

## Time Spent in Learning: Implications from Research

Janet H. Caldwell  
William G. Huitt  
Anna O. Graeber

*Research for Better Schools, Inc.  
Philadelphia, Pennsylvania*

Common sense suggests that the amount of time spent in learning is an important factor in determining a student's achievement. Theories of instruction and research findings confirm this observation. Many different measures of time have been examined, ranging from the number of days in a school year to the number of minutes students actually spend working successfully on specific tasks. This paper provides an overview of the research findings on time that are most relevant for administrators and teachers. Implications of this research for improving the use of time are also discussed.

Three of the measures of time to be discussed concern the *availability of time for instruction*: school year, school day, and allocated time for a subject area. Much early research on time was concerned



primarily with these types of very general measures.

Three other time measures indicate students' *involvement in instruction*: attendance year, engagement rate, and student engaged time. Although many of the early studies on time included data on student attendance, Carroll (1963) was the first to develop a model of school learning in which student involvement played a central role. He suggests that learning is optimal when the time a student spends in learning is the same as the time the student needs. Much of the work since 1963 has built on Carroll's model. For example, Bloom's (1971) mastery learning model and the models developed by Wiley and Harnischfeger (1974) and Cooley and Lohnes (1976) include students' active participation in learning as a major concept.

The last measure of time discussed in this paper, *academic learning time*, also indicates student involvement. Academic learning time is the amount of time spent working successfully on task-related academic content. The model proposed in the work of the Beginning Teacher Evaluation Study, phase IIIB (Fisher et al. 1978) incorporates this measure as a central feature.

Most of the available research focuses on instruction in the basic skills areas of reading, language arts, and mathematics. Research on each measure of time is of two types. Some studies simply report the current status of time in schools, describing the way schools and classrooms are. Unfortunately, these reports do not indicate whether that status leads to satisfactory student achievement (or other valued outcomes). Other (and perhaps more useful) research examines the relationship between time and student achievement and has implications for improving schools and classrooms. In this article research on learning is presented first, and then the implications are discussed.

## Research

### *School year*

The measures related to availability of time for instruction set upper limits on the amount of time students will actually spend in learning. One of the first limits on schooling is the length of the school year, the number of days scheduled for student attendance. Variations in the length of the school year have in recent years become relatively small, since most states have established standards. In 1974, the school year averaged about 179 days nationwide (Kemmerer 1979), with a difference of only about 10 days between the shortest and the longest statewide average school years (Wiley and Harnischfeger 1974).

Research findings on the relationship between the length of the school year and student achievement vary considerably (Fredrick and Walberg 1980). The lack of significant and consistent findings is most probably due to the limited range for the length of the school year and to a lack of control of other important variables, such as the content covered, student attendance, length of the school day, and time allocated to various subjects. Karweit (1976) suggests that the relationship between school year and student achievement may not be linear and may interact with other variables, as when a longer school year is associated with higher student absenteeism.

### *Attendance year*

Students do not usually attend school every day of the school year; they may be ill, on vacation, or skipping school. Thus, the number of days in the year a student actually attends school is the most general measure of a student's involvement in learning. Attendance is influenced by many different factors—the students themselves, both as individuals and as members of a peer group; home conditions and attitudes; community beliefs;



and the school and classroom environment.

In 1974, each pupil enrolled nationwide attended an average of about 160 days of school, reducing the average school year by 19 days or about 11 percent (Kemmerer 1979). However, in a study of Title I classes, student absences reduced the school year by an average of 45 days, or approximately 25 percent (Brady et al. 1977).

In a study of a large Northeastern urban school district attendance was found to correlate positively with reading achievement test-score gains (Kean et al. 1979). Earlier studies substantiate these results, with negative correlations between absenteeism and student achievement (Bond and Dykstra 1967; Harris et al. 1968).

### *School day*

Another constraint on a student's opportunity for schooling is the length of the school day, the number of hours each day that students are in school. State, district, school, and union policies greatly influence the length of the school day.

The average length of the school day seems to be about 5 hours (Passow et al. 1976; Brady et al. 1977). However, there may be marked variations in the length of the school day, even within a single district. For example, Wiley and Harnischfeger (1974) found differences of up to 2 full hours in the length of a school day for different schools in the same urban district.

The length of the school day was positively correlated with student achievement in a study of reading in Grades 1 and 2 (Harris et al. 1968). Gilbert and Price (1981) found that participation in an extended-day program improved student achievement at all grade levels.

### *Allocated time*

Of course, not all of the school day is used for instruction; students eat lunch,

have recess, and go to assemblies, for example. The remaining instructional time is then divided among various subject areas, with a specific amount of time planned or scheduled for instruction in each. District or school policies relating to special subjects (e.g., art, music, physical education) and pullouts (e.g., remedial reading, bilingual instruction) often limit the time available for basic skills instruction. Sometimes districts or schools establish specific amounts of time for reading, language arts, and mathematics. In many cases, teachers themselves establish schedules which may vary from day to day.

Schedules may often be changed by spontaneous, unplanned events, as is verified by comparisons of plans to actual records. Thus, the time actually allocated to a particular subject may be substantially different from that scheduled.

Because of differences in definitions, various studies do not agree as to average times teachers allocate to basic skills subject areas. These averages range from 85 to 133 minutes per day for reading/language arts (Mann 1928; Dishaw 1977b) and from 33 to 55 minutes per day for math (Brady et al. 1977; Fisher et al. 1978). However, a set of surveys done in three Northeastern states indicates some stability in reported allocated times across the elementary grades (see table 1). Teachers reported that they spend about 2 hours per day on reading/language arts and about 45 minutes per day on math (Graeber, Rim, and Unks 1977; Heinrichs and Rim 1980).

The research findings presented above do not reflect the extreme variations in actual allocated time from classroom to classroom and from student to student, within classrooms. For example, Dishaw (1977b) reports that time actually allocated for second-grade math ranged from a low of 24 minutes to a high of 61 minutes, and for second-grade reading from 32 minutes to 131 minutes. Time actually allocated for

TABLE 1. Average Time Allocations per Day in Minutes for Basic Skills

|  | Grade |     |     |     |     |     |
|--|-------|-----|-----|-----|-----|-----|
|  | 1     | 3   | 4   | 5   | 6   | 7   |
| Reading/language arts (Heinrichs and Rim 1980) | 132   | 124 | 122 | ... | 119 | ... |
| Mathematics (Graeber, Rim, and Unks 1977)      | 38    | 45  | ... | 47  | ... | 44  |

fifth-grade math ranged from 18 minutes to 80 minutes; allocated fifth-grade reading time ranged from 51 to 195 minutes. Allocated time may also vary enormously within a class; for example, in one study (Dishaw 1977a) one fifth-grade student spent 39 minutes each day on math while another student in the same class spent 75 minutes. These differences in actual allocated time suggest that some students may have two to four times as much opportunity to learn specific academic content as other students.

The amount of time scheduled for basic skills instruction does not seem to be positively related to student achievement at the elementary level (Cooley and Leinhardt 1980). However, data on the relationship of actual allocated time to student achievement indicate that, time actually spent on instruction is often (but not always) associated with increased achievement. Phase IIIB of the Beginning Teacher Evaluation Study (Fisher et al. 1978) showed that allocated time related in varying degrees to student achievement. For example, in second-grade reading, allocated time related positively with scores on subtests for total comprehension and word structure but did not relate to total reading score. In fifth-grade reading, allocated time did not relate either positively or negatively to the total comprehension score. In both second- and fifth-grade math, allocated time was related positively to a fractions subtest score but was related positively to total math achievement score only in the fifth grade.

In phase II of the Beginning Teacher Evaluation Study allocated time was re-

ported for different instructional settings (Lambert and Hartsough 1976). The setting included the size of the group assigned to an activity (individual, group, whole class) as well as the type of supervision (teacher, aide, students supervising other students, or students working independently). The relationship between allocated time and student achievement was analyzed for each of these settings, and varying findings were obtained for different grade levels and subjects. In fifth-grade math the time allocated to total class math instruction under the teacher's direction was positively related to math achievement. Time allocated to some settings was related negatively to achievement, however. For example, time allocated to reading group assignments with no adult supervision was related negatively to reading achievement in second grade. Similarly, time allocated to group assignments in math under an aide's direction was negatively related to achievement in math in Grade 2.

### *Engagement rate*

Although ample time may be allocated for instruction in a subject area, students are not likely to be attending to academic matters during that entire time. They may be socializing, daydreaming, or doodling. Thus, another measure of time, engagement rate, has been used to describe involvement. Engagement rate may be defined as the percentage of the class actively working, or engaged, in a subject area.

Two research studies at the elementary level present descriptive data on engage-



ment rates. The Instructional Dimensions Study (Brady et al. 1977) indicated that the average engagement rate for reading and math was about 60 percent. In the Beginning Teacher Evaluation Study, phase IIIB (Fisher et al. 1978), the rate for reading and math was about 75 percent. The differences between the rates in the two studies are probably due to the fact that general management activities, transition time, and "down time" (when no activities were assigned to students) were excluded from allocated time in the latter study but were coded as unengaged behaviors within allocated time in the Instructional Dimensions Study.

Several studies indicate that engagement rates are significantly related to student achievement (Anderson 1975; Fisher et al. 1978). Thus, variations in engagement rates are highly predictive of student achievement, accounting for as much as three-fifths of the variations in achievement (Bloom 1974).

### *Student engaged time*

Student engaged time, sometimes called "time on task," is the amount of time an average student is actively engaged in or attending to academic instruction or tasks. It is the product of allocated time multiplied by engagement rate. In one study data on student engaged time were collected in elementary classrooms throughout the country that were using sponsored Follow Through program models (Stallings and Kaskowitz 1974). A reanalysis of these data indicates that first-grade students spend about 120 minutes each day engaged in reading/language arts and 43 minutes engaged in math; third graders spend slightly more time engaged, about 123 minutes engaged each day in reading/language arts and 54 minutes in math (Rim and Collier 1978). These averages seem quite high in comparison with previously described measures of time. For example, multiplying the average allocated time for reading/language

arts in Grade 3 (120 minutes) by the average engagement rate (60 percent) yields an average student engaged time of only 72 minutes.

This same reanalysis of the Stallings and Kaskowitz data (Rim and Collier 1978) showed that classrooms with more engaged time in reading or math generally showed higher achievement in that subject. However, gains in student achievement did not always vary directly with engaged time. For some grade levels and subjects the relationship between student achievement and engaged time leveled off and then became negative when engaged time was larger than a certain value.

A second study relating engaged time to student achievement also found a positive relationship in most cases. Results from phase IIIB of the Beginning Teacher Evaluation Study (Fisher et al. 1978) indicated that engaged time was positively related to total reading achievement score in second and fifth grades and to total math achievement score in fifth grade.

### *Academic learning time*

A new measure of time was introduced in phase IIIB of the Beginning Teacher Evaluation Study (Fisher et al. 1978). Academic learning time was operationally defined in this study as the amount of time a student spends attending to relevant academic tasks while performing with a high rate of success. Two additional concepts are introduced with this measure: it is important to look at time spent working on content related to that measured by the evaluation process, and it is necessary to analyze the time spent working successfully on that content.

Data from this study indicate that students spend about 50 percent of engaged time working on relevant tasks at a high level of success. Second-grade students daily spend about 11 minutes for math and 19 minutes for reading working on task-related content successfully. Average academic learning time in Grade 5 is about

14 minutes for math and 35 minutes for reading. However, there is wide variation among classrooms; for example, some second graders spend as little as 3 minutes a day successfully working on reading, while others spend as much as 42 minutes. Findings from this study also indicate that, in general, the more academic learning time a student accumulates in a subject area, the higher his or her achievement in that subject; academic learning time was found to be highly correlated with achievement test scores.

### *Implications of research*

It is apparent that there are many ways to measure instructional time and numerous perspectives from which to view its impact. Even small changes in each measure of time can result in large differences in effects. The magnitude of such changes can be seen by looking at three hypothetical situations for each measure of instructional time: an average case, a low-

average case, and a high-average case (see table 2). The low- and high-average cases are each reasonable variations from the average case. Averages were obtained from research studies cited previously. The high and low averages were generally determined by adding and subtracting one standard deviation from the average. For attendance year, however, the low and high averages were obtained by using the range of state averages (Kemmerer 1979).

Table 2 shows that in an average elementary situation the school year is 180 days, with students attending school 160 days. Each school day of about 5 hours includes about 2 hours of reading/language arts instruction and about 45 minutes of math instruction. Students are engaged about 60 percent of the allocated time, spending about 72 minutes on task for reading/language arts and about 27 minutes on task for math. They are working successfully on relevant academic tasks for about half this time, about 36 minutes each

TABLE 2. Comparisons of Time Available for Schooling across Various Situations

|                                 | Low Average |          | Average |          | High Average |          |
|---------------------------------|-------------|----------|---------|----------|--------------|----------|
|                                 | Daily       | Yearly   | Daily   | Yearly   | Daily        | Yearly   |
| School year (1)                 | ...         | 180 days | ...     | 180 days | ...          | 180 days |
| Attendance year (1)             | ...         | 150 days | ...     | 160 days | ...          | 170 days |
| School day (2)                  | 4½ hr       | 675 hr   | 5 hr    | 800 hr   | 5½ hr        | 935 hr   |
| Allocated time (3):             |             |          |         |          |              |          |
| Reading/language arts           | 90 min      | 225 hr   | 2 hr    | 320 hr   | 2½ hr        | 425 hr   |
| Mathematics                     | 30 min      | 75 hr    | 45 min  | 120 hr   | 1 hr         | 170 hr   |
| Basic skills total              | 120 min     | 300 hr   | 165 min | 440 hr   | 3½ hr        | 595 hr   |
| Engagement rate (2) (%)         | 45          |          | 60      |          | 75           |          |
| Student engaged time:           |             |          |         |          |              |          |
| Reading/language arts           | 41 min      | 100 hr   | 72 min  | 192 hr   | 113 min      | 320 hr   |
| Mathematics                     | 14 min      | 34 hr    | 27 min  | 72 hr    | 45 min       | 128 hr   |
| Basic skills total              | 55 min      | 134 hr   | 99 min  | 264 hr   | 158 min      | 448 hr   |
| Academic learning time (4): (%) | (30)        |          | (50)    |          | (70)         |          |
| Reading/language arts           | 12 min      | 30 hr    | 36 min  | 96 hr    | 79 min       | 224 hr   |
| Mathematics                     | 4 min       | 10 hr    | 14 min  | 37 hr    | 32 min       | 90 hr    |
| Basic skills total              | 16 min      | 40 hr    | 50 min  | 133 hr   | 111 min      | 314 hr   |

NOTE.—Averages and standard deviations are obtained from data reported in: Kemmerer 1979 (1), Brady et al. 1977 (2), Dishaw 1977b (3), and Fisher et al. 1978 (4).



day for reading/language arts and 14 minutes each day for math. During an average school year, students thus have about 96 hours of academic learning time in reading/language arts and about 37 hours in math.

In the low-average situation, students attend school an average of 150 days and each school day is only  $4\frac{1}{2}$  hours. Allocated time is only 90 minutes for reading/language arts and 30 minutes for math each day. The engagement rate is low, about 45 percent. Student engaged time is 41 minutes for reading/language arts and 14 minutes for math, compared with 72 and 27 minutes in the average situation. If students are working successfully on relevant academic tasks only 30 percent of the time, then academic learning time is reduced to 12 minutes for reading/language arts and 4 minutes for math, less than one-third as much as in the average case. Over the year, students have only 30 hours of academic learning time in reading/language arts and 10 hours in math.

In the high-average case, the attendance year is 170 days and the length of the school day is  $5\frac{1}{2}$  hours. Daily allocated times are  $2\frac{1}{2}$  hours for reading/language arts and 1 hour for math. Engagement rates are 75 percent. Student engaged times are about 113 minutes for reading/language arts and 45 minutes for math. Students are working successfully on relevant academic tasks for 70 percent of the time, about 79 minutes for reading/language arts and 32 minutes for math. Over the year, students thus have 224 hours of academic learning time in reading/language arts and 90 hours in math. This is more than twice as much academic learning time as in the average case and more than six times as much as in the low-average case.

The use of time in the three hypothetical situations (low average, average, and high average) is graphically depicted in figure 1. There are several aspects of the

relationship between the different time measures which are evident. First, each measure is a limiting factor for subsequent measures of time. For example, student engaged time for basic skills in a classroom with low-average allocated time can never exceed 300 hours, which is approximately equal to academic learning time in a high-average situation. Second, it is evident that there are large differences in each measure, even though neither the low- nor high-average situation is at the extreme limits of the range. For example, allocated time for basic skills in the low-average situation is about two-thirds that of the average situation, but only half as much as in the high-average situation. Third, all of the measures for mathematics are about one-third those for reading/language arts, mainly as a result of time allocated to these subjects. In a society dominated by technology, this relationship may need to be examined more closely. Fourth, it is evident that even small changes in each time measure can result in larger alterations over the course of the year. These changes can result in students spending three to five times as much time successfully working on basic skills. Finally, figure 1 indicates that there is a range for each situation and, therefore, improvement in only one aspect can make a difference. While it may be most productive for all parties of an educational system to be involved in improving the use of time, each individual, be it student, parent, teacher, principal, or superintendent, can begin immediately to improve that aspect of time over which he has control.

In summary, time seems to be moderately related to student achievement, with the relationship becoming stronger as the measure of time reflects what students do in the classroom. Measures that reflect certain aspects of the quality of allocated time, such as student engaged time and academic learning time, show the strongest relationship to achievement. One would thus expect to find differences in achievement



1000 hrs.

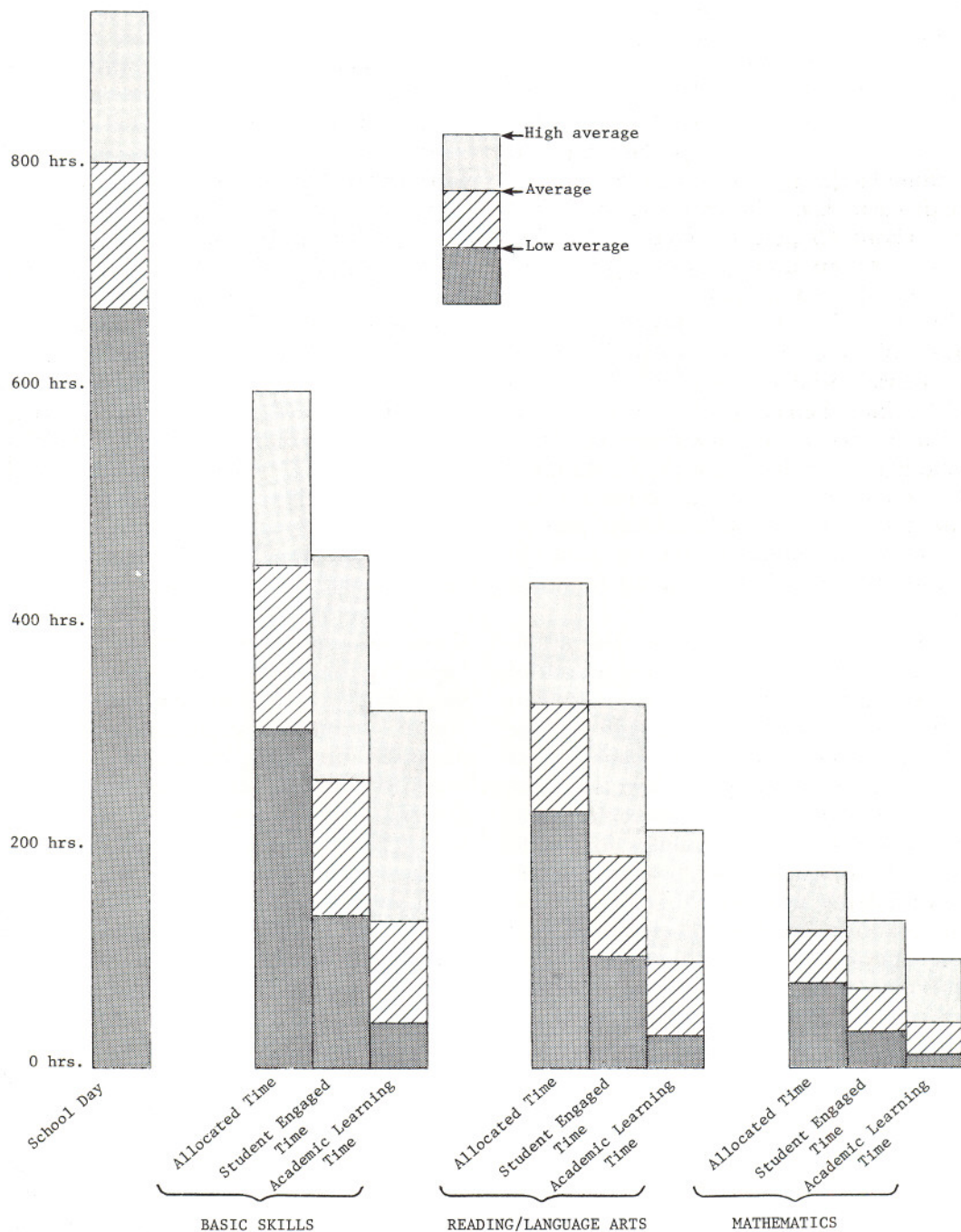


FIG. 1.—Use of time in three hypothetical situations



across the three situations described here, other things being equal. Students in the high-average situation for student engaged time, and academic learning time would most likely achieve more than those in the average situation, and average classes would probably do better than ones with low-average student engaged time and academic learning time.

Of course, time measures are not the only variables that have been shown to be significantly related to student achievement. Variables such as corrective feedback and attention to prior learning have also been identified as important. While increases in time per se do not automatically lead to increased student achievement, nevertheless, systematic attention to increasing each of the different aspects of time by administrators, teachers, parents, and students is one way that schools can become more efficient and effective, thereby improving student achievement.

#### Note

The work on which this publication is based was funded by the National Institute of Education, Department of Education. The opinions expressed in this publication do not necessarily reflect the position or policy of the National Institute of Education, and no official endorsement by the National Institute of Education should be inferred.

#### References

- Anderson, L. W. "Student Involvement in Learning and School Achievement." *California Journal of Educational Research* 26 (March 1975): 53-62.
- Bloom, B. S. *Individual Differences in School Achievement: A Vanishing Point?* Bloomington, Ind.: Phi Delta Kappa, 1971.
- Bloom, B. S. "Time and Learning." *American Psychologist* 29 (September 1974): 682-88.
- Bond, G. L., and Dykstra, R. "The Cooperative Research Program in First-Grade Reading Instruction." *Reading Research Quarterly* 2 (Summer 1967): 1-42.
- Brady, M. E.; Clinton, D.; Sweeney, J. M.; Peterson, M.; and Poyner, H. *Instructional Dimensions Study*. Washington, D.C.: Kirschner Associates, 1977.
- Carroll, J. B. "A Model of School Learning." *Teachers' College Record* 64 (May 1963): 723-33.
- Cooley, W. W., and Leinhardt, G. "The Instructional Dimensions Study." *Educational Evaluation and Policy Analysis* 2 (January/February 1980): 7-25.
- Cooley, W. W., and Lohnes, P. R. *Evaluation Research in Education*. New York: Irvington Publishers, 1976.
- Dishaw, M. *Descriptions of Allocated Time to Content Areas for the A-B Period*. Beginning Teacher Evaluation Study Technical Note Series, Technical Note IV-2a. San Francisco: Far West Laboratory for Educational Research and Development, 1977. (a)
- Dishaw, M. *Descriptions of Allocated Time to Content Areas for the B-C Period*. Beginning Teacher Evaluation Study Technical Note Series, Technical Note IV-2b. San Francisco: Far West Laboratory for Educational Research and Development, 1977. (b)
- Fisher, C. W.; Filby, N. N.; Marliave, R.; Cahen, L. S.; Dishaw, M. M.; Moore, J. E.; and Berliner, D. C. *Teaching Behaviors, Academic Learning Time and Student Achievement: Final Report of Phase III-B, Beginning Teacher Evaluation Study in Beginning Teacher Evaluation Study Technical Report Series*. Technical Report V-1. San Francisco: Far West Laboratory for Educational Research and Development, 1978.
- Fredrick, W. C., and Walberg, H. J. "Learning as a Function of Time." *Journal of Educational Research* 73 (March/April 1980): 183-94.
- Gilbert, R. M., and Price, A. T. "Is the School Day Long Enough?" *Phi Delta Kappan* 62 (March 1981): 524.
- Graeber, A.; Rim, E.; and Unks, N. *A Survey of Classroom Practices in Mathematics: Reports of First, Third, Fifth and Seventh Grade Teachers in Delaware, New Jersey, and Pennsylvania*. Philadelphia: Research for Better Schools, Inc., 1977.
- Harris, A. J.; Morrison, C.; Serwer, B. L.; and Gold, L. *A Continuation of the CRAFT Project Comparing Reading Approaches with Disadvantaged Urban Negro Children in Primary Grades: Final Report*. New York: City University of New York, Division of Teacher Education, January 1968.
- Heinrichs, A., and Rim, E. *A Survey of Classroom Practices in Reading: Reports of First, Third, Fourth, and Sixth Grade Teachers in Delaware,*



- New Jersey, and Pennsylvania*. Philadelphia: Research for Better Schools, Inc., 1980.
- Karweit, N. "A Reanalysis of the Effect of Quantity of Schooling on Achievement." *Sociology of Education* 49 (July 1976): 236-46.
- Kean, M. H.; Summers, A. A.; Raivetz, M. J.; and Farber, I. J. *What Works in Reading?* Philadelphia: Office of Research and Evaluation, School District of Philadelphia, 1979.
- Kemmerer, F. "The Allocation of Student Time." *Administrator's Notebook*, vol. 27 (1979).
- Lambert, N. M., and Hartsough, C. S. *APPLE Observation Variables and Their Relationship to Reading and Mathematics Achievement: Beginning Teacher Evaluation Study Phase II*. Final Report. Vol. 3, pt. 1. Princeton, N.J.: Educational Testing Service, 1976.
- Mann, C. H. *How Schools Use Their Time: Time Allotment Practice in 444 Cities, including a Study of Trends from 1826-1926*. New York: Columbia University, Teachers College, 1928.
- Passow, A. H.; Noah, H. J.; Eckstein, M. A.; and Mallea, J. R. *The National Case Study: An Empirical Comparative Study of Twenty-One Educational Systems*. New York: John Wiley & Sons, 1976.
- Rim, E., and Collier, A. *In Search of Nonlinear Process-Product Functions in Existing Schooling Effects Data: A Reanalysis of the First-Grade Reading and Mathematics Data from the Stallings and Kaskowitz Follow Through Study*. Philadelphia: Research for Better Schools, Inc., 1978.
- Stallings, J. A., and Kaskowitz, D. H. *Follow Through Classroom Observation Evaluation, 1972-1973*. Menlo Park, Calif.: Stanford Research Institute, 1974.
- Wiley, D. E., and Harnischfeger, A. "Explosion of a Myth: Quantity of Schooling and Exposure to Instruction, Major Educational Vehicles." *Educational Research* 4 (April 1974): 7-11.