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ABSTRACT

Ten studies investigating the relationship between instructional time and achievement on elementary school reading and mathematics tests were reviewed. The studies involved general classroom research, instructional time research, and attention research. The review indicated that the relationship between academic achievement and instructional time was not as strong as generally believed. It was felt, however, that the relationship would have been stronger if certain methodological problems were reduced. The following suggestions were offered: (1) use engaged time (time-on-task) as a more valid estimate of instructional time than time allocated by teacher logs; (2) use a causal model for achievement to interpret correlations; (3) use achievement tests having a substantial overlap with curriculum; (4) minimize the probability of making a Type I error by not including a large number of variables in the observation; (5) sample as much instructional time as funds permit; (6) minimize data collection errors and ceiling effects; and (7) investigate other variables such as sex, socioeconomic status, ability level, grade level, or instructional content; then causal models for achievement can be formulated. (The results of the studies are summarized and compared in tables). (CP)

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The Student Achievement-Instructional Time Relationship

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In recent years there has been a great deal of discussion in the educational research literature as to the importance of time spent in learning. In these discussions, there has been almost universal agreement as to the importance of instructional time as a major explanatory variable of student achievement. Such agreement is influenced by the notion that it is intuitively convincing that amount of instructional time is highly related to student achievement. As a result, confidence has been amassed to the degree that some researchers have proposed ignoring achievement as a dependent variable in favor of instructional time estimates in classroom process research. The major purpose of the present paper is to review the research literature with respect to the student achievement-instructional time relationship to determine the extent to which consistent results have been obtained in a specific educational domain. The review will be restricted to the domain of reading and mathematics instruction in the elementary school, where students or classrooms were the units of observation and analysis. Our review is not intended to be comprehensive. For example, we will not include mastery learning research or school level studies. A secondary purpose of the paper is to discuss methodological concerns which should be addressed in formulating classroom process research specific to the area of instructional time.

Review of Research

Interest in instructional time as an achievement-related variable was stimulated by the conceptual model of learning proposed by Carroll

(1963). Carroll's model is a function of the ratio of the amount of time students actually spend on the appropriate task to the total time that they need. Since 1963, three bodies of research have appeared in the literature that have investigated the relationship of instructional time and student achievement: (1) general classroom research, (2) instructional time research, and (3) attention research. In this section, we shall review the research in these areas in terms of their methods and results. Many methodological differences will be apparent in these studies and such will be discussed later in this paper. A summary of the reading and mathematics research and results is presented in Tables 1 through 4.

General Classroom Research

Following Carroll's model, a number of general classroom research studies have included measures of instructional time in their vast array of achievement-related variables. One of the initial efforts in this regard was the CRAFT project (Comparing Reading Approaches in First-Grade Teaching with Disadvantaged Children) conducted by Harris and Serwer (1966). The sample consisted of 1141 low SES first graders who were given a reading pretest battery in September and a different reading posttest battery in May. Teachers were trained in one of four methods for teaching reading. An examination of the parameter estimates associated with the pretests revealed initial student differences among the methods, which prompted them to adjust the posttest measures by partialling out the initial differences in readiness. Utilizing the adjusted class means (i.e., at the classroom level) for the posttest, correlations between all variables were computed. This produced a table of 1431 correlations that "was carefully inspected for variables other than the teaching methods that might show significant correlations with the posttest results. The most conspicuous finding of the correlational analysis was that teacher's use of time was a significant factor" (p. 37). Thus instructional time seems to have been selected post hoc from a number of variables because of its high relationship (r = .56, .55 for all methods combined, for 47 classes) to the posttests. Some of these variables would be significantly correlated by chance (i.e., Type I errors). The importance of the treatments was heavily impressed upon the teachers and thus they may have elevated instructional time estimates. Instructional time was assessed via teacher logs which were recorded for one week per month from January to May. Teachers recorded the amount of reading time they scheduled, which is generally referred to as "allocated time."

A second general classroom research study was the Follow Through classroom observation evaluation carried out by Stallings and Kaskowitz (1974). Seven sponsors were selected in that they had at least five sites that met the criteria of four grade 1 and grade 4 classes. The Wide Range Achievement Test was given in the fall as the pretest and the Metropolitan Achievement Test was given in the spring as the posttest. Each classroom was observed for three days by outside observers, a "snapshot" of classroom activities being taken every 15 minutes. The number of children involved in reading/math, which we refer to as a measure of "engaged time," was only one of over 500 variables. All variables were correlated with achievement aggregated at the classroom level (i.e., class means were used for the achievement measures). Some of these variables also would be significantly correlated by chance. For reading and math in both grades, raw correlations of engaged time with the pretest ranged from -.02 to .12, and with the posttest from .12 to .49 (see Tables 1 and 2 for more specific results). The observational period was only three days, leading one to question the generalizability of these observations.

Another general classroom research study, the Beginning Teacher Evaluation Study (BTES), was conducted by McDonald and Elias (1976). The study was concerned with behaviors associated with instruction in grades 2 and 5, and selected a non-random sample of eight California school districts. In terms of achievement, the BTES was concerned with achievement gains (Spring-Fall) on batteries of reading and mathematics tests at the classroom level. These batteries were composites of subtests of the California Achievement Test and of various Educational Testing Service achievement tests (for reading only). Each classroom was observed by BTES staff twice during the school year. Teachers also did their own observation via a work diary which was completed for two weeks during the spring. Again, the small amount of observation probably resulted in a generalizability problem. From these observations, 104 variables were measured (when correlated leading to some Type I errors). As shown in Tables 1 and 2, "engaged time" correlated about .02 with total achievement gain for grade 2 and about .14 for grade 5, for both reading and mathematics. Correlations of teaching time, or "allocated time," with total achievement gain were essentially zero for grade 2 math and grade 5 reading, and approximately -.24 for grade 2 reading and grade 5 math. In general, it would appear that general classroom research is not obtaining reasonable estimates of instructional time due to the large number of variables being measured and to the small amount of time being sampled.

Instructional Time Research

Several researchers have focussed their research efforts upon the investigation of instructional time. Kidder, O'Reilly, and Kiesling (1975) examined quantity of instruction in compensatory reading programs for grades four through six. A sample of 2516 students was selected from four school districts. These districts were selected for variation in resource use in reading instruction. Data on quantity of instruction was collected in interviews given to all principals, teachers, specialists, and selected teacher aides. The interviews investigated "allocated time" in minutes per week for all reading instruction scheduled for each student (i.e., at the student level). Estimates of instructional time were gathered from these personnel and enabled a series of cross checks for any given student. The validity of principal's assessments of individual student allocated time is questionable. Interviews were conducted over a six-month period followed by administration of the reading subtest of the California Achievement Test. The amount of information that was gathered about an individual student was not discussed. Kidder et al., (1975) felt that the relationship between "allocated time" and student achievement would not be linear, and thus used a natural log transformation on all of the time variables (as suggested by a number of researchers; see, for example Walberg, 1978). Raw correlations between total teacher instruction ("allocated") in minutes per year and final reading achievement ranged from .00 to .19 for the four school districts.

Good and Grouws (1975) investigated instructional time in fourth grade mathematics classes. Thirty-three fourth grade classrooms in a middle-class school district participated in the study. Each teacher was observed for five to seven entire math periods so as to estimate total class time spent in math (i.e., "allocated"). Five to seven class periods is probably not a sufficient sample of time and indicates the need for generalizability studies. The analysis utilized classroom mean residual scores on the math subtest of the Iowa Test of Basic Skills, the pretest being administered in October, the posttest in April. The partial correlation, at the classroom level, of posttest math achievement with "allocated time" was computed to be .18.

In a more comprehensive series of studies, Fisher, Filby, and Marliave (1977), Fisher, Filby, Marliave, Cahen, Moore, and Berliner (1976), and Fisher, Marliave, Filby, Cahen, Moore, and Berliner (1976) examined instructional time and student achievement in second grade reading and mathematics. A sample was taken from the BTES field work and consisted of those nine lower-class to middle-class classrooms who agreed to participate (total n = 152). "Allocated time" was estimated for each student in reading and math and assessed via teacher logs for all nine classes. "Engaged time" was estimated for each student in reading and math, and computed as:

$$\text{Estimated Engaged Time} = \begin{pmatrix}\text{allocated time}\\ \text{from teacher logs}\end{pmatrix} \left(\frac{\text{total engaged time from observation}}{\text{total time allocated from observation}}\right)$$

for six of the nine classes. Records of "allocated time" were collected during an eight week period (probably a sufficient sample of time), while "engaged time" estimates were collected for 10 consecutive school days (probably not a sufficient sample). Pretests and posttests were administered around the eight week period. The student achievement measures were a subset of the scales developed by the BTES. The math battery consisted of three subscales, while the reading battery consisted of 10. The achievement tests were relatively easy for the students as evidenced by severe ceiling effects on the pretests. Analyses were performed, and results reported, on those subtests where ceiling effects were less serious and involved a minimum of trimming of those students achieving near the ceiling (to reduce such effects and possibly reducing the magnitude of the correlations). A small percentage of the data were verified, revealing the unsettling fact that teacher log-keeping and direct observation procedures contained relatively large errors. Across the reading and math content areas, the raw correlations for the various subtests at the student level were as follows: pretest with "allocated time" ranged from -.24 to .08; pretest with "engaged time" ranged from -.21 to .24; posttest with "allocated time" ranged from -.16 to .23; and, posttest with "engaged time" ranged from .12 to .30. Of the instructional time research studies reviewed, the Fisher group seems to be on the right track with respect to estimating instructional time; however, their results were overwhelmed by methodological difficulties.

Attention Research

A number of researchers have been interested in a subset of instructional time research in examining the effect of attention in instruction on student achievement. In this paper, we shall refer to student attention as a measure of "engaged time." In one of the initial investigations of student attention, Lahaderne (1968) observed the attentional behavior of 125 sixth grade middle class pupils over a three month period. Observations were distributed over the entire school week and sampled all content areas. Each of the four classrooms were observed for approximately nine hours (again a short observational period). The observer scanned the classroom pupil by pupil and recorded whether or not the pupil was attending to the appropriate task. Student level raw correlations between attention and the Scott-Foresman Basic Reading Test, the Stanford Achievement Reading and Arithmetic subtests ranged from .39 to .53. Correlations for males were slightly larger than those for females.

Cobb (1972) observed the attentional behavior of five classrooms of middle-class fourth graders during arithmetic periods. Observers scanned the classroom and coded the behavior of each student during all phases of arithmetic instruction. Observational data were collected for nine consecutive school days (a short period of observation). Attention was defined as the "pupil is doing what is appropriate in an academic situation, e.g., he is looking at the teacher when she is presenting material; he writes answers to arithmetic problems, during recitation he looks at other students who are reciting" (p. 76). One week after completion of the observation, the students were given the arithmetic and reading-spelling subtests of the Stanford Achievement Test (SAT). Student level raw correlations of student attention in arithmetic instruction with the SAT were .40 and .48 on the arithmetic subtest for the two schools, and .25 and .24 on the reading-spelling subtest. As expected, attention in arithmetic instruction is more highly correlated with arithmetic achievement than with reading-spelling achievement.

Schultz (1973) studied the attentional behavior of 81 first grade middle class pupils in reading instruction. Each student in the classroom was observed during ten reading periods spread out over eight weeks (better generalizability, but still a small amount of time sampled). Attention was coded positively if the pupil was applying himself to both the area of focus and the prescribed activity. Following the completion of the observational period, student reading achievement was assessed by the Paragraph Meaning subtest of the SAT. At the student level, reading achievement was correlated with the percentage of time the student was attending to the appropriate instructional task. With all of the pupils included in the computation, the raw correlation was .48. In addition, correlations were larger for females than for males, which is contrary to the results obtained by Lahaderne (1968).

A fourth attentional study was conducted by Samuels and Turnure (1974). Eighty-eight middle class first graders were observed during the reading instruction hour. Task-relevant behaviors were coded as positive instances of behavior and other behaviors were coded as negative instances. The observer scanned the classroom, observing and coding each pupil in sequence. Observers made 15 visits to each of the four classrooms over one month (a more reasonable time sample). Attentional behavior data was transformed into a proportion of the number of positive instances divided by the total number of positive and negative instances. Reading achievement was measured by presenting 45 word recognition items that were randomly selected from the Dolch (1956) list of basic sight words. Reading readiness scores were also available and were used in computing partial correlations. At the student level, both the raw and partial correlations (controlling for reading readiness) of student attention with word recognition were equal to .44. From the research reviewed in attention, it would appear that attention is a more appropriate estimate of instructional time and yields more consistent correlations with posttest achievement. Methodological problems and differences will be discussed in the following section.

Methodological Discussion

There are numerous methodological issues which must be considered. One of the most important issues is the definition of instructional time used in the study. The strength of the time-achievement correlation appears to be related to the definition of instructional time utilized. Such is evidenced in Tables 3 and 4 where the average raw correlation of posttest achievement with instructional time is approximately 0.06 for time defined as allocated and 0.36 for time defined as engaged. This is not to say that averaging correlations is a powerful statistical procedure, but does serve to point out a possible correlational difference of 0.30. Engaged time (or attention or time-on-task) would appear to be a "better" or more valid estimate of instructional time than allocated time, since the time available for instruction may or may not be efficiently utilized, and may or may not be spent on the appropriate instructional task. Thus, the potential for learning will be at a maximum for a given student when that student is efficiently using the available instructional time and is working on the appropriate task. Such potential may not be realized, for example, when the task difficulty exceeds the ability level of the student (a poor match of curriculum to ability).

A second consideration is the type of correlation coefficient computed. Without a causal model for student achievement, correlational research is difficult to interpret, and zero-order correlations between the two variables, instructional time estimates and achievement, are meaningless. Working with what is presently available, one must interpret the correlational results accordingly. In our review, we found correlation coefficients computed for instructional time with achievement pretest, posttest, or gain scores, and partial correlation coefficients (i.e., posttest achievement correlated with instructional time partialling out the effects of the pretest) and none of these represent adequate models for the complex phenomena under investigation. Similarly, one should be aware of the level of observation and/or unit of analysis (i.e., student, classroom, school) in instructional time research especially when interpreting and comparing results within and across levels. Note that the level of observation may not be the same as the unit of analysis when using data aggregation procedures.

Another issue to consider is the method of collecting the instructional time data. Questions that need to be addressed are: (1) should the data be collected through observational, log keeping, interview or other procedures; and (2) should the data be collected by outside observers, teachers, principals, parents or someone else? The observational technique with less biased outside observers is probably the best procedure to use in collecting instructional time data, if that alternative is within the researcher's budget. If the researcher has limited funds, and thus can observe for only a short period of time, then the researcher should probably select a less expensive procedure and collect data over a longer period of time (the amount of time sampled will be considered next). Regardless of the procedure selected, the researcher should verify the data obtained so that recordkeeping errors are minimized.

One of the most neglected issues in the area of observational research is a generalizability and sampling problem, and relates both to the sampling of instructional time and to the amount of time sampled. The first problem to consider is the percent of total classroom instructional time over the course of the school year that should be sampled. One might decide to use a "seven percent solution," which derives from sampling theory. Most researchers use a convenient sample of time in terms of budget, personnel and the like. More research of the type reported by Rowley (1978) is needed to clarify this important question of optimal sample size.

Once the researcher decides upon an amount of time to sample, the second problem to examine is exactly when to go out in the field and observe. Given 20 days to observe, can one better generalize to the entire school year with four weeks of observation in January, or with two days of observation per month over ten months? In terms of generalizability, other things being equal, the latter solution is the better choice. If time constraints or other problems arise, then certainly some compromise must be made. In the present review of research, the amount of time sampled for observation varied from two days to eight weeks, with two days being definitely not generalizable to the entire school year. One should be concerned with these issues if one is interested in approaching "error free" and generalizable measures of instructional time.

Another issue to consider, especially in general classroom process research, is the probability of making a Type I error. Typically, one wants to control Type I errors at some nominal alpha rate, say 0.05. When a large number of variables are being observed simultaneously, not only is the reliability and validity of the total measurement process questionable, but some of these variables will be "significantly" correlated with student achievement by chance, that is, Type I error. A number of researchers have capitalized on mass correlational analyses, finding a "significant" correlation and getting a paper published. In such a case, one's actual alpha rate is probably greater than 0.05. Also, if a researcher is interested in a specific set of variables, then the researcher should report and discuss the results for all of the variables. The researcher should not limit the discussion to those variables selected post hoc because they were "significant" correlates of achievement (as Harris & Serwer [1966] appear to have done).

One possible explanation for the variation of the correlations in a given cell in Tables 3 and 4 is that there is variation in the match of the achievement test to the curriculum taught. For example, Cooley and Leinhardt (1978) describe this "variable" as overlap and define it as an estimate of the degree to which the curriculum teaches the particular content that is tested via the achievement measure. A child may be exposed to an excellent curriculum and be engaged in an appropriate instructional task, all of which may not be picked up by a test not relevant to the curriculum. Such is not to imply that teachers should teach for the test, but that if achievement scores (normative, etc.) are being used for numerous assessment procedures (e.g., funding), then appropriate and relevant measures should be utilized. The overlap variable is clearly a possible "source of variation" in instructional time research.

The final set of issues to be considered are potential problems and/or suggestions for future instructional time research where some differences in the time-achievement relationship may occur; or they may be referred to as sources of variation to be investigated. Two related variables which should be of interest are socioeconomic status and ability level of the student. Does a high SES child require as much engaged time in a specific content area as does a low SES child for similar achievement gains to result in that content area? Or are there other variables confounding our understanding? Similar questions could be posed for ability level as well. Two other variables in which instructional time differences may occur are the sex and grade level of the student; however, they seem not to have been systematically examined. Math and reading instructional time-achievement related differences can also be examined (the research indicated no differences), although math and reading are not independent content areas. A ceiling effect caused by a very easy pretest can be very problematic as evidenced in the Fisher group's research. If a ceiling effect becomes apparent in the early stages of research, one would be better off to use an alternative achievement measure if at all possible. Otherwise, instructional time-achievement correlations will be deflated. Another hypothesis currently being investigated is that the relationship between time and achievement is non-linear (e.g., Karweit, 1977; Kiesling, 1978; Kidder, O'Reilly, & Kiesling, 1975 and Walberg, 1978). In the event that a plot of the raw data suggests a curvilinear relationship, rather than using the misspecified linear model, one alternative is to use a natural logarithmic transformation to achieve linearity. One final problem is the availability of instructional time studies to the general research audience. For some reason--either researchers are not submitting their papers for publication or journal editors feel the issue has been sufficently substantiated or some other reason--the majority of papers written concerning the instructional time-achievement relationship have been unpublished dissertations, mimeographed papers, and "R&D" center publications which are not easily obtainable.

All of the discussion in this section is not meant to indicate that by removing the methodological difficulties all of our research questions will be answered. The purpose of this discussion has been twofold: first, to point out the methodological problems that have reduced the validity and generalizability of the results of these studies; and second, to stimulate interest in researching the numerous factors or variables which appear to be involved in the instructional time-student achievement relationship.

Conclusions

We have found in reviewing the research that the relationship between instructional time and student achievement has not been as strongly and consistently substantiated in the literature as most educational researchers have believed. We still feel, however, that the amount of instructional time is highly related to student achievement if certain qualifications are made on the research.

1. The definition of instructional time is an important specification. Allocated time was found to be essentially unrelated to posttest achievement, while engaged time (or attention) was found to be moderately related (raw correlations about 0.4). Engaged time appears to be the more valid estimate of instructional time and should be used as one's definition in a research study if possible. Allocated and engaged time were essentially unrelated to pretest achievement.

2. If the relationship between instructional time and achievement is non-linear, then computed correlation coefficients may be deflated. Thus, data plots are an obvious necessity.

3. If there is minimal overlap of test and curriculum, then correlational values will again be deflated. Thus, a substantial degree of overlap is a necessity for interpretation purposes.

4. The probability of making a Type I error should be held at some nominal alpha rate by not including a large number of variables in one's observations (which allows one to pick out the large correlations).

5. Sample as much instructional time as funds permit so as to have more power of generalization. Research on the amount of total instructional time sampled is necessary in order to give us confidence in making generalizations to an entire school year.

6. Minimize data collection errors and ceiling effects so as to maintain measurement validity.

Other considerations that need to be researched are whether the relationship between instructional time and achievement varies due to differences in sex, socioeconomic status, ability level, grade level or instructional content. Once the sources of variation have been identified and systematically investigated, causal models for achievement can then be formulated and tested that will include the relevant variables. Hopefully, the ultimate goal of most researchers in education is the development of causal models, whereby we can get the most out of the educational process in terms of achievement, socialization, etc.; the objective is really not to investigate small isolated groups of variables. We must not lose sight of our ultimate goal in the quest for those more immediate goals.

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Table 1

Instructional Time and Reading Summary

Study	Grade	Level	n	Extent of Observation	Test	Time Measured	r	Type r
Harris &	1	C	47	5 weeks	Post	Allocated	.56	P
Serwer			47	5 weeks	Post	Allocated	.55	P
Stallings &	1	C	108	3 days	Pre	Engaged	.03	R
Kaskowitz	1		108	3 days	Post	Engaged	.33	R
	3		58	3 days	Pre	Engaged	-.02	R
	3		58	3 days	Post	Engaged	.12	R
McDonald &	2	C	40	2 weeks	Gain	Allocated	-.26	R
Elias	2		40	2 days	Gain	Engaged	-.01	R
	5		53	2 weeks	Gain	Allocated	-.03	R
	5		53	2 days	Gain	Engaged	.13	R
Kidder,	4, 5, 6	S	567	6 mos. of interviews	Post	Allocated	.00	R
O'Reilly, &			947	6 mos. of interviews	Post	Allocated	.11	R
Kiesling			479	6 mos. of interviews	Post	Allocated	.19	R
			523	6 mos. of interviews	Post	Allocated	.07	R
Fisher, et al.,	2	S	91	8 weeks	Pre	Allocated	-.01	R
			86	8 weeks	Pre	Allocated	-.04	R
			79	8 weeks	Pre	Allocated	.08	R
			103	8 weeks	Pre	Allocated	-.24	R
			66	10 days	Pre	Engaged	.03	R
			64	10 days	Pre	Engaged	.24	R
			56	10 days	Pre	Engaged	.10	R
			72	10 days	Pre	Engaged	.12	R
			91	8 weeks	Post	Allocated	.14	R
			86	8 weeks	Post	Allocated	.01	R
			79	8 weeks	Post	Allocated	.23	R
			103	8 weeks	Post	Allocated	-.16	R
			66	10 days	Post	Engaged	.24	R
			64	10 days	Post	Engaged	.30	R
			56	10 days	Post	Engaged	.14	R
			72	10 days	Post	Engaged	.21	R

Table 1 (Continued)

Study	Grade	Level	n	Extent of Observation	Test	Time Measured	r	Type r
Lahaderne	6	S	61(M)	9 hours	Post	Engaged*	.51	R
			63(F)	9 hours	Post	Engaged*	.49	R
			56(M)	9 hours	Post	Engaged*	.46	R
			55(F)	9 hours	Post	Engaged*	.39	R
Cobb	4	S	60	9 hours	Post	Engaged**	.25	R
			43	9 hours	Post	Engaged**	.24	R
Schultz	1	S	81	10 days	Post	Engaged	.48	R
			48(M)	10 days	Post	Engaged	.43	R
			33(F)	10 days	Post	Engaged	.58	R
Samuels &	1	S	88	15 days	Post	Engaged	.44	R
Turnure			88	15 days	Post	Engaged	.44	P

Definitions: S - student level
C - classroom level
R - raw correlation
P - partial correlation

*Observed all content areas.

**Observed math instruction.

Table 2

Instructional Time and Mathematics Summary

Study	Grade	Level	n	Extent of Observation	Test	Time Measured	r	Type r
Stallings & Kaskowitz	1	C	105	3 days	Pre	Engaged	.12	R
	1		105	3 days	Post	Engaged	.36	R
	3		57	3 days	Pre	Engaged	.03	R
	3		57	3 days	Post	Engaged	.49	R
McDonald & Elias	2	C	40	2 weeks	Gain	Allocated	-.01	R
	2		40	2 days	Gain	Engaged	.06	R
	5		53	2 weeks	Gain	Allocated	-.22	R
	5		53	2 days	Gain	Engaged	.15	R
Good & Grouws	4	C	33	5 - 7 periods	Post	Allocated	.18	P
Fisher, et al.,	2	S	87	8 weeks	Pre	Allocated	-.21	R
			82	8 weeks	Pre	Allocated	.01	R
			87	10 days	Pre	Engaged	-.21	R
			82	10 days	Pre	Engaged	.08	R
			87	8 weeks	Post	Allocated	-.07	R
			82	8 weeks	Post	Allocated	.09	R
			87	10 days	Post	Engaged	.12	R
			82	10 days	Post	Engaged	.16	R
Lahaderne	6	S	56(M)	9 hours	Post	Engaged*	.53	R
			55(F)	9 hours	Post	Engaged*	.39	R
Cobb	4	S	60	9 hours	Post	Engaged	.40	R
			43	9 hours	Post	Engaged	.48	R

Definitions:
S - student level
C - classroom level
R - raw correlation
P - partial correlation

*Observed all content areas.

Table 3

Instructional Time-Reading Achievement Summary

1. Raw correlations, student level

	Allocated	Engaged
PRE	Fisher (-.01, -.04, .08, -.24)	Fisher (.03, .24, .10, .12)
POST	Fisher (.14, .01, .23, -.16) Kidder (.00, .11, .19, .07)	Fisher (.24, .30, .14, .21) Lahaderne (.51, .49, .46, .39)* Samuels (.44) Cobb (.25, .24)** Schultz (.48, .43, .58)

2. Raw correlations, classroom level

	Allocated	Engaged
PRE		Stallings (.03, -.02)
POST		Stallings (.33, .12)
GAIN	McDonald (-.26, -.03)	McDonald (-.01, .13)

3. Partial correlations, student level

	Allocated	Engaged
PRE		
POST		Samuels (.44)

4. Partial correlations, classroom level

	Allocated	Engaged
PRE		
POST	Harris (.56, .55)	

*Observed all content areas.

**Observed math instruction.

Table 4

Instructional Time-Math Achievement Summary

1. Raw correlations, student level

	Allocated	Engaged
PRE	Fisher (-.21, .01)	Fisher (-.21, .08)
POST	Fisher (-.07, .09)	Fisher (.12, .16) Cobb (.40, .48) Lahaderne (.53, .39)*

2. Raw correlations, classroom level

	Allocated	Engaged
PRE		Stallings (.12, .03)
POST		Stallings (.36, .49)
GAIN	McDonald (-.01, -.22)	McDonald (.06, .15)

3. Partial correlations, student level

	Allocated	Engaged
PRE		
POST		

4. Partial correlations, classroom level

	Allocated	Engaged
PRE		
POST	Good (.18)	

*Observed all content areas.