2.4	98.2
401-410	14	0.5	98.7	401-410	7	0.5	98.7
491-500	13	0.5	99.2	491-500	7	0.5	99.2
501-600	23	0.8	100.0	501-600	12	0.8	100.0

TABLE 6

ITEMS FROM THE CLASS AND PROGRAMS CHARACTERISTICS QUESTIONNAIRE REPRESENTING SKILLS EMPHASIS

A. If your reading class is organized into groups, indicate the frequency with which you organize by the following criteria:

	Often	Sometimes	Rarely	Never
Specific skill deficiencies	(1)	(0)	(0)	(0)

B. How much time does a typical pupil in your compensatory reading class spend in the following:

	A great deal	Some	Little or none
Phonics and/or structural analysis	(1)	(0)	(0)

C. How would you rate the following in terms of importance to you as goals in your current teaching of reading?

	Major Goal	Secondary Goal	Of little or no importance as a goal
Developing a sight vocabulary (whole word recognition)	(1)	(0)	(0)

D. How successful would you consider your teaching of reading to be with respect to the following:

	Highly successful	Moderately successful	Moderately unsuccessful
Enhancing pre-reading or reading skills	(1)	(0)	(0)

	Totally unsuccessful	Not applicable
	(0)	(0)

Note: Numbers in parentheses were summed for each teacher, giving each a score of 0-4.

TABLE 7

Distribution of Skill Emphasis

in Compensatory Reading Programs

at Grades 2 and 6

		Skill Emphasis					
		Low 0	1	2	3	High 4	Total
Grade 2	Frequency	4	20	44	42	12	122
	Row %	3.3	16.4	36.1	34.4	9.8	56.5
6	Frequency	11	38	28	15	2	94
	Row %	11.7	40.4	29.8	16.0	2.1	43.5

TABLE 8

Distribution of Skill Emphasis
in Regular Reading Programs at
Grades 2 and 6

Grade		Skill Emphasis Low 0	1	2	3	High 4	Total
2	Frequency	24	91	180	122	36	453
	Row %	5.3	20.1	39.7	26.9	7.9	51.5
6	Frequency	100	150	109	58	9	426
	Row %	23.5	35.2	25.6	13.6	2.1	48.5

TABLE 9

Design for Analyses of Covariance
for Instructional and Pupil Characteristics
on Reading Achievement

Instructional Time	Instructional Emphasis	Compensatory Readers												Regular Readers											
		Second Grade						Sixth Grade						Second Grade						Sixth Grade					
		H. SES		M. SES		L. SES		H. SES		M. SES		L. SES		H. SES		M. SES		L. SES		H. SES		M. SES		L. SES	
		B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
Minimum Instructional Time	High Skills																								
	Low Skills																								
Maximum Instructional Time	High Skills																								
	Low Skills																								

TABLE 10

Summary of Tests of Preconditions for Analysis of Covariance of Instructional and Pupil Characteristics on Achievement in Compensatory Reading Programs

	Grade 2			Grade 6		
	MWK	MREAD	COOP	MWK	MREAD	STEP
PUPIL						
SES	a1xyz	wxyz	a2xyz	a3xyz	a5xyz	a5xyz
Sex	wxyz	wxyz	wxyz	wxyz	wxyz	a4xyz
SES x Sex	wxyd	wxyd	wxyd	wxyz	wxyz	wxyz
INSTRUCTION						
Time	wxyz	wxyz	wxyz	wxyz	wxyz	wxyz
Emphasis	wxyz	wxyz	wxyz	a7xyz	a7xyz	a7xyz
IT x Emphasis	wxyz	wxyz	wxyz	wxyd3	a9xyd3	wxyd3
INTERACTION						
IT x SES	wxyd	wxyd	a10xyd	wxyd1	wxyd1	a6xyd1
Emphasis x SES	wxyd	wxyd	wxyd	wxyd2	a8xyd2	wxyd2

Are Conditions favorable?

	No	Yes
Comparable populations	a	w
Equal slopes	b	x
Ceiling effect absent	c	y
Adequate Cell n	d	z

TABLE 10 Continued

Summary of Tests of Preconditions for Analyses of Covariance of Instructional and Pupil Characteristics on Achievement in Compensatory Reading Programs

a1 = SES groups differ in achievement: MSES > LSES > HSES

a2 = SES groups differ in achievement: MSES > LSES > HSES

a3 = SES groups differ in achievement: HSES > MSES > LSES

a4 = Girls are higher than boys

a5 = SES groups differ in achievement: HSES > MSES > LSES

a6 = Prescores for maximum IT groups were lower than minimum IT groups for HSES and LSES, but minimum IT was higher than maximum IT for MSES.

a7 = Low skill emphasis had higher prescore than high skill emphasis

a8 = High SES low skills had a higher prescore than other groups.

a9 = High and low skills differ more in maximum IT than minimum IT

a10 = High SES minimum time lower prescore than other groups.

d1 = LSES minimum IT and HSES minimum IT had cell n's of 5 and 6 sampling units respectively.

d2 = High skill emphasis low SES has cell n of 6 that is borderline.

d3 = High skill emphasis minimum IT has cell n of 6 that is borderline.

TABLE 11

Summary of Tests of Preconditions for Analyses

of Covariance of Instructional and Pupil Characteristics

on Achievement in Regular Reading Programs

	Grade 2			Grade 6		
	MWK	MREAD	COOP	MWK	MREAD	STEP
PUPIL						
SES	c	c	wxyz	c	a1byz	a4xyz
Sex	c	c	a3xyz	c	wbyz	a3xyz
SES x Sex	c	c	wxyz	c	wbyz	wxyz
INSTRUCTION						
Time	c	c	wxyz	c	wbyz	wxyz
Emphasis	c	c	wxyz	c	wbyz	wxyz
IT x Emphasis	c	c	wxyz	c	wbyz	wxyz
INTERACTION						
IT x SES	c	c	a5xyz	c	a2byz	wxyz
Emphasis x SES	c	c	wxyz	c	wbyz	wxyz

Note: The code abcd wxyz is same as Table 15.

a1 = HSES higher than MSES higher than LSES on prescores (.001)

a2 = Low SES maximum time have lower prescores and high SES maximum time had higher prescores than other groups

a3 = girls higher than boys (.003)

a4 = HSES higher than MSES higher than LSES (.001)

a5 = Maximum and minimum IT different for high and low SES; they did not differ for middle SES

c = other assumptions were not tested due to ceiling effects on this variable

TABLE 12

Percentages of Variance in Reading Achievement Attributable to Instructional and Pupil Characteristics in Compensatory Reading Programs

Source	GRADES 2			GRADES 6		
	MWK	MREAD	COOP	MWK	MREAD	STEP
[illegible]						
SES						
SEX						
INSTRUCTION						
TIME	4***					3 *
EMPHASIS						
IT x EMPHASIS			3 *			
INTERACTION						
IT x SES				9****		8 ***
EMPHASIS x SES		5 **				

* $p < .03$

** $p < .02$

*** $p < .01$

**** $p < .005$

TABLE 13

Percentile Scores on the Sequential Test of Educational Progress for Sixth Grade Compensatory Groups of Different Instructional Time and SES Categories

Instructional Time

	MINIMUM			MAXIMUM		
	Fall	Spring	Change	Fall	Spring	Change
SES						
High	64	67	+3	36	31	-5
Medium	20	24	+4	29	24	-5
Low	16	10	-6	10	8	-2

TABLE 14

Percentile Scores on COOP and STEP in Regular and Compensatory Programs for Grades Two and Six

	Regular			Compensatory		
	Fall	Spring	Change	Fall	Spring	Change
Grade 2	63	48	-15	16	27	+11
Grade 6	50	53	+3	22	21	-1

TABLE 15

Percentages of Variance in Reading Achievement Attributable to Instructional and Pupil Characteristics in Regular Reading Programs

	Grade 2			Grade 6		
Source	MWK	MREAD	COOP	MWK	MREAD	STEP
Pupil						
SES	#	#		#		
SEX	#	#		#	1*	
SEX x SES	#	#		#		1*
Instruction						
Time	#	#		#		
Emphasis	#	#		#		
IT x Emphasis	#	#		#		1*
Interaction						
IT x SES	#	#		#	1**	3***
Emphasis x SES	#	#		#	2**	

* $p < .05$

** $p < .01$

*** $p < .001$

\# Not tested due to ceiling effects

TABLE 16

Percentile Scores on the STEP for Sixth Grade Regular Programs Under Different Instructional Time and SES Categories

Instructional Time, 6th Grade, Regular

	Minimum			Maximum		
	Fall	Spring	Change	Fall	Spring	Change
SES						
High	53	56	+3	59	60	+1
Medium	53	53	0	50	53	+3
Low	47	53	+6	42	33	-9

OPEN DISCUSSION OF GUTHRIE PRESENTATION

GREGG: John, I was a little unhappy with one of your conclusions in the abstract, about low instructional emphasis on skills and devoting a large amount of time to reading showed the largest gains in comprehension. And I was all set to take off after you on something like that, but it occurs to me that it really is an after-the-fact thing, the experiments were already carried out. What is the right way of getting data in an evaluation study like this, to tell us what is going on in terms of the reading process?

It seems to me, and I would like your comment, then, that someone should really obtain data on the proportion of the absolute amount of time spent in both of those, or the proportions, given that there are large amounts or small amounts of time spent on reading. Did you think about that?

GUTHRIE: Well, I haven't yet had the luxury of planning the future study that these would suggest. We don't have absolute information about the amount of time allocated to different activities within the classroom. The interaction that you mentioned I think is fairly plausible. When you have reading comprehension as a criterion, as measured by the Cooperative Primary Battery Test, and I submit that that has comprehension as a heavy weight in its measurement, then a lot of time in a low skills approach is better than a lot of time in a high skills approach. That's intuitively plausible.

GREGG: But in high instructional time, with a low emphasis on skills, actually absolutely more time may be spent on the skills, you don't know from the data that we have available. Do you see what I mean?

GUTHRIE: Yes. There could actually be a very much larger amount of time on those basic skills being devoted, and we just don't have that information from the way the study was carried out. Therefore I was objecting to your posing the conclusion.

RESNICK: You only have measures of relative emphasis. You don't have measures of time.

GUTHRIE: We don't have absolute amounts. We have total amounts of time per week in the program, and we have what they said their emphasis was in the total program. How th was allocated is not available here, and it should be.

CAZDEN: That same conclusion bothered me, and I frankly am very unsure as to what is obtained in this kind of research. When you come out with a conclusion that a low skills emphasis plus maximum time is the most effective program treatment for at least that one dependent variable, what do you know about what "low skill emphasis" means? I mean, if you were going to talk to teachers or principals about how to improve a reading program, what could you say?

GUTHRIE: Well, I don't think that finding is very illuminating.

CAZDEN: Exactly. I am not sure the whole study is very illuminating.

GUTHRIE: What is illuminating to me is the outcome that time, amount of instructional time has dramatic effects which are discernible for low SES children in, for instance, sixth grade compensatory programs. The amount of instructional time, the difference between six minutes per day, on the average,

and 45 minutes per day, on the average has no impact on achievement for middle and high socio-economic level sixth graders.

What that implies to me is that they are getting a fairly substantial amount of exposure to written language outside of what might be called formal instruction. Whereas for low SES children, who one might suspect get less reading at home, who are less keen to read, formal instruction influences achievement in a fairly reasonable manner.

SAMUELS: John, a person might respond to the Wiley and Harnischfeger finding with the thought that instructional time does have an impact on reading achievement, "So what? Isn't it obvious?" Please comment on the reason why, in your opinion, this finding is important. We should remember that Coleman's 1966 study of school achievement found that, primarily, non-school factors such as SES were associated with achievement. Only recently, with new modes of analysis are researchers such as Bidwell, Brown and Saks, Carver, and Summers and Wolf findings that schools can indeed have a significant impact on educational achievement.

GUTHRIE: I think there is a contrast to be made here, clarification, in addition to contrast, between the outcomes of this and the Coleman study or the Jenks study. We have, in a sense, evidence for school effects, that is, characteristics of instructional programs by these kinds of criteria account for achievement in reading. We also find that socio-economic level of children does not account for the amount of achievement gain over one year. In Coleman's study, he found the opposite. Socio-economic level accounted for substantial amounts of variance in reading; school resources, as he studied them, accounted for negligible amounts of achievement in reading. Not necessarily in reading,

they accounted for small amounts of differences. So he is saying that school effects are very minimal, and they are vastly overshadowed by socio-economic influences.

We did something different than they. They tested children once during sixth grade, and looked at how different variables impact at that time.

When one looks at sixth graders, and tries to get a measure of school effects, one has to look at global things, like the principal's salary, the number of books in the library, and so on. Those variables don't influence achievement, as Coleman indicated. What we looked at was the program characteristics occurring over the course of a year, and we see that qualities of the educational environment make a difference; whereas Coleman suggested they make no difference in the method of analysis that he used. We use what I think are pedagogically relevant criteria, he used qualities of school, that I think are pedagogically removed. And therefore they accounted for little or no difference in achievement, by their system.

SUPPES: There is an old axiom of physics that time is never a cause, and unfortunately we have some psychologists and educators who now seem to think contrary-wise, but I don't think they do. I mean, time is used as a sort of surrogate measure. But it seems to me the Wiley study is an example that moves in the wrong direction, and I think you put your finger on something that would be much better. I think it is a wrong move methodologically to ask these questions about time. It would be much better to get some measure of what the child did, for example, the number of pages read, where you had some index of what was going on. A general conceptual analysis would be a better measure than looking at something as crude as time.

GUTHRIE: Obviously I agree, it's not time, it's events that occur in time, and the only distinction we can make which is nontrivial, is that these events were called formal reading instruction events by the teacher, the principal. That's to be distinguished from other kinds of events, like discussions, dramatization, art, which one study clearly shows do not bear a relation to reading achievement.

BECK: What really should be discerned also is time students spend with the teacher and also their individual study time. Does 45 minutes of reading mean that the teacher was spending 45 minutes in direct contact with the students? If so, what other reading activities occurred when they went back to their seats, out of the reading group? Was there a prescription for them to read a trade book? In this situation we might be getting two or three hours time during which students interact with reading materials. These two situations: time spent with the teacher during instruction and then student's individual time, have to be looked at separately, and then together. They are different.

RESNICK: With all of that being true, the fact that there is any kind of significance in the time variable is all the more astonishing. It suggests that there is a lot of power in looking at what's going on instructionally, because there are huge errors of measurement in the independent variable.

BECK: But what about Guthrie's data that indicate some students receiving reading instruction for six to eight minutes? It is astounding to me that there could possibly exist in this country a second grade that allocates eight minutes a day to reading instruction.

A VOICE: Or a teacher that would admit it.

BECK: The only way I could account for such a minimal amount of time being reported was that this time was probably spent conferencing with students in an individualized reading approach, where the students would then go on to read trade books for substantial amounts of time.

WALLACH: This is a fortiori, to the extent that you get effects despite all of the problems that mitigate against them, that is all the stronger evidence.

RESNICK: What you are saying is if you could measure all of those things, then the mechanics ought to come out even stronger. But they are getting effects even with these very weak measures.

WALLACH: I would hope that from this sort of material one comes away with the feeling that instead of trying to refine this sort of measure at the level of large scale survey information, that one needs now to try to get better indexes of just what the processes are that can underlie the instructional attempts. For example, we know that teachers make reports about skill emphasis of one kind or another versus other kinds of emphasis. It is very hard from that to know what the teachers are really doing instructionally. Rather than trying to do large scale processing with huge amounts of information, which I think would only take one so far, my feeling is it is time to try to make very incisive representational probes into how instruction is carried out, and what may be done that would be more effective.

From that point of view, this is all once again a fortiori, because it is limited to the current armamentarium of popular approaches that are being used in these schools.

For all we know, that just scratches the surface of what would be possible if one tried to capitalize on what could be determined about different kinds of instructional approaches.

TRABASSO: I am curious about the interrelations between the tests you used; that is, your set of data are rather complex in the sense that some tests show some variables to be effective for some groups, under some conditions, and so on. You did comment that this was worrisome to you. Did you look at the correlations among these sets of tests?

GUTHRIE: These intercorrelations vary, as most do. For instance, .6 between the word recognition and the reading subtest of the Metropolitan Achievement, .65 between the Co-op and the Metropolitan Reading, which are similar comprehension measures.

TRABASSO: Are these ones you obtained in the data samples you were analyzing, or those ones reported in the brochures on these tests?

GUTHRIE: Those reported by the ETS study in their sample, prior to our re-analysis.

TRABASSO: I am just curious about the pattern of intercorrelations within your sample.

GUTHRIE: Within the sample, they would be about that.

TRABASSO: I don't see how you can say that. To me those patterns of results,

the fact that some tests show effects and others don't, are very bothersome. You have heterogeneity among your tests, and yet you call these measures of reading achievement. I am not sure what is really being measured.

GUTHRIE: I think the Cooperative Primary Battery and the Metropolitan Reading measure different things. I have conducted an analysis of what those differences are. They intercorrelate .6 to .65.

TRABASSO: In your own data, or ETS brochure?

GUTHRIE: In the ETS data, prior to our re-analysis. That's a third of the variance, one test counts for a third of the variability in the other, approximately 40 %. That doesn't eliminate the possibility that an instructional impact could influence one measure and not the other.

I think they are likely to measure different cognitive operations, and that might be susceptible to instruction rather differently. I don't think there is a little g factor for reading comprehension.

TRABASSO: I was curious whether or not you might be able to make some a priori predictions between instructional success, and SES or age levels, depending upon what is being stressed or taught as content, and what is being measured in the test. That is, to what extent are the tests in some sense task specific, and appropriate to the age of the group being instructed, and the kind of instruction being given? One might have been able then to make some predictions in advance, and one might also be able to interpret some of your interactions. In the absence of that information, that is, what is being measured by the tests, it is very, very difficult to interpret those interactions, and the results that some

tests show effects and others don't.

GUTHRIE: I have some of that information. For instance, I can suggest one prediction that we could have made a priori regarding why one measure would show an influence and another measure would not, but I could never disentangle the reading subtest of the Metropolitan Achievement and the Cooperative Primary Battery. Both are loaded heavily with comprehension, they have paragraphs with questions following, and they have sentence-picture associations at the low levels. And I have not done the analysis to distinguish what cognitive operations each is measuring. And I couldn't make a distinction or an explanation for why the impacts occurred for the Cooperative, but not the Metropolitan, or the STEP and not the Metropolitan.

I think that our measures of comprehension are crude right now, and we need to improve those, and match them to instructional goals in programs, before we can make much headway. I would have predicted that the word knowledge subtest of the Metropolitan would show instructional impacts at second grade, and particularly second grade compensatory, primarily because the error analysis data of Weber and Biemiller, for instance, shows that what first grade children lack dramatically seem to be decoding skills. Their comprehension of the passage, while certainly not totally proficient, is apparently reasonable, whereas their decoding is extremely poor. A distinction between poor readers and good readers is marked in terms of decoding proficiency. So I would have expected instructional impacts would occur for a test heavily weighted on decoding, which the word knowledge test of the Metropolitan seems to measure.

That much I can say met with an unstated a priori judgment about what would happen. Beyond that, I was attempting to pose questions, to try to locate what few facts there might be in this data base, rather than as you are implying, testing a model, or testing a hypothesis about instruction. I don't think we have those models yet. The closest things we have are these loose-time kinds of notions, which my be a vehicle, but we need to fill that time with instructional and cognitive events.

TRABASSO: When you compared compensatory with the regular classes, were the gains in the compensatory classes larger than those in the regular classes?

GUTHRIE: At second grade, distinctly yes; at sixth grade, no. No, they were smaller.

McCONKIE: If you did a study like this, and found that indeed for second graders there was no effect that instruction time had on the ability of the kids to read, and you had a second grader in your local school district, would you go into the PTA and argue that the instruction time ought to be cut from 45 minutes to 8 minutes, because it wasn't doing any good?

GUTHRIE: No.

McCONKIE: Why?

GUTHRIE: I interpret this in my more relaxed moments meaning that what happens for second graders, who are at expected reading level, is that they are really saturated with printed material, and they interact with it a tremendous

amount in their spelling books, in their social studies, in the newspaper at home; I mean, they read the headline, they read the words, and make sense out of it to some extent. And by contrast to that interaction, this reading instruction time is rather secondary.

McCONKIE: But you still wouldn't go in and argue that it should be done away with in the school?

CUTHRIE: I would talk about it with the group, and I might suggest that we could fill that time with other kinds of interactions with printed materials that might be more beneficial, for example, let's read more fairy tales instead of having this heavy formal instructional activity that may or may not be beneficial. I wouldn't want to decrease the total amount of interaction with written material.

RESNICK: Aren't you saying that time ought to be reallocated, so that it was going more to the low SES and compensatory children, thereby taking it away from the others, given limited resource?

SUPPES: Or another argument might be you had a lousy reading program, because the time spent in it didn't make any difference.

REID: We have had about five years of time studies, way back in the 60's, and found for instance with 1,200 first grade children, that time was not a correlate of reading success, until we went to predictability formulas, and as soon as we weeded out ineffective teachers, so that only those teachers who were taking children above prediction were included, then time became a direct correlate with the gains of the pupils.

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When you are generalizing that time is more helpful for lower grades than for uppers, and for those students who have deficits than for those that are reading effectively in the classroom, what you are saying is that those teachers are evidently more qualified to teach those particular needed skills than they are upper level skills, or to teach children who are reading on a second grade level rather than those reading at a sixth grade level. We don't get any differences in time with ineffective teachers, we only get differences in time, a direct correlate, when we have effective teachers.

Your study might not relate at all to time, but could be related rather to the effectiveness of teachers.

SAMUELS: Henrietta Lahaderne did a doctoral dissertation at the University of Chicago with sixth grade children. She was interested in mathematics achievement and reading achievement as a function of time on task. She used a procedure in which you look at the child for a few seconds and decide whether the child is on task. If the child is on task, you put down a plus mark, if the child is off task, you put down a minus mark. You do this hundreds of times during the period in which the observations take place. Then you run correlations between time on task and achievement. She found substantial correlations between time on task in reading and mathematics achievement. That was in grade six.

Jim Turnure and I used the same procedure in a first grade classroom, with reading, and we also looked at a sex variable, males and females, with regard to time on task. We found females significantly on task more than boys, and also girls had better reading achievement. Apparently time on task does make a difference, and also the usual finding about girls being superior to boys in reading achievement may not be interpreted necessarily in terms of genetic

factors, but simply by attentional factors, over which the teacher may have considerable influence.

Recess