

## Close-Up #8

# Educational Time Factors

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## INTRODUCTION

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A sense of the value of time--that is, of the best way to divide one's time into one's various activities--is an essential preliminary of efficient work.

--Arnold Bennett

Dost thou love life? Then do not squander time, for that is the stuff life is made of.

--Benjamin Franklin

Western culture is rich with words of wisdom on the subject of time. The first of the above passages has to do with the proper allocation of time to different pursuits. The second is a piece of advice about using time well.

Because time is obviously essential for learning, and because educators view time as something they can manipulate at least partially, a large body of educational literature has grown up around these two related matters of time allocation and time usage.

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## BACKGROUND

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Researchers and theorists concerned with educational time factors often begin their comments with a nod in the direction of John B. Carroll, whose landmark 1963 article, "A Model of School Learning," defined degree of learning as **TIME ACTUALLY SPENT IN LEARNING DIVIDED BY TIME NEEDED FOR LEARNING**. In Carroll's model, the time needed for a given student to learn a given concept depends upon five factors:

- **APTITUDE** - the amount of time an individual needs to learn a given task under optimal instructional conditions
- **ABILITY** - capacity to understand instruction
- **PERSEVERANCE** - the amount of time the individual is willing to engage actively in learning
- **OPPORTUNITY TO LEARN** - the time allowed for learning
- **QUALITY OF INSTRUCTION** - the degree to which instruction is presented so as not to require additional time for mastery beyond that required by the aptitude of the

Carroll's work is widely regarded as the beginning of modern inquiry into the effects of time factors in the learning process. Those interested in theoretical models of the time-learning relationship are encouraged to consult Carroll's writings, as well as those of Benjamin Bloom, David Wiley and Annegret Harnischfeger, and Charles W. Fisher and his colleagues involved in the Beginning Teacher Evaluation Study (see the references). The focus of the present review is the array of findings emerging from the research on the effects of various educational time factors on student outcomes.

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## DEFINITIONS

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Understanding the research on the effects of time factors requires some familiarity with the different kinds of educational time with which researchers are concerned. These definitions are taken from the work of Anderson (1983), Bloom (1976), and Fisher, et al. (1980).

**ALLOCATED TIME** is the amount of time specified for an activity or event. When educators and educational researchers speak of allocated time, they are referring to one of the following elements:

- **SCHOOL TIME** - the amount of time spent in school. When used this way, allocated time may refer to the number of school days in a year or the number of hours in a school day.
- **CLASSROOM TIME** - the amount of time spent in the classrooms within the school (i.e., excluding lunch, recess, time spent changing classes, etc.).
- **INSTRUCTIONAL TIME** - the portion of classroom time spent teaching students particular knowledge, concepts, and skills pertaining to school subjects (i.e., excludes routine procedural matters, transitions, and discipline).

**ENGAGED TIME**, or **TIME-ON-TASK**, refers to portions of time during which students are paying attention to a learning task and attempting to learn. This excludes time spent socializing, daydreaming, engaging in antisocial behavior, etc.

**ACADEMIC LEARNING TIME (ALT)** is a term and concept emerging from a large-scale research effort called the Beginning Teacher Evaluation Study (BTES) conducted in the 1970s. ALT refers to that portion of engaged time that students spend working on tasks at an appropriate level of difficulty for them and experiencing high levels of success (excludes time spent engaged in tasks which are too easy or too difficult).

**DEAD TIME** - refers to periods of classroom time during which there is nothing students are expected to be doing; that is, time which the teacher has failed to manage in any way.

It is important to note that these different measures do not merely refer to different amounts of time or to time spent in different environments. Instead, they represent different ways of conceiving of time and its expenditure. In a recent conversation with the present author, researcher Lorin Anderson addressed these conceptually different notions.

Allocated time, Anderson says, "tells you something about values," that is, the values of a district, school, or teacher are implicit in the relative amounts of time allocated to different activities.

Instructional time "tells you something about classroom organization and management." In other words, the time actually available for and spent in teaching is indicative of the teacher's ability to organize instructional activities and expedite noninstructional ones such as transitions and discipline. Dead time measures also permit inferences about the teacher's organization/management skills.

Time-on-task, meanwhile, "tells you something about teaching," that is, it reveals the teacher's skill in selecting learning activities which engage students' attention and in keeping them focused.

Finally, academic learning time "tells you something about learning," in that it refers to situations in which student and learning material are well-matched and learning is occurring in a fairly ideal fashion.

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## THE RESEARCH BASE ON EDUCATIONAL TIME FACTORS

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### CHARACTERISTICS OF THE RESEARCH

The findings presented here are based on an analysis of 57 research studies concerned with the relationship between one or more of the educational time factors cited above and the student outcomes of achievement and attitudes. Twenty-nine are primary sources (studies or evaluations) and 28 are secondary source (reviews, syntheses, and meta-analyses).

Student populations participating in the research projects include a wide range of socioeconomic, racial, and ethnic groups and ability levels. Most of the research was conducted in the United States, although German, British, Australian, Canadian, and Israeli studies are also represented in the research base.

Eighteen of the reports are concerned with elementary students, eight with secondary students, and 31 with the entire elementary-secondary range.

Thirty of the documents are concerned with the relationship to student outcomes of allocated time, 38 with the effects of time-on-task, and 11 with the outcomes produced by academic learning time (ALT). Many of the investigations focused on more than one type of educational time.

Many were also concerned with the effects of time factors on more than one outcome area. General achievement was the focus of 35 of the documents. Other outcomes of interest in the reports include reading (11 documents); mathematics (12); student attitudes (6); retention of learning (4); science (2); and spelling, social studies, foreign languages, IQ, dropout rates, motivation, anxiety level, learning rate, and self-concept (1 each).

The research on time factors is closely related to research in two others areas--mastery learning and homework. Both bodies of research are concerned, in part, with the effects produced by increased time allocations for learning and by increased time-on-task.

Full-scale reviews of the homework research and the mastery learning research are outside the scope of this report. However, since these topics can scarcely be ignored in a review of educational time factors, a few recent, major summaries in each area have been included among the references supporting this analysis. The findings from the homework literature are quite consistent; but because there is controversy among researchers about the effects of

mastery learning, an attempt has been made to reflect the positions held by different investigators and to limit the focus to the increased time component of mastery programs.

In addition to the 57 key references whose characteristics are outlined above, the "Other References" section of the bibliography contains 28 citations. Articles identified in this section include research on educational time use and the relationship of time to other school variables, models and theories, guidelines for increasing time-on-task, methods for logging different kinds of time use, and other related topics.

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## RESEARCH FINDINGS

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### EDUCATIONAL TIME USE

The first realization that confronts the student of educational time research is that there are large differences in instructional time allocations across schools and classrooms. Anderson (1980); Karweit (1984, 1985); Hossler, Stage, and Gallagher (1988) and many others have noted that the amount of exposure to instruction in a given curricular area can vary enormously--so that students in one school or classroom may experience three or more times as much mathematics instruction, for example, as those in another setting.

Karweit (1984) and others note that further variation in exposure to instruction is caused by factors such as absenteeism, tardies, classroom disruption, dead time, and closures due to strikes or weather conditions.

Researchers have also made comparisons such as the ratio of school time to instructional time and the ratio of classroom time to time-on-task, and their investigations have produced findings that many find shocking. Honzay (1986-87) and Karweit (1984, 1985) found that only about half the typical school day is actually used for instruction, the remainder of the time being taken up by schoolwide and classroom matters of a noninstructional nature. And according to Anderson (1983); Fredrick, Walberg, and Rasher (1979); and Seifert and Beck (1984), students spend only about half their in-class time actually engaged in learning activities, the rest of the time being expended in classroom procedural matters, transitions, disciplinary matters, dead time, or off-task activities.

These and related findings led the National Commission on Excellence, in their 1983 report, to call for "...more effective use of the existing school day, a longer school day or a lengthened school year" (p. 29).

### TIME USE AND STUDENT OUTCOMES - GENERAL FINDINGS

Before discussing potential policy changes regarding time allocations and time use, it is important to examine what educational researchers have determined about the effects of various time factors on achievement and other student outcomes. General findings are cited in this section.

### **THERE IS A SMALL POSITIVE RELATIONSHIP BETWEEN ALLOCATED TIME (HOWEVER MEASURED) AND STUDENT ACHIEVEMENT.**

A few studies (e.g., Wiley and Harnischfeger 1974; Kidder, O'Reilly, and Keisling 1975) have found a strong positive relationship between quantity of schooling and achievement, and some investigators have found virtually no relationship (e.g., Smith 1979 and some of

the studies reviewed by Borg 1980). But most researchers and reviewers have identified a weak, non-statistically significant-- but positive-- relationship to achievement. This general finding has emerged from the work of Anderson (1980, 1981); Blai (1986); Borg (1980); Brown and Saks (1986); Cotton and Savard (1981); Fisher and Berliner (1985); Fredrick and Walberg (1980); Honzay (1986-87); Karweit (1976, 1985); Leach and Tunnecliffe (1984); Levin and Tsang (1987); Lomax and Cooley (1979); Mazzarella (1984); O'Donnell (1978); Quartarola (1984); and Walberg (1988).

Obviously, if there is no time at all allocated for learning a particular subject, then learning will not take place. But what the above-referenced research indicates is that when students experience greater quantities of allocated time, their achievement is only very slightly better than those experiencing lesser quantities.

**THERE IS A POSITIVE RELATIONSHIP BETWEEN TIME-ON-TASK AND STUDENT ACHIEVEMENT; THIS RELATIONSHIP IS STRONGER THAN THE ALLOCATED TIME-ACHIEVEMENT RELATIONSHIP, BUT IS STILL MODEST.**

This finding comes from virtually all investigators whose work was consulted for this analysis (Anderson 1975, 1980; Borg 1980; Cotton and Savard 1981; Derevensky, Hart, and Farrell 1983; Fisher and Berliner 1985; Good and Beckerman 1978; Guskey and Gates 1986; Hossler, Stage, and Gallagher 1988; Karweit 1982, 1984, 1985; Leach and Tunnecliffe 1984; Lomax and Cooley 1979; Mazzarella 1984; McGarity and Butts 1984; O'Donnell 1978; Quartarola 1984; Rosenshine 1979; and Sanford and Evertson 1983).

This finding about time-on-task needs to be interpreted with some caution, however. As we shall see, there is reason to believe that the effects of a given amount of time-on-task appear to be different depending upon student characteristics, instructional strategies, and subject matter.

**THERE IS A STRONG POSITIVE RELATIONSHIP BETWEEN ACADEMIC LEARNING TIME (ALT) AND BOTH STUDENT ACHIEVEMENT AND ATTITUDES.**

ALT is a very specific kind of time use; it refers as much to a kind of instruction as it does to time PER SE. And because it is so closely tied to the nature of the learning task, all researchers and reviewers who investigated its effects found it to bear a very close relationship to the achievement and attitudes of students involved in it, i.e., Anderson (1980; Borg (1980); Cotton and Savard (1981); Fisher and Berliner (1985); Karweit (1984); Mazzarella (1984); O'Donnell (1978); Quartarola (1984); Sanford and Evertson (1983); and Walberg (1988).

These same researchers have also identified ways of using time that are negatively related to achievement. These include off-task behavior, dead time, social interactions, disruptions, disciplinary actions, and some forms of seatwork (e.g., in-class silent reading).

**KINDS OF TIME-ON-TASK**

The finding noted above--that academic learning time (ALT) bears a strong positive relationship to student achievement-- indicates that not all forms of time-on-task are equal in their effects. Researchers have devoted a great deal of attention to the QUALITY of

time-on-task expended by students, and have made discoveries of consequence to educators and policymakers.

**TIME-ON-TASK IN INTERACTIVE ACTIVITIES WITH A TEACHER PRODUCES GREATER ACHIEVEMENT AND BETTER ATTITUDES THAN TIME-ON-TASK IN SEATWORK.**

This finding emerges from the work of many researchers interested in the effects of time-on-task (e.g., Borg 1980; Quartarola 1984; Rosenshine 1979; Sanford and Evertson 1983; Seifert and Beck 1984; Stallings 1980; and Strother 1984). Specific interactive activities identified by these researchers as beneficial uses of student and teacher time include:

- The use of immediate feedback and correctives in classroom recitations
- Focused questions, praise, and reinforcement
- Listening and thinking during classroom interactions
- Discussion/review, reading aloud, verbal drill and practice

Some researchers have taken a closer look at the effects of time-on-task in seatwork and have determined that not all seatwork activities are equal in their effects. Although these researchers were not specifically concerned with the ALT concept, their findings point to the positive effects produced by seatwork activities likely to increase ALT.

**SEATWORK IS MOST BENEFICIAL TO STUDENTS WHEN TEACHERS PREPARE ACTIVITIES CAREFULLY, MANAGE SEATWORK EFFICIENTLY, SUPERVISE IT ACTIVELY, AND GIVE STUDENTS HELP AND FEEDBACK IN SUCH A WAY THAT OTHER STUDENTS ARE NOT DISTURBED.**

Rosenshine (1979) found this to be true regarding the seatwork component of his direct instruction model, and this finding has also emerged in the work of Strother (1984) and of Helmke and Schrader (1988), who write:

...qualitative, not quantitative, factors are crucial for the effectiveness of practice....First, adequate external conditions must be provided for independent practice; for example, nonacademic activities, procedures, and disruptions should be held to a minimum. Second, the continuity of seatwork seems to be of special significance....independent practice is of benefit only if student have already attained a minimum level of competency....Third, practice is more successful when the teacher actively circulates around the classroom, not only monitoring but also supervising students' work and giving support to single students discreetly, without distracting other students (p. 74).

Conversely, researchers (e.g., Quartarola 1984) have found that unmonitored seatwork and seatwork activities which are not matched to student ability levels are at best unrelated to achievement and sometimes have negative achievement effects.

The foregoing findings have mostly to do with different kind of structures and with the overt activities of students. Covert measures of student engagement are important, too, and researchers have found that these are an even better indicator of the quality of time-on-task during seatwork than are overt measures:

**TIME-ON-TASK IN SEATWORK ACTIVITIES IS MOST BENEFICIAL WHEN STUDENTS' THOUGHTS ARE FOCUSED ON SPECIFIC COGNITIVE**

## **STRATEGIES AND ON MOTIVATIONAL IDEAS.**

Peterson and Swing (1982), among others, have noted that when students' thoughts are focused on "I can do it," and "here's how I can do it," achievement results are superior to those produced by thoughts unrelated to the task or reflective of anxiety about the task. These researchers point to the importance of gathering students' reports about their thought processes as part of research on the effects of time factors, since it is easy for observers to mistake an on-task student for one who is off-task and vice versa.

## **MASTERY LEARNING AND HOMEWORK**

If certain kinds of time-on-task are positively related to student achievement, it is reasonable to expect that instructional approaches which foster those kinds of time-on-task would be successful in promoting achievement increases. Mastery learning, with its emphasis on specific objectives, careful teaching to those objectives, and provision of additional time allotments to those students who initially fail to reach a predetermined criterion on formative tests, has frequently been found superior to nonmastery approaches in fostering achievement gains.

As noted earlier in this report, research results on the effectiveness of group-based mastery learning programs are mixed, and this is not the place to examine in detail the many mastery learning studies and their findings. However, looking at the work of researchers as diverse in their views and findings as Block, Efthim, and Burns (1989); Slavin (1987), and Guskey and Gates (1986), one can say with confidence that:

### **THE SUCCESS OF MASTERY LEARNING PROGRAMS IN PROMOTING LEARNING GAINS IS DUE LARGELY TO THE EXTRA AMOUNTS OF QUALITY TIME-ON-TASK EXPENDED BY STUDENTS IN THESE PROGRAMS, AND PARTICULARLY BY MIDDLE- AND LOWER-ABILITY STUDENTS.**

The research on homework has produced more consistent findings. While researchers are careful to point out that homework PER SE is unlikely to produce achievement gains, they have concluded that:

### **APPROPRIATE KINDS AND AMOUNTS OF HOMEWORK RAISE ACHIEVEMENT LEVELS FOR STUDENTS ABOVE THE PRIMARY GRADES.**

And what are appropriate kinds and amounts of homework? The attributes of effective homework assignments are identified in the work of Butler (1987); Holmes and Cross (1989); Hossler, Stage, and Gallagher (1988), and Paschal, Weinstein, and Walberg (1984). They have found that homework is most beneficial when it is:

- Relevant to learning objectives
- Appropriate to students' ability and maturity levels
- Assigned regularly (Paschal, Weinstein, and Walberg 1984 found the greatest benefits produced by daily homework assignments.)
- Assigned in reasonable amounts (Thirty minutes per subject per day, say Hossler, Stage and Gallagher 1988.)
- Well explained and motivational
- Collected and reviewed during class time
- Used as an occasion for giving feedback to students

- Supported by parents (e.g., arranging for study space, signing off on assignments)

## **TIME FACTORS AND STUDENT CHARACTERISTICS**

Thus far, the findings presented pertain to the effects of time allocations and time-on-task on students in general. More specific findings include:

### **INCREASING ALLOCATED OR ENGAGED TIME IS MORE BENEFICIAL TO LOWER-ABILITY STUDENTS THAN TO HIGHER-ABILITY STUDENTS.**

Since student performance is dependent upon the amount of time NEEDED to learn as well as the amount of time provided, only those students who need greater amounts of time to learn (and who, perhaps, do not normally have enough time to pursue tasks thoroughly and learn them well) perform better when they are given and make use of additional learning time. Various researchers (e.g., Anderson 1983; Brown and Saks 1986; Gettinger 1984, 1989; Kidder, O'Reilly, and Kiesling 1975, and others) have noted that:

### **HIGHER-ABILITY STUDENTS BENEFIT FROM INCREASES IN ALLOCATED AND/OR ENGAGED TIME VERY SLIGHTLY, IF AT ALL.**

Gettinger (1984) writes:

...the present findings suggest that the consequence of additional instructional time may not be the same for all students because there are individual differences in how much exposure or instruction is actually needed for mastery (p. 626).

Another way in which time-on-task affects different students differently emerges from the work of Guida, Ludlow, and Wilson (1985), who found that:

### **INCREASING TIME-ON-TASK REDUCES THE ANXIETY AND ENHANCES THE ACHIEVEMENT OF HIGHLY ANXIOUS STUDENTS.**

## **TIME FACTORS AND DIFFERENT SUBJECT AREAS**

What about the effects of increasing the amounts of time students spend engaged in different curricular areas? The work of researchers such as Block, Efthim, and Burns (1989); Sanford and Evertson (1983); and Stallings (1984), leads to the conclusion that:

### **INCREASING TIME-ON-TASK IS MORE BENEFICIAL IN THE MORE HIGHLY STRUCTURED SUBJECTS, SUCH AS MATHEMATICS AND FOREIGN LANGUAGES, THAN IN THE LESS STRUCTURED ONES, SUCH AS LANGUAGE ARTS AND SOCIAL STUDIES.**

## **THE RESEARCH PERSPECTIVE ON INCREASING TIME ALLOCATIONS**

Because some educators and legislators would have schools increase time allocations as a means of increasing student achievement, many researchers have examined their own research and that of others to determine the likely effects of such increases. Keeping in mind that the concept of ALLOCATED TIME has different meanings, we will look first at what researchers have concluded about the likely effects of increasing the overall quantity of schooling, that is, lengthening the school day, the school year, or both:

**SIGNIFICANT INCREASES IN THE QUANTITY OF SCHOOLING WOULD BE REQUIRED TO BRING ABOUT EVEN MODEST INCREASES IN ACHIEVEMENT. THE COSTS ASSOCIATED WITH EXTENDING THE SCHOOL DAY OR YEAR ARE THEREFORE NOT JUSTIFIABLE.**

This conclusion is drawn by researchers and reviewers as diverse as Hossler, Stage, and Gallagher (1988); Karweit (1985); Levin and Tsang (1987); Mazzarella (1984); Quartarola (1984); and Slavin (1987). Karweit (1985) writes:

The inconsistencies of the research results, the often weak effects for time, the concentration of studies on elementary school populations, and the diversity of sources and problems with school time all suggest that blanket increases of time for schooling are at best likely to have an uncertain outcome. The addition of raw numbers of hours obviously does not guarantee that the additional time will be used to any better purpose than the present time is used (p. 14).

What about teachers reallocating time within classrooms so as to increase time allocations for subjects where achievement increases have been deemed important?

**INCREASING TIME ALLOCATIONS FOR PARTICULAR SUBJECTS WITHIN CLASSROOMS CAN BE BENEFICIAL TO STUDENTS NEEDING ADDITIONAL HELP IF THAT TIME IS DEVOTED TO THE USE OF EFFECTIVE INSTRUCTIONAL STRATEGIES.**

Dewalt and Rodwell (1988) and some of the mastery learning researchers have found that allocating time for reteaching is effective only if the reteaching involves different materials, examples, and demonstrations than those used during initial instruction. In cases where the reteaching is merely a "rehash" of initial instruction, additional time allocation for reteaching does not increase achievement. In general, the same instructional activities which are associated with greater amounts of time-on-task and higher achievement will need to be utilized during extra time allocations in order for that increased time to be beneficial.

A word of caution seems in order here. While some students do appear to benefit from increased learning time, some researchers warn that requiring students to expend more time on learning activities may have some undesirable consequences for at-risk students. Hossler, Stage, and Gallagher (1988) make the following points:

- High-demand classrooms may cause lower-achieving students to work less hard because they feel lost or left behind.
- Greater time demands (e.g., more homework) may force low-income students to choose between school and employment.
- Increased school or homework time demands may interfere with the participation by at-risk students in extracurricular activities--which are sometimes the only bond between these students and their schools. (pp. 2-3)

Closely related to this finding is the discovery made by researchers (e.g., Gettinger 1989; Strother 1984; and Wyne and Stuck 1979) that

**ACHIEVEMENT BENEFITS RESULT WHEN TEACHERS WORK WITH THEIR STUDENTS IN SUCH A WAY AS TO REDUCE THE TIME NEEDED FOR**

## **LEARNING.**

An alternative to increasing the amount of time students spend in learning activities is to decrease the amount of time required for learning. Ways to achieve this which have proven successful in experimental research include providing rewards for passing tests on the first try, and dramatizing or otherwise communicating so much enthusiasm about learning tasks that students apply themselves more fully than they would be likely to do under average learning conditions.

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### **THE RESEARCH PERSPECTIVE ON MAKING BETTER USE OF EXISTING TIME**

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As just noted, increasing student motivation and therefore reducing time needed to learn is one powerful way of using time well. Various other methods for managing time effectively so as to improve student achievement and attitudes are also offered by researchers.

Suggestions for teachers include:

- Begin and end lessons on time.
- Reduce transition time between tasks.
- Closely monitor student learning and behavior, including placing students in desk arrangements that allow teacher and students to see one another well from different points in the classroom.
- Establish and follow simple, consistent rules regarding student behavior in the classroom.
- Make certain that students understand what is expected of them and how to measure its accomplishment.
- Select learning tasks resulting in high levels of success.
- Employ objective feedback about the correctness of responses and assignments and provide suggestions for revision of work products or thought processes.
- Require frequent responses and samples of work, including assigning, collecting, and grading homework regularly.
- Cover content as fully as possible.
- Pay attention to the degree of match between curriculum and testing.
- Reduce noninstructional activities whenever possible.

Recommendations for administrators include:

- Make certain that the amounts of time allocated to various curricular subjects truly reflect the relative values placed on these subjects by school staff and community members.
- Encourage inservice activities to help teachers learn to use time more effectively.
- Encourage parents to teach respect for teachers and for schooling as a means to reducing time-consuming disciplinary actions.
- Establish clear school policies about tardies and absenteeism and make certain these are enforced.
- Keep loudspeaker announcements and other interruptions of class time to a minimum.

"As every thread of gold is valuable, so is every moment of time," noted author John Mason. Following the above suggestions can serve to give this precious element the respect

it deserves, and thereby bring about desired improvements in student learning.

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## **KEY REFERENCES**

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Anderson, L. "Instruction and Time-on-Task: A Review." *JOURNAL OF CURRICULUM STUDIES* 13 (1981): 289-303.

Reviews a variety of research concerned with time-- Learning for Mastery, the Beginning Teacher Evaluation Study, Follow Through evaluations, etc. Major findings: that allocated time bears a small relationship to achievement and engaged time a stronger relationship. Discusses curricular and instructional implications of findings.

. "Learning Time and Educational Effectiveness." *NASSP CURRICULUM REPORT* 10 (1980). (ED 210 780).

Presents research findings on the relationship between instructional time and achievement and discusses approaches- -direct instruction and mastery learning--which have been shown to increase time-on-task. Gives examples of school districts which have implemented practices to increase instructional time.

. "Policy Implications of Research on School Time." *THE SCHOOL ADMINISTRATOR* 40 (1983): 25-28.

Summarizes research on time factors in learning and offers research-based recommendations for policy makers regarding time allocations and use.

. "Student Involvement in Learning and School Achievement." *CALIFORNIA JOURNAL OF EDUCATIONAL RESEARCH* 26 (1975): 53-62.

Investigates relationships among student characteristics, environmental characteristics, time-on-task, and achievement. Subjects were 30 junior high school mathematics students. Time-on-task was positively related to achievement, and students who had more positive entry characteristics and who studied in a more adaptive learning environment exhibited more time-on-task and higher achievement than other students.

Arlin, M. "Time, Equality, and Mastery Learning." *REVIEW OF EDUCATIONAL RESEARCH* 54 (1984): 65-86.

Reviews research on mastery learning to assess the validity of the claim made by mastery learning proponents that the gap in learning rates between initially slower and faster learners closes in response to using mastery methods. Found this claim to be unsupported by the mastery learning data.

Blai, B., Jr. "Educational Reform: It's About 'Time'." *THE CLEARING HOUSE* 60 (1986): 38-40.

Summarizes research on the relationship of allocated time and learning outcomes. Concludes, along with most other writers on this subject, that

increased time allocations, in and of themselves, are unlikely to produce achievement increases.

Block, J.H.; Efthim, H.E.; and Burns, R.B. "How Well Does Mastery Learning Work?" In **BUILDING EFFECTIVE MASTERY LEARNING SCHOOLS**. New York: Longman, 1989.

Reviews research on mastery learning and discusses directions for future research. The major conclusion is that mastery learning is effective in promoting achievement increases and has produced one of the largest effect sizes of any instructional program.

Borg, W.R. "Time and School Learning." In **TIME TO LEARN**, edited by C. Denham and A. Lieberman. Washington, DC: National Institute of Education, 1980.

Summarizes the work of various researchers on time as a variable in learning. Focuses on findings from the Beginning Teacher Evaluation Study (BTES) on allocated, engaged, and academic learning time.

Brown, B.W., and Saks, D.H. "Measuring the Effects of Instructional Time on Student Learning: Evidence from the Beginning Teacher Evaluation Study." **AMERICAN JOURNAL OF EDUCATION** 94 (1986): 480-500.

Proposes a model of learning curves for elementary reading and mathematics using data from the Beginning Teacher Evaluation Study. Reanalysis of these data reveals a positive relationship between allocated time and achievement, though much less for high-ability than for low-ability students. No relationships were noted between type of time use and achievement.

Butler, J.A. **HOMEWORK. CLOSE-UP NO. 1**. Portland, OR: Northwest Regional Educational Laboratory, 1987.

Cites findings from research studies on the effects of homework on student achievement. Homework bears a positive relationship to learning outcomes for students above the primary grades when it is relevant to learning objectives, appropriate to student ability and maturity levels, assigned regularly in reasonable amounts, well explained and motivational, collected and reviewed during class time, and used as an occasion for giving feedback to students.

Cotton, K., and Savard, W.G. **TIME FACTORS IN LEARNING**. Portland, OR: Northwest Regional Educational Laboratory, 1981. (ED 214 706).

Reviews 35 studies on the relationship between various time factors and student achievement. Found a small positive relationship between allocated time and achievement, a stronger positive relationship between time-on-task and achievement, and a still stronger positive relationship between academic learning time (ALT) and achievement.

Deham, C., and Lieberman, A. (eds.). **TIME TO LEARN**. Washington, DC: National Institute of Education, 1980.

Offers a compilation of research study reports and other articles relating to the

Derevensky, J.L.; Hart, S.; and Farrell, M. "An Examination of Achievement-Related Behavior of High- and Low-Achieving Inner-City Pupils." *PSYCHOLOGY IN THE SCHOOLS* 20 (1983): 328-336.

Reports the results of an observational study of the relative amounts of time-on-task expended by high- and low-achieving inner-city Canadian students in grades 1-6. Both groups spent large amounts of time on-task (75-85%), but high achievers expended more time on appropriate, high-success tasks than low achievers.

Dewalt, M.W., and Rodwell, F.G. "Effects of Increased Learning Time in Remedial Math and Science." *ERS SPECTRUM* (1988): 33-36.

Investigates the effects of allocating 30 additional minutes of math and science instruction each day for remedial students in grades 5, 6, and 7. No achievement or attitude changes were noted for math students, but science students' achievement and attitudes improved, probably because the additional math lessons were a "rehash" of material presented in students' regular classes, while science instruction was different and varied.

Fisher, C.W., and Berliner, D.C., eds. *PERSPECTIVES ON INSTRUCTIONAL TIME*. New York: Longman, 1985.

Presents research findings and their implications regarding time factors in education. Many contributors were involved in the Beginning Teacher Evaluation Study and other major studies of time variables in learning.

; Berliner, D.C.; Filby, N.N.; Marliave, R.; Cahen, L.S.; and Dishaw, M.M. "Teaching Behaviors, Academic Learning Time, and Student Achievement: An Overview." In *TIME TO LEARN*, edited by C. Denham and A. Lieberman. Washington, D.C.: National Institute of Education, 1980.

Cites findings emerging from the Beginning Teacher Evaluation Study (BTES) conducted between 1972 and 1978 with second and fifth grade teachers and their students. Lists 14 major findings, including a strong positive relationship between academic learning time (ALT) and both student achievement and attitudes.

Fredrick, W.C., and Walberg, H.J. "Learning as a Function of Time." *JOURNAL OF EDUCATIONAL RESEARCH* 73 (1980): 183- 194.

Reviews research on the relationship between different measures of time allocation and learning outcomes. Years of schooling bear a small, positive relationship to knowledge, IQ, cultural openness, religious commitment, and language learning. Days of instruction demonstrate an inconsistent relationship to outcomes. Hours of classes show a moderate but persistent relationship to achievement and other outcomes. Minutes of instruction are modestly and positively related to achievement.

; Walberg, J.; and Rasher, S.P. "Time, Teacher Comments, and Achievement in Urban High Schools." JOURNAL OF EDUCATIONAL RESEARCH 73 (1979): 63-65.

Reports on a time use study in 175 classes of inner-city juniors and seniors. Researchers found that 46.5 percent of class time was lost to absences, lateness, and inattention. Variables positively associated with reading and mathematics achievement include engaged time (Actual Student Time - AST) and positive teacher comments.

Gettinger, M. "Achievement as a Function of Time Spent in Learning and Time Needed for Learning." AMERICAN EDUCATIONAL RESEARCH JOURNAL 21 (1984): 617-628.

Reports the results of a study in which students spent less than adequate amounts of time for successful learning of spelling and reading tasks. Both achievement and retention suffered from insufficient learning time. This study is also reported in Gettinger 1985 below.

. "Effects of Maximizing Time Spent and Minimizing Time Needed for Learning on Pupil Achievement." AMERICAN EDUCATIONAL RESEARCH JOURNAL 26 (1989): 73-91.

Reports the results of an experiment designed to determine the effects on retention when students' time-on-task and time required for task completion were altered through providing incentives. Subjects were 118 third graders. Extra time-on-task improved the retention of lower-aptitude students, but not higher-aptitude ones. Minimizing time requirements improved the retention of both groups.

. "Time Allocated and Time Spent Relative to Time Needed for Learning as Determinants of Achievement." JOURNAL OF EDUCATIONAL PSYCHOLOGY 77 (1985): 3-11.

Examines the reading achievement and retention effects produced when fourth and fifth students were allocated less time than they needed for a learning task or when they selfselected less time than they needed for the task. In either case, both achievement and retention were lower than they were when children spent the amount of time they actually needed. These findings are also reported in Gettinger 1984 above.

Good, T.L., and Beckerman, T.M. "Time on Task: A Naturalistic Study in Sixth-Grade Classrooms." THE ELEMENTARY SCHOOL JOURNAL 78 (1978): 193-201.

Examines the relationship between time-on-task and (1) kind of instructional activity and (2) achievement in six sixth grade classrooms in two schools. High achievers were on task more than low achievers, and students were most on task in the subjects of mathematics and spelling and when working in a small group with the teacher.

Guida, F.V.; Ludlow, L.H.; and Wilson, M. "The Mediating Effect of Time-On-Task on the Academic Anxiety/Achievement Interaction: A Structural Model." JOURNAL OF RESEARCH AND DEVELOPMENT IN EDUCATION 19 (1985): 21-26.

Examines the relationship among academic anxiety, time-ontask and achievement. Subjects were 91 seventh graders in two all-black urban

elementary schools. High anxiety levels were negatively related to time-on-task and achievement. Researchers conclude that achievement can be raised by increasing the time-on-task expended by anxious students.

Guskey, T.R., and Gates, S.L. "Synthesis of Research on the Effects of Mastery Learning in Elementary and Secondary Classrooms." *EDUCATIONAL LEADERSHIP* 43 (1986): 73-80.

Synthesizes the results of 27 studies on group-based mastery learning programs. Findings pertain to many of mastery learning's components, including time use. The effectiveness of mastery programs is attributed, in part, to their efficient use of time.

Helmke, A., and Schrader, F.W. "Successful Student Practice During Seatwork: Efficient Management and Active Supervision Not Enough." *JOURNAL OF EDUCATIONAL RESEARCH* 82 (1988): 70-75.

Investigates the achievement effects of time spent on seatwork activities which were differently managed by teachers. German fifth graders in 39 mathematics classes participated. The amount of seatwork PER SE had no effect on achievement. The seatwork of higher-achieving students was characterized by careful preparation, efficient management, active supervision, and discreet support and feedback on the part of their teachers.

Holmes, M., and Croll, P. "Time spent on homework and academic achievement." *EDUCATIONAL RESEARCH* 31 (1989): 36- 45.

Examines relationships among time spent on homework, achievement, and a variety of home and background variables of third-year boys in a British grammar school. A positive relationship was found between time spent on homework and achievement.

Honzay, A. "More is Not Necessarily Better." *EDUCATIONAL RESEARCH QUARTERLY* 11 (1986-87): 2-6.

Summarizes research on the relationship between time allocations and achievement and concludes that lengthening the school day or year is not likely to bring about achievement changes without improvements in classroom instruction and management.

Horn, E.A., and Walberg, H.J. "Achievement and Interest as Functions of Quality and Level of Instruction." *JOURNAL OF EDUCATIONAL RESEARCH* 77 (1984): 227-232.

Data on 1,480 of the high school students responding to the 1977-78 National Assessment of Educational Progress survey were used to determine correlates of mathematics achievement. Identified were: number of math courses taken, the level of those courses, student interest in mathematics, use of traditional instruction, educational level of parents, quality of the home environment, and minimum exposure to television.

Hossler, C.; Stage, F.; and Gallagher, K. "The Relationship of Increased Instructional Time to Student Achievement." *POLICY BULLETIN: CONSORTIUM ON EDUCATIONAL*

POLICY STUDIES 1 (1988).

Reviews research on the effects of allocated time (i.e., number and length of school days) and engaged time on student achievement and derives policy implications from findings.

Karweit, N. "A Reanalysis of the Effect of Quantity of Schooling on Achievement." *SOCIOLOGY OF EDUCATION* 49 (1976): 236-246.

Replicates analyses carried out by researchers Wiley and Harnischfeger on the effects of quantity of schooling. Data on students in grades 3, 6, 9, and 12 were analyzed. In contrast to W and H, this author found only very small, nonsignificant effects.

. "Should We Lengthen the School Term?" *EDUCATIONAL RESEARCHER* 14 (1985): 9-15.

Reviews studies on the effects of allocated and engaged time and, in light of findings, discusses proposals to increase the length of the school year. Data from studies reviewed do not support such an increase as a means of increasing student achievement.

. *TIME ON TASK: A RESEARCH REVIEW*. Report No. 332. Baltimore, MD: Center for the Social Organization of Schools, The Johns Hopkins University; Washington, DC: National Commission on Excellence in Education, 1982. (ED 228 236).

Reviews research on time use in schools, particularly studies on the effects of time-on-task, including the Beginning Teacher Evaluation Study. Noted inconsistent findings regarding the effects of time variables on achievement, with relatively weak positive achievement effects noted for time-on-task.

. "Time-on-Task Reconsidered: Synthesis of Research on Time and Learning." *EDUCATIONAL LEADERSHIP* 41 (1984): 32-35.

Describes and summarizes research on the effects of time allocations, engaged time, and ALT on student achievement. Offers cautions about attempts to put research findings into practice.

Kidder, S.J.; O'Reilly, R.P.; and Kiesling, H.J. *QUANTITY AND QUALITY OF INSTRUCTION: EMPIRICAL INVESTIGATIONS*. Paper presented at the Annual Meeting of the American Educational Research Association, March-April 1975. (ED 110 417).

Uses a model developed by Wiley and Harnischfeger to conduct a study on the quantity and quality of schooling with students in grades 4-6. Major findings: allocated exposure time is related to achievement, even when controlling for other factors; extra engaged time benefits low- and middleability students, but not high-ability students.

Leach, D.J., and Tunnecliffe, M.R. "The Relative Influence of Time Variables on Primary Mathematics Achievement." *THE AUSTRALIAN JOURNAL OF EDUCATION* 28 (1984): 126-131.

Studies the effects of four variables on the mathematics achievement of 42 Australian fifth and seventh graders. All variables were positively related to achievement. They are, in descending order of effect size, engaged time, IQ, socioeconomic status, and allocated time.

Levin, H.M., and Tsang, M.C. "The Economics of Student Time." *ECONOMICS OF EDUCATION REVIEW* 6 (1987): 357-364.

Cites research studies on the effects of increasing school time (the length of day or year) on achievement, and also applies economic theory to determine the likely effects such increases. Concludes that substantial increases in instructional time would be required to produce even small increases in achievement.

Lomax, R.G., and Cooley, W.W. *THE STUDENT ACHIEVEMENT/INSTRUCTIONAL TIME RELATIONSHIP*. Pittsburgh, PA: Learning Research and Development Center, University of Pittsburgh, 1979. (ED 179 598).

Reviews findings of ten research studies on the effects of instructional time on achievement. Found a very small positive relationship of allocated time to achievement and a larger but still modest effect of engaged time to achievement.

Mazzarella, J.A. "Longer Day, Longer Year: Will They Make a Difference?" *PRINCIPAL* 63 (1984): 14-20.

Reviews research on relationships between time factors and learning outcomes and draws conclusions about the likely effects of increasing school time. Cites supportive and opposing spokespersons. Offers guidelines for making maximum use of currently available time.

Mevarech, Z.R. "Time Engagement and Achievement in CAI." *EDUCATIONAL TECHNOLOGY* 26 (1986): 38-40.

Examines the effects of offering children the option of spending extra time on CAI mathematics activities. Subjects were 166 female Israeli second, third, and fourth graders. Those who availed themselves of the extra learning time outperformed those who did not.

McGarity, J.R., Jr., and Butts, D.P. "The Relationship Among Teacher Classroom Management Behavior, Student Engagement, and Student Achievement of Middle and High School Science Students of Varying Aptitude." *JOURNAL OF RESEARCH IN SCIENCE TEACHING* 21 (1984): 55-61.

Examines relationships of various teacher behaviors to time-on-task and the science achievement of middle school and high school students. Close monitoring, providing feedback, reteaching, maintaining learner involvement in lessons, using instructional time effectively, and managing disruptive behavior efficiently were found to be positively related to achievement.

O'Donnell, H. "Instructional time as related to reading achievement." *THE READING*

TEACHER 32 (1978): 246-251.

Reviews research reports available through the Educational Resources Information Center (ERIC) system on the relationships between different measures of instructional time and student achievement. Documents cited indicate positive effects on achievement produced by allocated time, engaged time, and academic learning time (ALT).

Paschal, R.A.; Weinstein, T.; and Walberg, H.J. "The Effects of Homework on Learning: A Quantitative Synthesis." JOURNAL OF EDUCATIONAL RESEARCH 78 (1984): 97-104.

Provides the results of a meta-analysis of fifteen studies on the effects of homework on the achievement of elementary and secondary students. Major finding: Assigned homework produced significantly more learning than no homework.

Peterson, P.L., and Fennema, E. "Effective Teaching, Student Engagement in Classroom Activities, and Sex-Related Differences in Learning Mathematics." AMERICAN EDUCATIONAL RESEARCH JOURNAL 22 (1985): 309-335.

Examines the relationship between different kinds of time use and the achievement effects on fourth grade boys and girls. Cooperative learning activities were most beneficial to girls, while boys fared better with competitive activities. Time-off-task was negatively related to boys' achievement, while engagement in sanctioned social activities was negatively related to girls' achievement.

, and Swing, S.R. "Beyond Time on Task: Students' Reports of Their Thought Processes during Classroom Instruction." THE ELEMENTARY SCHOOL JOURNAL 82 (1982): 481-491.

Examines the relationship between students' thought processes while on task and their achievement and attitudes. Subjects were 72 fifth and sixth graders. Attention to tasks--and particularly a focus on specific cognitive strategies--was positively related to achievement. Selfmotivational thoughts were positively related to achievement.

Quartarola, B. A RESEARCH PAPER ON TIME ON TASK AND THE EXTENDED SCHOOL DAY/YEAR AND THEIR RELATIONSHIP TO IMPROVING STUDENT ACHIEVEMENT. Sacramento, CA: Research, Evaluation, and Accreditation Committee, Association of California School Administrators, 1984. (ED 016 890).

Summarizes research on the relationship to student achievement of allocated time, time-on-task, and academic learning time. Findings are consistent with those of other studies of these topics.

Rosenshine, B.V. "Content, Time, and Direct Instruction." In RESEARCH ON TEACHING: CONCEPTS, FINDINGS, AND IMPLICATIONS, edited by P.L. Peterson and H.J. Walberg. Berkeley, CA: McCutchan Publishing Corp., 1979.

Reports the results of research on the relationships between each of these three

factors and student achievement. Each was found to bear a strong relationship to achievement outcomes.

Sanford, J.P., and Evertson, C.M. "Time Use and Activities in Junior High Classes." JOURNAL OF EDUCATIONAL RESEARCH 76 (1983): 140-147.

Investigates relationships among time use, instructional approaches, achievement, attitude toward teachers, and behavior in junior high English and mathematics classes. Patterns differed for English and math classes.

Seifert, E.H., and Beck, John J., Jr. "Relationships Between Task Time and Learning Gains in Secondary Schools." JOURNAL OF EDUCATIONAL RESEARCH 78 (1984): 5-10.

Cites results of a study of the achievement effects produced by different instructional modes, presence or absence of task relevance and task engagement, and different kinds of task engagement. Sixty first-year algebra student participated. The lecture/discussion method, high task relevance, and on-task behavior (particularly "listening/thinking") were positively related to achievement.

Slavin, R.E. "Mastery Learning Reconsidered." REVIEW OF EDUCATIONAL RESEARCH 57 (1987): 175-213.

Cites the results of a "best-evidence synthesis" of studies of group-based mastery learning programs. Also criticizes the duration and methodology of many studies claiming significant achievement benefits for mastery learning programs. Correcting for these methodological problems, mastery learning programs were not found to produce greater achievement benefits than nonmastery approaches.

Smith, N.M. "Allocation of Time and Achievement in Elementary Social Studies." JOURNAL OF EDUCATIONAL RESEARCH 72 (1979): 231-236.

Investigates the relationship between allocated time and achievement in 68 sixth grade classrooms. No significant relationship was found.

Stallings, J. "Allocated Academic Learning Time Revisited, or Beyond Time on Task." EDUCATIONAL RESEARCHER 9 (1980): 11-16.

Reports the results of two studies focused on the relationships among instructional approaches, time factors, and reading achievement. Students in 87 secondary-level remedial classes evidenced greater achievement gains when involved in larger amounts of interactive learning with their teachers. In the second study, students of teachers receiving training in interactive approaches outperformed students of control teachers.

. AN EVALUATION OF THE NAPA COUNTY OFFICE OF EDUCATION'S FOLLOW THROUGH STAFF DEVELOPMENT EFFORT TO INCREASE STUDENT LEARNING TIME AND ACHIEVEMENT. Washington, DC: National Institute of Education, 1984. (ED 245 303).

Assesses the effectiveness of the Napa County Instructional Skills Staff

Development Program. Most participating teachers benefited from the program. Positive relationships were noted between engaged time and achievement in both reading and math. The program improved time-on-task and achievement in math but not in reading.

Strother, D.B. "Another Look at Time on Task." *PHI DELTA KAPPAN* 65 (1984): 714-717.

Summarizes research on time factors in learning and offers suggestions to those seeking to increase student achievement through policies which bear on instructional time.

Tobin, K. "Student Task Involvement and Achievement in Process-Oriented Science Activities." *SCIENCE EDUCATION* 70 (1986): 61-72.

Reports the results of a study of the relationships between various kinds of on-task behavior and the science achievement of Australian 6th and 7th graders. Among the behaviors of attending, recalling, collecting, comprehending, quantifying, planning, generalizing, noncognitive on-task behaviors, and off-task behaviors, only planning and collecting were positively related to achievement.

Walberg, H.J. "Synthesis of Research on Time and Learning." *EDUCATIONAL LEADERSHIP* 45 (1988): 76-86.

Offers insights on the role played by time in learning processes, and gives cross-cultural examples of educational time use and its effects. Speculates that increases in allocated, engaged, and particularly "productive" time (a concept similar to academic learning time) would be likely to improve learning outcomes.

, and Tsai, S. "Reading Achievement and Diminishing Returns to Time." *JOURNAL OF EDUCATIONAL PSYCHOLOGY* 76 (1984): 442-451.

Uses data from a study involving nearly 3,000 13-year-olds to determine the relationship to reading achievement of 24 variables. One significant finding was that time allocations and frequency of verbal activities are positively related to achievement up to a point, then begin to show diminishing returns.

; Paschal, R.A.; and Weinstein, T. "Homework's Powerful Effects on Learning." *EDUCATIONAL LEADERSHIP* 42 (1984): 76-79.

Reports results of the same synthesis effort detailed in Paschal, Weinstein, and Walberg, 1984 (see above).

Wiley, D.E., and Harnischfeger, A. "Explosion of a Myth: Quantity of Schooling and Exposure to Instruction, Major Educational Vehicles." *EDUCATIONAL RESEARCHER* 3 (1974): 7- 12.

Uses experimental data and state school attendance figures to determine relationships between quantity of schooling (length of school day and year, attendance rates, etc.) and achievement. Strong, positive relationships were

revealed between these measures and achievement. Offers a model of the relationship between quantity of schooling and student outcomes, and presents policy implications of findings.

Wyne, M.D., and Stuck, G.B. "Time-On-Task and Reading Performance in Underachieving Children." JOURNAL OF READING BEHAVIOR 11 (1979): 119-128.

Examines the effects on time-on-task and reading achievement of resource room interventions designed to increase student engagement rates through the provision of tangible rewards. Students in grades 2, 3, 5, and 6 participated. Both time-on-task rates and achievement of experimental children increased significantly and improvements were still being maintained at the time observations and data collection ended--four months after the interventions stopped.

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Anderson, L.M. "What Are Students Doing When They Do All That Seatwork." In PERSPECTIVES ON INSTRUCTIONAL TIME by C.W. Fisher and D.C. Berliner. New York: Longman, 1985.

Draws on classroom research to provide insights into the nature and problems associated with seatwork activities in elementary classrooms--activities which consume an estimated 70 percent of instructional time.

. A MEASURE OF STUDENT INVOLVEMENT IN LEARNING: TIME-ON-TASK. Columbia, SC: University of South Carolina, no date. (ED 110 504).

Presents and describes methods for measuring student time on -task and suggests ways these methods can be applied in classrooms.

. "Time and Timing." In PERSPECTIVES ON INSTRUCTIONAL TIME, edited by C.W. Fisher and D.C. Berliner. New York: Longman, 1985.

Discusses time factors research, focusing on such topics as time needed to learn, matching instruction to students' characteristics, ideal learning times, pacing, and classroom management.

Ben-Peretz, M. TIME: THE FIFTH COMMONPLACE IN CURRICULAR DELIBERATIONS. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA, April 1986. (ED 275 599)

Argues that time, along with the learner, the teacher, the milieu, and the subject matter, needs to be given adequate consideration when making curriculum decisions.

Berliner, D.C. "Tempus Educare." In RESEARCH ON TEACHING: CONCEPTS, FINDINGS, AND IMPLICATIONS, edited by P.L. Peterson and H.J. Walberg. Berkeley, CA: McCutchan Publishing Corp., 1979.

Presents findings from the large-scale Beginning Teacher Evaluation Study

regarding time factors. Very large variations were found in the amounts of allocated time, engaged time, and academic learning time (ALT) for different content and subskill areas examined in second and fifth grade classrooms.

Bloom, B.S. HUMAN CHARACTERISTICS AND SCHOOL LEARNING. New York: McGraw-Hill, 1976.

Presents a research-based theory of the way that learning takes place and discusses the advantages of mastery learning approaches in helping all students achieve at their potential and have positive views of themselves as learners.

. "Time and Learning." AMERICAN PSYCHOLOGIST 29 (1974): 682-688.

Reviews early research on time factors and learning outcomes and discusses mastery learning as a potential solution to the problems associated with differences in student learning rates and attention levels.

Brandt, R. "On Improving Teacher Effectiveness: A Conversation with David Berliner." EDUCATIONAL LEADERSHIP 40 (1982): 12-15.

Presents insights from educational psychologist David Berliner, who discusses time allocations, engaged time, match between instruction and school/district goals, classroom management, and classroom climate. Berliner views in-classroom coaching as the best way to improve teaching.

Carroll, J.B. "A Model of School Learning." TEACHERS COLLEGE RECORD 64 (1963): 723-733.

Advances a model for learning as a function of time needed and time spent. Suggests directions for future research.

Croll, P., and Moses, D. "Teaching methods and time on task in junior classrooms." EDUCATIONAL RESEARCH 30 (1988): 90- 97.

Investigates the relationship between teaching approaches and student engagement rates in 32 elementary ("junior") classes in the British school system. Found that greater amounts of whole class instruction were associated with higher levels of student time-on-task.

Daniele, V.A., and Aldersley, S.F. "Implications of TimeOn -Task Research for Teachers of the Hearing Impaired." AMERICAN ANNALS OF THE DEAF 133 (1988): 207-211.

Draws from research on time factors and research on teaching the hearing impaired to make a series of recommendations regarding effective time use with hearing impaired students.

Easton, J.Q.; Muirhead, R.S.; Fredrick, W.C.; and Vanderwicken, S. RELATIONSHIP AMONG STUDENT TIME ON TASK, ORIENTATION OF TEACHERS, AND INSTRUCTIONAL GROUPING IN ELEMENTARY READING CLASSES. Chicago, IL: Department of Research and Evaluation, Chicago Board of Education, 1979. (ED 169 503).

Investigates grouping factors related to engaged time in 74 inner-city

classrooms serving grades 1-6. The major findings was that students were much more on-task during whole class instruction than in small group instruction.

Falk, J.H. "Time and Behavior as Predictors of Learning." *SCIENCE EDUCATION* 67 (1983): 267-276.

Describes the development and testing of a method for predicting achievement through observation of student behaviors and time-on-task.

Filby, N.N., and Cahen, L.S. "Teacher Accessibility and Student Attention." In *PERSPECTIVES ON INSTRUCTIONAL TIME*, edited by C.W. Fisher and D.C. Berliner. New York: Longman, 1985.

Examines some of the data from the Beginning Teacher Evaluation Study to identify which kinds of classroom organization and teaching behavior are related to student engagement rates and achievement.

Fitz-Gibbon, C.T., and Clark, K.S. "Time Variables in Classroom Research: A Study of Eight Urban Secondary School Mathematics Classes." *BRITISH JOURNAL OF EDUCATIONAL PSYCHOLOGY* 52 (1982): 301-316.

Describes a study of time use in mathematics classes conducted in eight British secondary schools. The relationship to outcomes was not explored, but researchers did determine that only about half the time allocated for mathematics instruction was actually spent in on-task behavior by students.

Karweit, N. "Time Scales, Learning Events, and Productive Instruction." In *PERSPECTIVES ON INSTRUCTIONAL TIME*, edited by C.W. Fisher and D.C. Berliner. New York: Longman, 1985.

Discusses various instructional time factors, including duration, timing, and pace. Emphasizes that the ways learning activities are organized is a more important variable than duration of instruction.

Lasley, T.J., and Walker, R. "Time-on-Task: How Teachers Can Use Class Time More Effectively." *NASSP BULLETIN* 70 (1986): 59-64.

Offers research-based recommendations to help teachers make better use of class time.

Leinhardt, G. "Instructional Time: A Winged Chariot." In *PERSPECTIVES ON INSTRUCTIONAL TIME*, edited by C.W. Fisher and D.C. Berliner. New York: Longman, 1985.

Summarizes the results of three studies on instructional time use and, based on results, offers suggestions for approaches to be taken by future research projects.

National Commission on Excellence in Education. *A NATION AT RISK: THE IMPERATIVE FOR EDUCATIONAL REFORM*. Washington, DC: U.S. Department of Education, 1983.

Reviews the quality and effectiveness of contemporary U.S. education and concludes that American students and graduates have less knowledge and skill than their counterparts in other industrialized nations. Suggests possible avenues for reform.

Ornstein, A.C. "Academic Time Considerations for Curriculum Leaders." *NASSP BULLETIN* 73 (1989): 103-111.

Defines different kinds of school-related time concepts, offers comparative information about the different ways time is allocated and used, and presents suggestions for ways to increase the productivity of instructional time use.

Rosenberg, M.S., and Baker, K. "Instructional Time and the Teacher-Educator: Training Pre-Service and Beginning Teachers to Use Instructional Time Effectively." *TEACHER EDUCATOR* 20 (1985): 12-18.

Draws upon findings from time factors research to make suggestions to teacher educators regarding ways to train teachers to use classroom time more effectively.

Rosenshine, B. "How Time is Spent in Elementary Classrooms." In *TIME TO LEARN*, edited by C. Denham and A. Lieberman. Washington, DC: National Institute of Education, 1980.

Discusses findings from the Beginning Teacher Evaluation Study regarding time allocations and levels of time-on-task among the second and fifth graders participating in that study.

Rossmiller, R.A. "Time-on-Task: A Look at What Erodes Time For Instruction." *NASSP BULLETIN* 67 (1983): 45-49.

Discusses research on instructional time use in schools and offers implications for educational practitioners. Findings include: only about 60 percent of the school day is actually available for instruction, girls are on-task more than boys, high-ability students are on-task more than low-ability students, and the average student is on-task 70 to 75 percent of the time.

Smyth, W.J. "A Context for the Study of Time and Instruction." In *PERSPECTIVES ON INSTRUCTIONAL TIME*, edited by C.W. Fisher and D.C. Berliner. New York: Longman, 1985.

Reviews the history of teacher effectiveness research and that of time factors research in particular. Presents implications for practitioners of research on instructional time.

Stallings, J.A. "Using Time Effectively: A Self-Analytic Approach." In *IMPROVING TEACHING: 1986 ASCD YEARBOOK*, edited by K.K. Zumwalt. Alexandria, VA: Association for Supervision and Curriculum Development, 1986.

Describes two case studies of time use by junior high school English teachers, and argues that the methods for analyzing time use used in the study can be

effectively applied by teachers to analyze their own use of time and make appropriate changes.

Wang, M.C. "An Analysis of Program Design Implications for Teacher and Student Use of School Time." In PERSPECTIVES ON INSTRUCTIONAL TIME, edited by C.W. Fisher and D.C. Berliner. New York: Longman, 1985.

Describes an instructional approach, the Adaptive Learning Environments Model, based on findings from effective teaching research, and presents results of a study of ALEM's effects on student achievement in a laboratory school setting.

Watkins, P. TIME, ORGANIZATION AND THE ADMINISTRATION OF EDUCATION. Victoria, Australia: Deakin University, 1986. (ED 283 262).

Offers a review and critique of time as perceived as used in education, and presents four articles related to this theme: "A Model of School Learning" by J.B. Carroll, "About Time for Educational Reform" by H.M. Levin, "Reflections on the History of the Concept of Time" by G.J. Whitrow, and "The Secondary School: Administrative Wonder and Educational Absurdity" by K. Harris.

Wilson, R. "Direct Observation of Academic Learning Time." TEACHING EXCEPTIONAL CHILDREN 19 (1987): 13-17.

Presents a rationale for tracking academic learning time in classrooms, describes a method for such tracking, and offers ways that the information gathered can be put to use.

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