Wood, Fred Simpson, Jr.

A DESCRIPTIVE ANALYSIS OF THE EFFECTS OF A MODEL OF FLEXIBLE SCHEDULING ON ACHIEVEMENT IN READING

The University of North Carolina at Greensboro ED.D. 1983

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A DESCRIPTIVE ANALYSIS OF THE EFFECTS OF A MODEL OF FLEXIBLE SCHEDULING ON ACHIEVEMENT IN READING

by

Fred S. Wood, Jr.

A Dissertation submitted to
the Faculty of the Graduate School at
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Approved by

Sandra M. Powers
Dissertation Adviser

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro.

Dissertation Adviser _____

Committee Members _____

_____

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_____

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WOOD, FRED S., JR. A Descriptive Analysis of the Effects of a Model of Flexible Scheduling on Achievement in Reading. (1983) Directed by Dr. Sandra M. Powers. Pp. 107.

It was the purpose of this study to investigate the effects of a model of flexible scheduling on achievement in reading for primary school children. It was hypothesized that the model of flexible scheduling would reduce the fragmentation of the primary school day and increase the time allocation to the language arts and reading instruction. It was also hypothesized that any increase in the time allocations to the subject area of reading would result in an increase in "academic learning time" (ALT) and more achievement in reading.

The subjects were 70 students in the primary school using the model of flexible scheduling and 187 students in four comparison schools (primary level). Two of the comparison schools used some form of scheduling and two did not. The subjects were not randomly selected but were considered to be representative of all students in the school populations.

The data were collected using a pretest/posttest pre-experimental design over a six-month period of time for the 70 subjects and by calculating gain scores (scale scores) in reading for the 187 students at the comparison school and 46 of the 70 subjects at the intervention school over a three-year period of time. Teachers at Brown Summit Primary School who worked with the implementation of the scheduling model responded to a questionnaire on the effects of the scheduling model on fragmentation and reading achievement. These data were analyzed using a t test and by summarizing the responses to the questionnaire.

The results of the study showed that hypothesis one, that the model of flexible scheduling would reduce the fragmentation of the school day

and increase the time allocation to language arts and reading was accepted. Hypothesis two, that increased time allocations to reading would provide for more academic learning time and increase achievement in reading, was rejected.

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CHAPTER I

INTRODUCTION

Time has long been considered a factor in learning. Time has played a fundamental role in our understanding of education, our administration of schools, and in the development of programs and curriculum. The very notion of education implies that time is essential (Daniels & Haller, 1981). Over the years the length of the school day and the school year have been increased and kindergarten has been added to the years of formal schooling. All of this was done on the assumption that more schooling was better--that more time in school was better.

In addition, time is a factor that is essential to the effective operation of schools; many states exercise control over instructional programs by defining instructional subject areas in terms of a minimum amount of time per day. Thus, for an understanding of education--curriculum and instruction and its administration--time is of central importance. Moreover, common sense suggests that the amount of time spent in learning is an important factor in determining a student's achievement.

The use of time in schools has been a topic of considerable recent research interest. Models of the learning process have been proposed which incorporate quantitative, as well as qualitative, measures as variables in studying student achievement. This research has found that time spent, from the number of days in a school year to the number of minutes students actually spend working successfully on specific tasks, affects achievement gained. Research also identified practices that

promote more effective use of learning time. Research findings have established a relationship between a teacher's management of time and student learning.

Frederick and Walberg (1980; 1982) note that the research on instructional time and learning demonstrates that time is a modest predictor of achievement--that is, there is a moderate and positive correlation between time and learning. Thus, Frederick and Walberg (1980) point to the need for clarifying the conditions under which more time spent does indeed produce more learning.

The amount of time that students have for instruction (per school year, per school day, and per subject area), and the involvement of the student in instruction (attendance at school, attention to learning tasks, and successful participation) are the conditions that will determine the degree of student achievement. An understanding of how time spent affects achievement is important because time is one of the few resources that can be directly managed and adjusted by teachers and administrators. Time use, in particular, the pacing of instruction, and the allocation of time to particular subject areas, is directly controllable by individual teachers. Justifiably, Wyne (1981) has listed time as one of six key elements of classroom management, while Guthrie (1980) observed that it is "the teacher's first responsibility to schedule time" (p. 1).

Canady (1980) advocated time management as a critical factor in reading instruction. He sees this factor as becoming increasingly important in light of the many programs and services that compete for a part of the instructional day. Canady developed a concept of flexible

scheduling--consisting of grouping of students for reading instruction and scheduling these reading groups at a time when they would not conflict with support service classes, such as remedial reading or mathemathics, media services, etc.

Statement of the Problem

It has been established that there is a positive correlation between the effective use of instructional time by students and student achievement gains. Some prior research on time and learning has focused on time allocations to specific learning tasks (Bloom, 1974; Carroll, 1963; Fisher et al., 1978). Harnischfeger and Wiley (1976), to the contrary, looked at the allocation of time to a curricular area and how the effective use of time by a student affected achievement gains. Canady (1980) (like Harnischfeger and Wiley, 1976) observed that "students profit from a reading program with directed instruction, uninterrupted reading periods of adequate length, and practices that allow the teacher and student to interact on a regular basis" (p. 8).

The present study has investigated the relationship between time allocated to reading and student achievement (with particular attention given to time management, scheduling considerations that promote homogenous grouping, and direct and continuous instruction).

Purpose of the Study

The purpose of the present study is to evaluate the effects of a model of flexible scheduling, referred to as Parallel Scheduling, on the language arts program at Brown Summit Primary School, in Brown Summit, North Carolina. The objective of the scheduling model was twofold: (1) to reduce the fragmentation (the interruptions) in the instructional day that resulted from remedial and

special education programs, and (2) to increase the time allocation to the language arts component of the curriculum. With this program of flexible scheduling, particular emphasis was placed on time allocated to the subject area of reading, the management of this reading time allocation, and the grouping of students for reading instruction (Barr, 1975; Canady, 1980; Francis, 1980). Each of these elements is critical to the delivery of good reading instruction.

These two objectives were to be accomplished by increasing the homogeneity of the classroom (providing for, generally, two reading groups of approximately 13 students each per class) and scheduling a student's teacher-directed reading period at a time other than when they would be required to attend a support service class (pullout program). These two procedural changes were to result in an increased allocation of time to the language arts component and provide for, generally, interruption-free reading periods with the use of an extension concept.

It was then intended that the increased allocation of time to reading, the increased homogeneity of the reading group, and the reduction of classroom distractions would provide for more direct and continuous instruction by the teacher and increase the percentage of engagement in reading by the student.

The emphasis on direct instruction, as defined by Berliner and Rosenshine (1977), was evident in the program of flexible scheduling. Additional time was allocated to reading for all students by the scheduling procedure. Twice that amount of time was allocated for students who were in special reading programs (see Figure 1 and Table 1). Low teacher-student ratios allowed the teacher to effectively manage the time of a

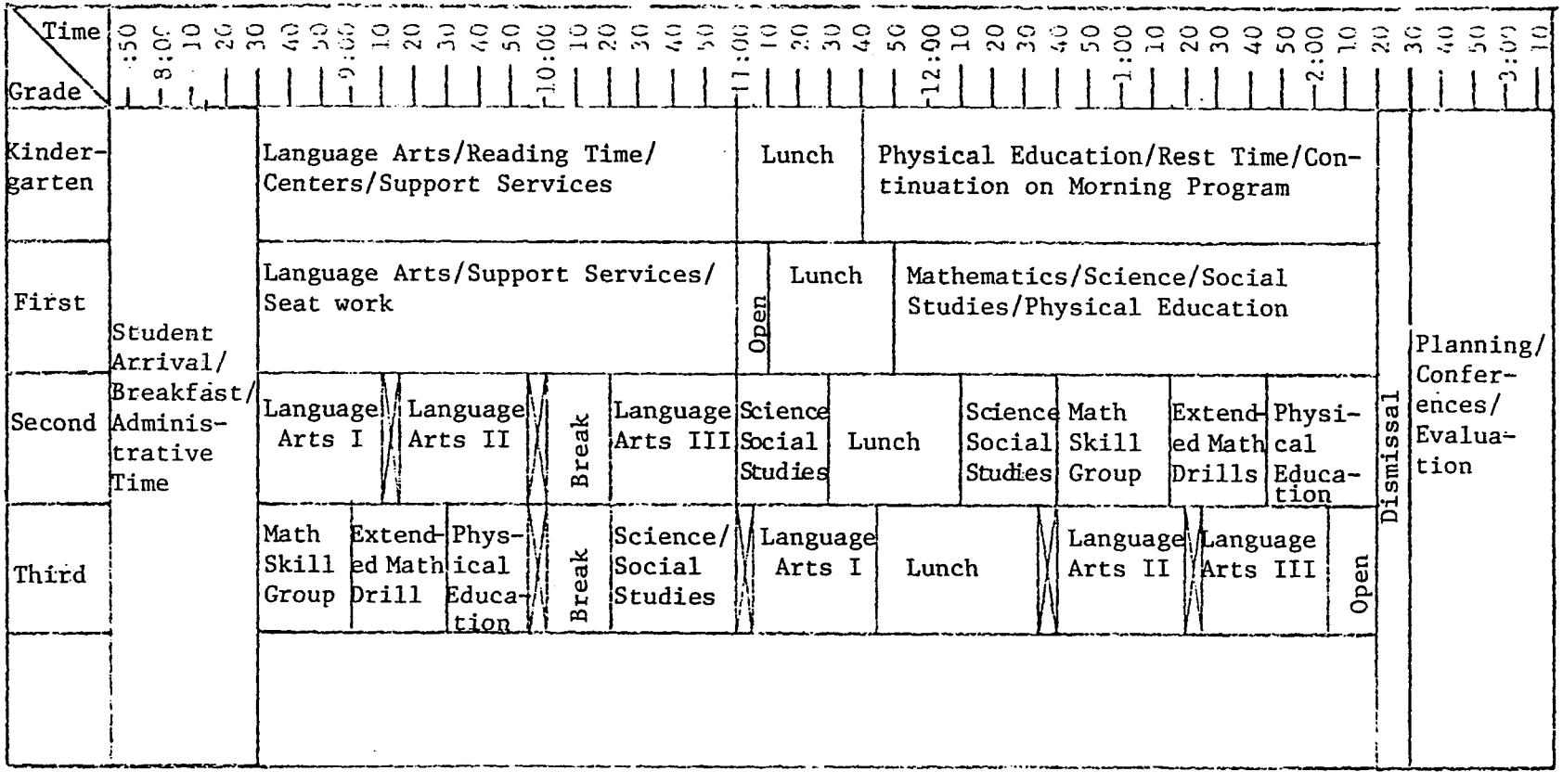

Figure 1. Master Schedule for Brown Summit Primary School

Table 1

Schedule Model for Reading Groups and Extensions by Teachers for Grades Two and Three

Grade	Teacher	Language Arts Periods Period I: 8:30-9:10	Period II: 9:15-9:55	Period III: 10:20-11:00
2	A	Directed Reading Group 1	Directed Reading Group 2	Language Arts 1 and 2
2	B	Directed Reading Group 1	Language Arts 1 and 2	Directed Reading Group 2
2	C	Language Arts 1 and 2	Directed Reading Group 1	Directed Reading Group 2
Extension Groups		A2 B2	A1 C2	B1 C1
		Period I: 11:05-11:45	Period II: 12:40-1:20	Period III: 1:25-2:05
3	A	Directed Reading Group 1	Directed Reading Group 2	Language Arts 1 and 2
3	B	Directed Reading Group 1	Language Arts 1 and 2	Directed Reading Group 2
3	C	Language Arts 1 and 2	Directed Reading Group 1	Directed Reading Group 2
Extension Groups		A2 B2	A1 C2	B1 C1

group (10-13 students) during reading time, providing the opportunity for increased student engagement time. Lastly, the homogeneity of the groups allows the instructional materials to be matched to the group in an effort to provide successful experiences for the students.

Definition of Terms

For the purpose of this study, the following definitions will be used:

Allocated time. The amount of time that is assigned to a subject area or to a learning task.

Achievement. Gains made by a student on a learning task or in a subject area after engagement in an instructional process and measured on the norm-referenced California Achievement Test.

Content area. A segment of a defined subject area; e.g., decoding is a part of the subject area of reading. This term is synonymous with the term, learning task.

Flexible scheduling. A method of maximizing the allocation of time to a subject area in which homogeneous grouping plays a major role.

Direct instruction. Instruction that is administered or supervised directly by the teacher that promotes interaction and exchange between the student and teacher.

Learning task. A segment of a defined subject area; e.g., decoding is a part of the subject area of reading. This term is synonymous with the term, content area.

Pull-out program. A support service of a school (e.g., Title I, special education, speech and language) that takes a child out of the regular classroom for instruction.

Parallel scheduling. A type of flexible scheduling in which directed reading is scheduled at a time other than the time needed for pull-out programs.

Program component. A major division of a primary school program such as language arts, mathematics, etc.

Subject area. A division of a program component; e.g., reading is a division of language arts.

Reinforcement. Follow-up work by a paraprofessional (aide) on learning tasks which the teacher has previously presented to the students.

Limitations of the Study

It is recognized that this study represents a case study of an attempt at instructional improvement at one primary school. It is also recognized that because of the absence of randomization in sampling and a control group, the findings in this research have inferential usefulness only to similar populations in this school system (a) to the extent that the Brown Summit students are representative of the other students in the population, and (b) to the extent that construct validity exists.

The principal of the school was also the researcher in the present study. It must be noted that his positional authority could have had an affect on the other participants in the 1980-81 evaluation.

Hypotheses

The hypotheses of this study are as follows:

1. The use of the model of Parallel Scheduling will reduce the fragmentation of the school day, thereby increasing the time allocation to language arts and to reading instruction.

2. With more opportunity to learn in reading and language arts, with smaller and more homogeneous reading groups, and with more direct and continuous reading instruction, academic learning time (ALT) will increase for reading and result in more reading achievement.

CHAPTER II

REVIEW OF LITERATURE

The Origin of Time and Learning Theory

Research on the effects of instructional time dates back to at least 1928 with a study by Mann (1928). The 1970's saw increasing interest in this concept among educational researchers. This revived interest in time and learning during the 1970's has as its intellectual roots the model of school learning derived earlier by Carroll (1963). Carroll introduced a model of schooling that attempted to explain the role of the time variable and its relationship to learning rate and achievement. He viewed time as the central variable in school learning and defined several major educational variables in terms of time. These variables are the ability to understand instructions, time allowed for instruction (opportunity), aptitude, perseverance, and quality of instruction. The basic proposition underlying Carroll's model is that a "learner will succeed in learning a given task to the extent that he spends the amount of time that he needs to learn that task" (p. 725). These five variables have been classified by Carroll in the two categories: time needed for learning (aptitude, ability to understand instructions, and the quality of instruction) and time spent in learning (time allowed for instruction or opportunity, and perseverance).

Carroll (1963) said that a learner's aptitude for a given task is a function of numerous variables, including what the learner has achieved previously which is relevant to the task to be learned. Carroll views a

series of learner characteristics as contributing to aptitude on a given task. Aptitude then would determine the amount of time needed to learn a specified task. The expression of the learner's estimated needed time to learn a task is a function of a series of basic aptitudes less the amount of time saved due to the knowledge the student already has about the task. Mathematically, this has been expressed as:

$$a_t = f(\alpha_1, \alpha_2, \ldots, \alpha_n) - S_t \quad \text{(Carroll, 1963, p. 726)}$$

where

a_t = estimate time needed

α_n = basic aptitudes

s_t = total time saved

The two variables, ability to understand instructions and quality of instruction, are interrelated in Carroll's (1963) model. The ability to understand instructions is a "combination of 'general intelligence' and 'verbal ability' and comes into play in the instructional situation when the learner is left to infer for himself the concepts and relationships inherent in the materials to be learned or when the language utilized in the instruction is beyond the grasp of the learner" (p. 726). The variable, quality of instruction, pertains to the organization and presentation of the task to the student. Carroll (1963) wrote:

> The amount of time actually needed by the person to learn a given task satisfactorily is a function not only of the aptitude, but also of the quality of instruction in so far as it is less than optimal. And the amount of additional time he will need is an inverse function of his ability to understand instruction. (p. 727)

Carroll's (1963) second category, time spent in learning, included time allowed for learning or opportunity, and perseverance. Carroll said that there is variation in the amount of time that children need for

learning and that an inappropriate amount of time for a task is often allowed. This situation affects students of both high and low aptitude with frustration from being left unchallenged or being overtaxed. Carroll states that "probably one of the most adversive things a school can do is not allow sufficient time for a well motivated child to master a given task before the next is taken up" (p. 728).

Closely allied to the fact that varying amounts of time are needed and inadequately allowed is the child's perseverance or the time that the child is willing to spend learning. If the child does not persevere on a task--remain actively engaged in learning a task for the required amount of time he needs--the degree of learning will be decreased. Carroll pointed out that three of the five variables in his model (aptitude, ability to understand instructions, and perseverance) reside in the child while the remaining two (time allowed for learning and the quality of instruction) are external to the child. Carroll expressed the degree of learning as a function of the ratio of the amount of time the learner actually spends on the learning task to the total amount of time needed by the learner. Mathematically it is expressed as:

$$\text{degree of learning} = f\left(\frac{\text{time actually spent}}{\text{time needed}}\right)$$

where:

degree of learning is the amount of student achievement

time actually spent is time the student actually engages in instruction

time needed is the time needed by a specific student to learn a task.

The numerator of this fraction will be equal to the smallest of the three quantities: (1) opportunity, the time allowed for learning; (2) perseverance, the amount of time the learner is willing to engage actively in learning; and (3) aptitude, the amount of time needed to

> learn; increased by any amount of time necessary because the quality of instruction by the teacher is poor or the lack of the ability of the student to understand less than optimal instructions. The last quantity (time needed to learn, which is subject to an adjustment for the quality of instruction that is given and the ability of the student to understand instructions) is also a denominator of the fraction. (Carroll, 1963, p. 730)

Carroll summarized his model with this statement: "one of the bolder hypotheses implicit in the model is that the degree of learning, other things being equal, is a simple function of the time during which the pupil actively engages in learning" (p. 732).

The Components of Time and Learning Theory

Bloom (1974) expanded on Carroll's work and developed his own theoretical framework for time and learning. He called the amount of time that a student actually spends on a learning task the "time-on-task." Like Carroll (1963) he postulated variables that affected the amount of time that a learner would actually spend on a given task, claiming that the prior learning of a pupil would be a determining factor in the student's success at that task.

Bloom (1974) identified three major educational variables that were prerequisites to increased time on task: "cognitive entry behaviors, affective entry characteristics, and quality of instruction" (p. 687). Cognitive entry behaviors refer to a student's success on the prior learning task in the series. Bloom observed that "as students are provided with feedback on what they have learned over a particular learning task, and as they are given additional time and help to correct their difficulties, they enter the next learning task with a better grasp of the preceeding learning task in the series" (p. 686). Thus, according to Bloom, the student (having learned well a preceding task) has

established the prerequisite for the succeeding task. This variable then would be highly related to the student's achievement level on a successive learning task. Affective entry characteristics relate to the student's confidence and interest in a learning task. Bloom believed that when students reached an adequate level of achievement on preceding tasks their confidence and interest increased, causing them to feel good about themselves and learning. He warns of the converse also; that is, repeated failure to achieve success on tasks will destroy a zeal for learning, make a student view himself negatively, and increase the time it takes him to learn. Bloom's third variable, quality of instruction, has a direct effect on the other two variables. He defined quality of instruction as the "feedback and correctives" that cause high levels of achievement on prior learning tasks. He wrote: "when the quality of instruction is high the level of achievement of the students and the time-on-task increase" (p. 687).

The variables postulated by Bloom, like those of Carroll, can also be placed in two categories. Cognitive and affective entry characteristics are characteristics that reside with the student while quality of instruction is external to the student. Moreover, quality of instruction, according to Bloom, assumes a greater degree of importance in Bloom's model than in the others because it is capable of altering the student's entry characteristics and, consequently, affecting the student's achievement.

Harnischfeger and Wiley (1976) developed a model of the learning process in elementary school that was conceptually similar to Carroll's (1963) model of school learning and the theoretical framework developed

by Bloom (1974). The concept of time was also the basis for the construction of their model--learning time and learning rate both played a crucial role. Harnischfeger and Wiley (1976) observed that a pupil's activity--a pupil's use of time--was central to his learning. Pupil pursuits or time usage, therefore, became the focus of their model. Along with pupil pursuits, they held teacher pursuits (or activities) to be a contributing factor to student achievement.

Harnischfeger and Wiley also considered the actual time spent in learning (Carroll, 1963) or the time-on-task (Bloom, 1974) to be the determining factor for success at a learning task. They wrote: "the total amount of active learning time on a particular instructional topic is the most important determinant of the pupil's achievement on that topic" (Harnischfeger & Wiley, 1976, p. 13). Like Carroll and Bloom, they saw variations in the time different students would need, realizing that this would cause inadequate allocation of time to some students. They attributed the time variances among students to variables similar to Carroll's (1963) and Bloom's (1974): aptitude, quality of instructions, affective entry characteristics, perseverance, and ability to understand instructions.

In summary, the Harnischfeger and Wiley model (1976) said that a quantity of schooling (time allocation) is allocated to various curricular areas (X) and then to various pupil pursuits (or learning activities) within that curricular area. Further, they said:

> total active learning time on X is determined by a pupil's task involvement which is influenced by his intrinsic motivation, by the teacher's motivating skills, and by her surveillance. Ultimately, it is the pupil's skill in managing his own learning that determines the limits of active learning time. Only this active portion of the time assigned to a task is effective in learning X. That is, the

> lower the frequency in duration of hinderences to learning, the higher the relative percentage and absolute amount of active learning time and the greater the educational outcome. (p. 15)

One of the most useful publications to emerge from the research on teaching during the 1970's was the Beginning Teacher Evaluation Study (BTES) (Fisher, Berliner, Filby, Marliane, Cashen, Dishaw, & Moore, 1978). The BTES was a six-year, three phase research project. Its purpose was to identify classroom conditions and teaching activities that fostered student learning in elementary schools. The basis for the BTES was the Carroll model of school learning (Carroll, 1963), subsequent work on time and learning by Bloom (1974), and the model of school learning of Harnischfeger and Wiley (1976).

From the BTES (Fisher et al., 1978), a model for conceptualizing classroom instruction and student learning was evolved. The central construct was "academic learning time" and was defined as "the amount of time a student spends engaged in a task that produces few student errors and which is directly related to a defined content area" (p. 1-7).* The model was called the Academic Learning Time (ALT) model. To test this construct of the model, data on the instructional process were collected by direct observation, teacher logs, interviews, and ratings, and used to address the following questions:

> What is the relationship between student academic learning time and achievement? What are the relationships between teaching process and academic learning time? (Fisher et al., 1978, p. 1-7)

In the BTES study, Fisher et al. (1978) observed that there was a difference between the amount of time allocated to a learning task and the amount of time a student spent learning that task. Their "academic learning time" (ALT) model consisted of four basic components: allocated time, student engagement, student error rate, and task relevance.

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Allocated time is the first component and refers to the assignment of a given amount of time to a student for a content area or learning task (for example, decoding in reading). This component in other models of time and learning had other labels: "elapsed time" (Bloom, 1974), "opportunity" (Carroll, 1963), and "total time in a curricular area (X)" (Harnischfeger & Wiley, 1976). Each model said that it was the responsibility of the classroom teacher to make time allocations to learning tasks or to curricular areas. Student engagement is the second component of the "academic learning time" (ALT) model. Consistent with prior models of time and learning, the ALT model described a time period in which the student was actively involved in learning a task. The ALT model referred to this component as student engagement, and called it "a necessary precondition for learning" (Fisher et al., 1978, pp. 2-5). Engaged time then, not allocated time, is the time factor in the ALT model that is considered to affect achievement gains.

Error rate is the third component of the ALT model. Although a pupil is actively attempting to learn (engaged in a learning task) he may not acquire new knowledge, insights, or skills rapidly (Harnischfeger & Wiley, 1976). These authors and Carroll (1963) postulate that low aptitude, inability to understand instructions, or the quality of instruction may be contributing factors to lack of learning. The ALT model's component for lack of learning is called error rate, the degree to which "the student correctly processes and understands the learning task" (Fisher et al., 1978, pp. 2-5). The child's degree of understanding in the ALT model is also influenced by the aptitudinal and instructional variables (Bloom, 1974; Carroll, 1963).

The fourth component of the ALT model is task relevance. Task relevance is implicit in the models of Carroll (1963), Bloom (1974), and Harnischfeger and Wiley (1976). Explicitly the ALT model says that student engagement on a task must be relevant to the outcome to be measured. The other models (Bloom, 1974; Carroll, 1963; Harnischfeger & Wiley, 1976) imply that good to optimal instruction by a teacher will assure that the time spent by a student will be relevant to a learning task.

In the ALT model, like the other models, some components reside with the student (student engagement and error rate) while some components are external to the student (allocated time and task relevance).

The time learning models of Carroll (1963), Bloom (1974), Harnischfeger and Wiley (1976), and Fisher et al. (1978) all postulate learning as a function of time. Each observes that the more time used effectively on a learning task the higher the level of achievement in that learning task. There are several commonalities that run through the four models. Each model postulates that the time actually spent--the productive time-on-task--is crucial and vital for achievement gains. Each model also sees the time needed for learning and the productive learning time as being student-specific, that is, a function of the cognitive and affective characteristic of a given student. Each model refers to the performance of the teacher or the quality of instruction as being a contributing factor to learning time. The quality of instruction (Bloom, 1974; Carroll, 1963; Harnischfeger & Wiley, 1976) or teacher activities (Fisher et al., 1978) can interact with other variables and increase the time spent learning by the student or it can appreciably

decrease such time. Carroll (1963) writes: "if the quality of instruction is anything less than optimal . . . . the learner will need more time to learn the task" (p. 727). Harnischfeger and Wiley (1976) support this statement with the observation that if "only a teacher can organize a task, give clear instructions, and choose an appropriate pace and complexity level, a pupil will be able to use this learning time optimally" (p. 18).

The work of Harnischfeger and Wiley (1974; 1976) and the BTES study (Fisher et al., 1978) focused especially on teacher activities as part of the teaching-learning process. In these models, teacher planning and activities, selecting elements of curricular content, making decisions about student groupings, and specific time allocations to learning tasks have a significant effect on how the student learns.

As important as it may be, teacher planning may not always come to full fruition, as limitations hinder the individual teacher to varying degrees, sometimes hindering the teacher severely. Harnischfeger and Wiley (1976) wrote:

> these teacher planning decisions, whether curricular in the narrow sense or strategic, are constrained by sundry limitations. They depend not only on the teacher's skills and preferences, but also on her perception of pupils' needs and on distinct curricular guidelines and administrative policies. There are materials and organizational constraints to be considered: school facilities, supplies, and resources such as the available equipment or type of classroom; intellectual and personal resources such as reading specialist and curriculum libraries; organizational arrangements such as team teaching. Further, there are time constraints, such as the legislatively or administratively determined duration for school days, lunch periods, and recesses, as well as the time needed for transition from one educational activity to another. These diverse demands, supports and restraints result in considerable differences relevant to educational policy, for they provide criteria for teacher hiring and influence districts decisions about and allocation to, for example, curriculum centers, school facilities, teacher aides. (p. 18)

What is explicit then in each model is that the linking of curriculum policies, as described above, to teacher planning and to actual classroom activities determines, to a large extent, the amount of actual learning time that students can spend on learning tasks, and subsequently the pupil's acquisition or achievement--the educational outcome.

Empirical Support for the Relationship Between Time and Learning

The research on time and learning emanating from the four major and corroborating theoretical frameworks has postulated that student engaged time is positively associated with student achievement. Many researchers have used these frameworks to test for a positive relationship between time and learning. These researchers have used both experimental and naturalistic research designs.

The BTES (Fisher et al., 1978), in addition to producing a model of time and learning, was also an empirical study to test the components of the model it derived. The empirical phase of the BTES was called a field study and used the procedure of direct observation and teacher logs to collect data on instructional time for subjects. Data were collected during the 1976-77 school year on two samples of students--one at grade two and one at grade five.

The BTES utilized two pretest-posttest periods (October, 1976 - December, 1976; January, 1977 - April, 1977), and the observational data on time and teacher characteristics were collected by trained observers during the two intertest periods. There was also follow-up testing in September, 1977.

The approximately 50 teachers per grade level participating in the study were volunteers and received a small honorarium and extension

course credit for their participation. This type of reward could have influenced the teachers to "try harder" to provide the types of behaviors that observers were looking for. This would have set up an unnatural learning environment and influenced the results of the study. Three to five students from each class were selected as subjects in the study. The classes of these teachers provided an initial student sample of 150 second-grade and 134 fifth-grade students. Sample mortality decreased these figures to 139 second-grade students and 122 fifth-grade students.

Student achievement was measured with a reading and mathematics test battery developed by the researchers for this study. At the beginning of each testing phase the students' attitude toward reading and mathematics were measured with an instrument designed for this study. Measures of instructional time, "academic learning time" (ALT), were obtained from teacher logs and from direct observation. The teachers logged the time allocated for reading and mathematics for each target student for each day during the inter-test periods. Time in minutes was recorded for specific content areas rather than for an entire subject area. The components of "academic learning time" (ALT) were measured by direct observation of the target students. Observation was conducted for a full day approximately once each week. During the 23 weeks of intertest time each subject was observed in excess of 100 hours.

To determine engaged time, students' behaviors were coded as engaged when they were actively involved in either the substantive content of either a reading or mathematics task or learning directions that were required for the performance of substantive aspects of the task. The observers also noted the various teacher behaviors while in the classroom.

Specifically, they observed the presentation of the teacher, management techniques of the teacher, and the interaction of the teacher with the students.

The empirical phase of the BTES examined the relationship between the components of "academic learning time" (ALT) and student achievement, using multiple regression analysis. The analyses of the relationship were conducted on two sets of data: the data from the October through December intertest period and the data from the January through April intertest period. The data from the second set were considered to be more definitive and trustworthy than the data from the first set and also the second set was considered to be a replication of the data from the first set. This summary, for those reasons, will concentrate more on data from the latter set.

The analysis of data revealed that approximately 28% of the school day at the second grade was allocated to reading and language arts while approximately 40% of the school day was used for reading and language arts at the fifth-grade level. Each grade level allocated approximately the same amount of time to mathematics instruction (12%). For reading only it was estimated that second-grade students received an average of 59.8 minutes per day of reading instruction, while at the fifth grade this figure was 61.7 minutes per day. There was also a small disparity between student average minutes per day of mathematics for the two grades: 30 minutes per day for grade two and 34 minutes per day for grade five.

The findings also showed an average engagement rate for the period of the study of between 70 and 75% for both grades in both subject

areas. This calculation of engagement rate was done after excluding transition time from allocated time.

The researchers also examined the effects of engaged time in reading and mathematics and on student achievement. This was the product of allocated time based on teacher logs and engagement time from observation. To report these effects the proportion of residual variance in the post-achievement measure that was accounted for by engagement time was recorded. Residual variance was defined as the variance remaining in the postachievement measure after preachievement had been removed through regression.

Fisher et al. (1978) found that engaged time was positively and significantly related to student learning. Engaged time is the period of time that a student is actively involved in a learning task. Engaged time is a component of the construct "academic learning time" (ALT) which is a measure of the time a student spends engaged on a relevant task making few errors. Most important to these researchers was the academic learning time given to a content area and the relationship between the academic learning time and student's achievement in the content area. The results of two observations, out of the hundreds of observations made, are cited as examples. "Word structural syllables" for second grade was very significantly and positively related to achievement, and engaged time accounted for 7% of the residual post-achievement variance in this content area. For "fractions" at grade five, the engaged time accounted for approximately 26% of the residual postachievement variance.

The researchers concluded that the amount of time that is allocated to instruction in a content area and the proportion of that time that students are engaged is positively associated with learning in that content area. Further, they concluded that the proportion of time that a learning task provided a high success rate for a student was positively associated with student learning and that the converse was also true.

It was mentioned that instructional processes were also noted during direct observation. In doing this the researchers were attempting to determine the impact that teaching behaviors and characteristics of the classroom environment had on student learning. Observers asked the teachers to predict how their students would do on test items, rated the appropriateness of the instructions that they observed for particular students, observed the amount of teacher time provided to students, observed the interaction between the teacher and/or aide and the student, and observed the management of the class. From the analysis of these observations, in conjunction with other data collected, the researchers concluded there was a positive relationship between a teacher's diagnostic ability and student achievement in a content area. It followed naturally then that student engagement was positively related to teacher diagnostic ability. It is evident here that the teacher who can determine a student's particular needs in a content area, be they weaknesses or strengths, would be more likely to increase the student's engagement on instructional materials relative to that content area, thus increasing the student's achievement level in that content area. In addition to the positive relationship between diagnostic ability and student achievement, it was also found that the teacher's ability to prescribe appropriate

learning tasks for a student related positively to student engagement and student achievement. This latter relationship is a necessary sequel to diagnostic ability; that is, once student's needs are diagnosed some prescription would have to follow in order to involve the student instructionally to increase his engagement and hence increase his level of achievement. Researchers also found that the amount of substantive interactions (meaningful teacher-student instructional situations or instructional situations between an aide and a student) was positively related to student engagement time and to student achievement. Finally, the researchers concluded that the frequency of academic feedback (whether positive or negative), and the management of the classroom (in terms of having structure and direction) were positively associated with student engagement time and subsequently with student achievement.

The major findings of this empirical phase of the BTES were that increases in academic learning time are associated with increases in student achievement. This empirical phase did support the conceptual model that was developed earlier. The most noteworthy aspect of the BTES is the comprehensiveness with which the empirical phase was conducted. In testing the theoretical concepts hundreds of hours of direct observation on the components of the academic learning time model were made. The mere fact that this amount of time was spent observing an instructional process, and that the same observers worked in the classroom over a long period of time, give credibility to the findings of the study.

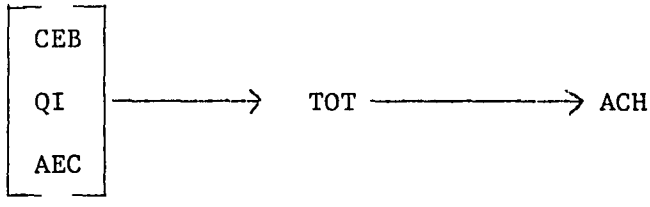
Anderson (1973) used both naturalistic and experimental designs to test for the relationship between time and learning. Jacobson (1980) and

Kiesling (1978) used naturalistic studies to test for these same relationships. Wyne and Stuck (1979) used an experimental design for their test of the relationship between time and learning.

Anderson (1973) restated the models of Carroll and Bloom and conceptualized his own model of time and learning. Anderson's model states

> that student characteristics [cognitive entry behaviors, affective entry characteristics] in a given learning environment [quality of instruction] affect the amount of time that students spend on tasks [time on task] which in turn affects the student's achievement [achievement]." (p. 94)

Schematically, Anderson's model can be represented:



The arrows in the model indicate the direction of causal relationships which are hypothesized to exist between the various components. Anderson's reconceptualization is a model in the true sense of the term: that is, it represents a conceptual scheme that identifies a set of constructs relative to academic achievement and posits relationships among them. The model also infers that student background characteristics, as well as teacher qualities, are factors that influence the amount of time that a student engages in learning.

The primary assumption in Anderson's model is that the strongest determinant of academic achievement is the amount of time (time-on-task) that a student is actively engaged in learning. This assumption is also primary in the models of Harnischfeger and Wiley (1976) and the BTES (Fisher et al., 1978).

The central relationship in the entire model is the relationship between time-on-task and achievement. Anderson, however, investigated each of the relationships in the model: the relationship between time-on-task and the antecedent variables (cognitive entry behaviors, affective entry characteristics and quality of instruction) and the affects of the antecedent variables taken individually on time-on-task. Anderson hypothesized that time-on-task would be highly related to achievement and to the antecedent variables, that there was a causal relationship between time-on-task and achievement, and a causal relationship between time-on-task and the antecedent variables, and that each antecedent variable had a direct effect on time-on-task and achievement.

To measure the percentage of time-on-task for each student, Anderson devised two indicators of on-task behavior: a classroom observation instrument and a stimulated recall technique. A trained classroom observer used the classroom observation instrument to code the on-task or off-task behavior of the observed students. This observational technique yielded a set of data points for each student from which the student's percent of time-on-task was calculated. The stimulated recall technique involved having the students' recall in writing what they were thinking about at different points during the class period. These written statements by students were given to a reader who coded the thoughts as being on-task or off-task behaviors. The two time-on task measures were combined into a single score for each student and yielded the percentage of time-on-task for the student. In coding on-task and off-task behavior the observers would have to carefully monitor the behavior being exhibited by the subject and consider the age level of that subject.

Generally, on-task behavior would be behavior during which a student is attending to academic matters or tasks. There would be the absence of socializing, day dreaming, doodling, or other such behavior. On-task behavior, however, is more easily determined for primary age students because when they are off-task it is so apparent. Older students have the necessary sophistication to appear on-task yet, mentally, be completely apart from the task.

Anderson postulated that if no associational relationship existed between the critical variables, time-on-task and achievement, there could be no associational relationship between the other variables inherent in the model. Further, he postulated that if the associational relationships did not exist between all variables in the model it would be useless to conduct an experimental study to test for causal effects of manipulated variables.

Anderson's naturalistic study examined the relationship between the critical variables of time-on-task and achievement. The samples were taken from two mathematics classes at two different grade levels in a junior high school. The school was located in a middle class suburb of a midwestern metropolitan area. One sample consisted of 27 students in a seventh-grade arithmetic classroom and the second sample consisted of 28 students in a ninth-grade algebra classroom. The two classrooms were chosen randomly from all of the seventh and ninth grade classes in the junior high school.

The six-day naturalistic study utilized the same procedure for both the algebra and arithmetic classrooms. To determine each student's entry level in arithmetic, achievement scores on teacher-made tests given prior

to the study were summarized and used as a measure of cognitive entry behavior. On the first day of the study each student was administered a pretest in mathematics. On the second day of the study, to determine how each student felt about his mathematical ability, a math self-concept inventory (to determine a measure of affective entry characteristics) was given to each student. Each student was also asked to give his perception of the teacher's instructional ability by completing a questionnaire which asked about how well the teacher explained the math concepts to the student and how often a student was rewarded for correct responses. On the third, fourth, and fifth days of the study students were observed in the classroom during approximately twenty minutes of teacher presentation and approximately thirty minutes of seatwork for the purpose of gathering a time-on-task composite for each student. On the last day of the study the pretest was readministered as a posttest to each student.

The results of Anderson's naturalistic study demonstrated that there was an associational link between the components of the model. He concluded that there was a high associational relationship between time-on-task and achievement for the 27 students in the arithmetic sample ($r = .59$) and for the 28 subjects in the algebra sample ($r = .62$). Having found this relationship between time-on-task and achievement, Anderson sought to determine what influence the antecedent variables had on time-on-task. He found that the three antecedent variables were not significantly related to time-on-task for the arithmetic sample ($R = .38$) but for the algebra sample there was a significant relationship ($R = .68$). The antecedent variable of quality of instruction was found to have the least amount of significance in each sample (arithmetic, $r = .14$, algebra,

r = .30). Anderson's naturalistic study did establish that the antecedent variables accounted for from approximately 15% (arithmetic) to 50% (algebra) of the variation in time-on-task. With time-on-task being the central variable in Anderson's model, and with the antecedent variables explaining, in each case, less than 50% of the variation in time-on-task, these findings do not adequately show that the antecedent variables had an influence on time-on-task. If any gains in achievement are attributed to an increase in time-on-task then it must be considered that some other antecedent variables also had a causal effect on time-on-task.

Anderson's naturalistic study substantiated the claim of time-and-learning theory, that is, that there is a positive relationship between time and learning. He then proceeded to examine the causal mechanisms underlying the relationship by conducting an experimental study.

Anderson hypothesized that most students, if given enough time and help, could learn various types of subject matter to a relatively high level of competence. He suggested that help could come in the form of mastering content in a sequence of learning tasks to a preset criterion as preparation for learning a final or critical task. This is to say that in a sequence of six tasks, the first five would be preparatory for the sixth. He argues that in such a sequence, students would spend approximately the same amount of time-on-task to attain a criterion level on the critical sixth task despite their differences in ability. Anderson conceded that students who spend a lesser percentage of the allocated time for a critical task engaged in learning will need more elapsed time to spend the necessary amount of time-on-task to reach a criterion level. The amount of time needed (Carroll, 1963) would be

specific to each student. This postulate serves as the basis for Anderson's investigation of the causal relationship between time-on-task and achievement.

To investigate the causal relationship between the antecedent variables and time-on-task, Anderson hypothesized that students for whom the antecedent variables were higher (regardless as to whether the increased quality rested with the teacher or the student) would spend greater percentages of time-on-task and greater gains in achievement would be evident. These antecedent variables, according to Anderson, would have a collective and separate effect on time-on-task and achievement.

Anderson's final investigation of causal effect covered mastery learning and time. He hypothesized that mastery learning strategies would provide a better quality of instruction than conventional strategies; they would cause students to spend a greater percentage of their time-on-task, and have less elapsed time on a critical task.

In his experimental study the sample consisted of three classes (of 26, 27, and 29 students each) of eighth-grade math students. The students and treatment were randomly assigned to the classes. Treatment consisted of a three-unit sequence of programmed material in matrix arithmetic taught under two different strategies. The first two classes used mastery learning strategies (one class having a preset criterion level of 85% for mastery and the other class a preset criterion level of 75% for mastery). The third class used a more conventional teaching/learning strategy. The basic difference between the instructional methods of the groups was that the students in the mastery learning

classes were given additional time and help to obtain the preset criterion level while students in the conventional classroom were not given the additional time or help, nor were they required to obtain a preset criterion level (Anderson, 1973).

Cognitive entry behavior was measured by a score on the Lorge-Thorndike Intelligence test and by the student's achievement on a prior task in the program. Affective entry characteristics were measured by the student's score on a math self-concept inventory and by the student's response to a question about how interesting the next task in the series would be based on their experience with the prior task. A summative pretest and the math self-concept inventory were administered to the students prior to the beginning of the experiment. The students in this study completed a programmed booklet of math instruction. Following the completion of the programmed booklet the students took a formative test to determine their achievement on the programmed materials. A time was recorded for their work on this booklet and the formative test. The students in the mastery learning strategies who had not obtained the preset criterion level (85% for mastery or 75% for mastery) were given review materials and subsequently tutorial service (if they needed it) to obtain the preset criterion level. Thus, all students had an original amount of time to complete the programmed materials and formative test. Only mastery learning students who did not reach criterion level initially had additional time and/or help. The sum of these amounts of time constituted the total amount of time-on-task for each student. At the end of the experiment each student was readministered the summative examination as a posttest measure.

Anderson analyzed these data from the experimental study by investigating the associational relationship between the critical variables of the model for the total sample of 82 students and also separately for the 27 students in the conventional classroom. He supported his findings from the naturalistic study by finding an associational relationship between time-on-task and achievement. Time-on-task explained approximately 40% ($r = .66$) of the variability in achievement for the 27 students in the conventional classroom and approximately 44% ($r = .58$) of the variability for the 82 students in the total sample. He also found that the antecedent variables had an influence on time-on-task in this experimental study. Antecedent variables explained 32% of the variability of time-on-task. Separately each antecedent variable (cognitive entry behaviors, $r = .52$; effective entry characteristics, $r = .35$; and quality of instruction, $5 = .50$) was significantly related to the variable of time-on-task. These findings of associational relationships from the experimental study supported the finding of the naturalistic study. Anderson then investigated the causal effect of the variable of the model on achievement.

To investigate the causal relationship between time-on-task and achievement Anderson observed the amount of time-on-task necessary to reach a criterion level by three different groups of learners over the three learning tasks. Anderson chose three groups as follows: Group One consisted of students in the conventional and 75% mastery learning classes who achieved 80% or more on the formative test for all units the first time they were taken; Group Two consisted of students in the 85% mastery learning classes who scored 80% or higher on the formative test

for Unit Three the first time it was taken (these students did not necessarily score 80% or above in the initial amount of time on all three units); and Group Three consisted of students in the 85% mastery learning group who required additional time or help on Unit Three.

Anderson found no significant difference between the mean time-on-task for Groups One and Two in either Unit One or Two. However, there was a significant difference between the mean time-on-task of Groups One and Two and that of Group Three in the first two units. The magnitude of significance decreased in Unit Two--an indication that the mean time-on-task of the three groups was becoming less variable. On the third unit there were no significances between the three groups. Each group needed approximately the same amount of time-on-task to learn the materials to the preset criterion level. These findings supported Anderson's hypothesis that learning a sequence of preparatory tasks to a preset criterion level would insure students of different ability levels to learn a criterion task using the approximately same amount of time-on-task.

To investigate the causal effect between the antecedent variables and time-on-task, Anderson examined the means and standard deviation of the three classes (two mastery and one conventional) on percentage of time-on-task and original percentage correct on the critical task (Unit Three).

Anderson had established that the three classes were extremely similar in general mental ability and performance on the first of the three units. Thus, their cognitive entry behaviors were not significantly different. The three classes did not differ significantly on affective entry characteristics either. The only difference in the three

classes, among the antecedent variables, was in the quality of instruction. Recall that Anderson made the assumption that the mastery learning strategy was a better method of instruction than conventional learning strategy. This, then, was the only antecedent variable manipulated.

When Anderson looked at the causal effects of manipulating the antecedent variable of quality of instruction on time-on-task, he found that in the conventional class both the percentage of time-on-task and the percentage of correct responses on unit formative tests decreased over the entire sequence of the three units. Conversely, he found that in the 85% mastery learning classes both the percentage of time-on-task and the percentage of correct responses increased over the sequence of the three units. The combined results of the two mastery learning classes, when compared with the result of the conventional class on percentage of time-on-task and original percentage correct, showed the same results. There was a significant difference between percentage of time-on-task and the percentage of correct responses for students in mastery learning classes over students in conventional learning classes. He concluded from these findings that there is a causal relationship between the antecedent variable of quality of instruction and time-on-task and achievement.

Anderson continued with a separate examination of the effects of the antecedent variables on time-on-task and achievement. He found that students with high cognitive entry behaviors, regardless as to what class they were in, had a high percentage of time-on-task and original percentage correct across the three units. This was not the case for the antecedent variable of affective entry characteristics. There was no significant difference between percentage of time-on-task and original percentage correct for students of high and low interest in math.

Anderson (1973) summarized his studies with this statement:

> The evidence suggests that time-on-task is a significant variable in school learning; that it is related to, and affected by alterable, learnable, and situation specific antecedent variables, and finally, that it is related to, and affects, student achievement. (p. 102)

Jacobson (1980) reported on a naturalistic study that attempted to find out if students who spent more time in reading and mathematics classes exhibited greater gains in reading and mathematics achievement than those who spent less time in those classes. Jacobson also questioned whether the quality of time which a student spent on a subject had an affect on achievement gains. Jacobson's work was heavily influenced by the theoretical models of Carroll (1963) and Harinschfeger and Wiley (1976).

This study, conducted during the 1978-79 school year, utilized a pretest-posttest design with time-on-task data being collected during the interim. The sample in this study consisted of 200 third grade students enrolled in three elementary schools. The schools were selected which had differing demographies (socioeconomic status, urban area, rural area) and each purported to individualize instruction. Initial achievement data were gathered from an achievement test administered the year prior to the observation year and from a posttest which was administered at the end of the school year. The difference between the two derived test scores was recorded as achievement gain in reading and math. The researchers calculated the amount of time that was allocated to reading and math per school; observed each class to determine the time-on-task percentage for each student, and the amount of teacher time (direct instruction) contributed to students by each teacher.

Jacobson found that there was a statistically significant difference between the amount of instructional time allocated to reading and math by each school. The average reading class length in minutes per day for School One was 57.2; for School Two, 71.0; and for School Three, 64.8. For math instruction the average class length per day for School One was 63.3 minutes; for School Two, 44.9 minutes; and for School Three, 45.5 minutes. Jacobson supported earlier research findings of Harnischfeger and Wiley (1976) that there was a wide variation in the quantity schooling available to individuals.

Jacobson also investigated student use of time (Carroll, 1963) and the amount of direct instruction (Berliner & Rosenshine, 1977) in the schools. He found significant differences in the percentage of time-on-task of students in the three schools. School One had a mean percentage of time-on-task in reading of 76.4 (that is, 43.7 minutes); School Two, a mean percentage of 66.4 (that is, 47.0 minutes; and School Three, a mean percentage of 70.1 (that is, 45.4 minutes). When Jacobson analyzed these data by reading ability levels he found that high ability students spent the greatest percentage of time-on-task (70.1%) and low ability students the least percentage of time-on-task (68.8%). These differences are not of great magnitude; however, it is noteworthy that students of lower ability received the greatest amount of teacher time (direct contact with the teacher in a one-to-one, small group, or large group situation). Intuitively, it seems that the small difference in the percentage of time-on-task (1.3%) between high and low ability students is a direct result of the greater percentage of teacher time given to the lower ability students. Higher ability students had the least amount of teacher time. These

amounts of teacher time, like allocated time and time-on-task, varied significantly by schools. The same results were found for students in the math subject area.

Jacobson also investigated the relationship between the amount of time spent in reading and math and achievement gains. Reading scores were reported as scale score gains. The students in reading showed a gain of 10.5 scale score points and the students in math a gain of 12.1 scale score points. Students with lower ability had more gains in reading (11.58 scale score points) than students of higher and average ability. Recall that these students also received more teacher-directed instruction. Conversely, students with higher ability had more achievement gains (12.96 scale score points) in math than other students. Achievement gains in reading and math were significantly different by schools and School One, which had the greatest percentage of time-on-task in reading and math, had the greatest amount of achievement gain (12.0 scale score points for reading and 14.7 scale score points for math).

Jacobson's findings supported the postulates that time-on-task has a positive relationship to student achievement. He corroborated the findings of Anderson (1973) that higher ability students spend more time-on-task than lower ability students. He also supported the position of Berliner (see Note 2) that lower ability students benefit more from teacher directed instruction. Jacobson concluded that the results of his study were related to and had implication for the scheduling of student time in elementary schools. He wrote:

> teachers, administrators and school boards should pay close attention to unused school time . . . in relationship to the amount of actual instructional time available to students (allocated time) . . . . the great amount of transition time, preparation time, and

> other forms of process behavior which distract from the actual instructional time take away from the affective use of time during the school year. (p. 157)

Jacobson's naturalistic study, unlike Anderson's naturalistic study, was a summary of ongoing activities in three schools. There was no attempt to alter the critical variable of time-on-task, but rather to report on the relationship of time allocated and the use of time in the schools. This researcher considers the study a demonstration that adequate time allocations are necessary prerequisites to effective use of time and increase percentage of time-on-task. Jacobson's study adequately points out that scheduling procedures must take into consideration the need to plan for transition and managerial time.

Kiesling (1978) reported on a study that investigated the relationship between a student's reading performance and the amount of instructional time (spent on varying modes of reading instruction). This study investigated the time allocated for learning (Carroll, 1963) assuming that the quality of instruction was uniform among the instructors or that the differences varied randomly.

Kiesling had five major concerns in his research effort:

1. The allocation of resources (time) to students of different ability levels
2. The effectiveness of instruction according to the different sizes of instructional groups
3. The effectiveness of various types of instruction according to the achievement level of students
4. The shape of the functional relationships that exist between instructional time and reading performance according to student ability level and to type of instruction

5. The effectiveness of a locally produced criterion-referenced instrument as opposed to more widely used norm-referenced tests

The subjects in this study were approximately 2,400 elementary students (grades four, five, and six) in four New York State school districts. The total sample at the beginning of the study consisted of approximately 5,877 subjects. The sample mortality included the loss of what was originally a fifth school district and about 600 other cases in the other four school districts. Kiesling believed that the large sample, even though it was not randomly selected probably was an adequate representation of population. The subjects were stratified by reading ability for analyzing results and not required to be representative of all students in the population. One would tend to agree with Kiesling's claim of a nonbiased sample.

A pretest-posttest design was used and the students were administered a norm-referenced and a criterion-referenced test as a pretest in February and the same instruments as posttests in May. The California Achievement Test was the norm-referenced instrument and the criterion-referenced instrument was devised locally by the school district. During the study the students were administered a series of criterion-referenced tests so that continuous monitoring and feedback could be done.

Instructional time in the study was described by type of instructor (classroom teacher, reading specialist, paraprofessional) and mode of instruction (whole group instruction, small group instruction, individualized instruction and individual help). Regression analysis was used to analyze the data and the data were examined for linear relationships between instructional time and achievement as well as curvilinear relationships that would result from saturation.

Regarding the allocation of instructional time to student ability groups Kiesling (1978) found that the greatest amount of time was allocated to the lowest ability students (students two and three levels below grade level). These findings were identical to those of Jacobson (1980). However, Kiesling seems to have characterized these students as being students of low academic ability in general rather than just being "behind" in reading. This distinction should have been made as it is not uncommon for students of average ability to have a lag in reading ability. This is the premise on which Title I Reading Programs are developed; that is, that additional time and instruction at an appropriate level can have a compensatory affect and close the gap between general ability and reading ability. Across the three modes of instruction, and compared with students a grade level below, at grade level or a grade level above, these low ability students received 32% of the instructional time allocated.

In his analysis of the effectiveness of instruction, when compared to the size of the instructional group, Kiesling found that slightly less than half of the students had positive relationships between teacher-directed large or small group instruction and reading performance. The percentage of statistically significant positive relationships was consistently greater for students at or below the proper grade level for both small-group and large group instruction with one exception; that is, students at the lowest level had the smallest number of positive relationships in small group instruction. Kiesling, again, does not define "lowest level" as being lowest reading level or lowest ability level. However, in either situation the number of the occurrences of positive relationships

should be secondary to the fact that the positive relationships did occur. Kiesling also found that individualized instruction by specialists and the individual help of paraprofessionals was found to be more positively related to reading performance than for small or large group instruction.

Kiesling tested for both linear and curvilinear relationships between amounts of instructional time and reading performance. He concluded that the affects of additional amounts of large group instruction was constant and not decreasing. This was not an indication of a true curvilinear form because there was not a corresponding decrease to the rise of achievement after it reached its highest level. Instead, and as has been pointed out, achievement levels in reading remained approximately constant over time. When small group instruction was investigated, Kiesling found a definite linear relationship between the amount of instructional time and reading performance.

Kiesling found no support for the hypothesis that students' performance on the criterion-referenced instrument showed more consistently positive relationships to instructional time than the results on norm-referenced tests.

Wyne and Stuck (1979) reported on a study that also gave empirical support to the previously described theoretical frameworks. They postulated a positive relationship between time and achievement and speculated that increased time-on-task in reading would increase reading achievement. This experimental investigation was conducted in two schools in an eastern North Carolina city. One school was a primary school (K-3) located in a predominantly white, relatively affluent area, while the other school was an intermediate school (4-6) located in a predominantly black, economically depressed area.

The sample consisted of students from grades two, three, five, and six of the selected schools. Teachers were asked to refer students for screening who had the ability to achieve but were performing well below grade level in reading and had persistant classroom behavior problems or inattentiveness.

All subjects were selected using the following criteria: that they had an IQ of 89 or above as determined on the Short Form Test of Academic Attitude; that their achievement on reading was one or more grade levels behind as determined on the Comprehensive Test of Basic Skills; and that each had less than 50% on-task behavior during reading instruction in the regular classroom as measured by the Walker Observation Scale. This initial screening resulted in a population of 60 eligible students per school. From this population the students were randomly assigned to be in a time-on-task classroom or a comparison classroom (control group).

With this pretest-posttest control group design Wyne and Stuck manipulated the variable of time-on-task to determine the effects that an increase in time-on-task would have on reading achievement. Anderson (1973) had already established an associational and causal relationship between time-on-task and achievement using the subject area of math. Wyne and Stuck's intervention procedure, a time-on-task classroom, was used to alter the off-task behavior of the students assigned.

Ten subjects in each school were assigned to the time-on-task classroom (a second and third grade combination class and a fifth and sixth grade combination class) and remained for the morning for an eight week period of time. At the same time, ten subjects were assigned to a

control group in the regular classroom. At the end of the eight-week phase the children from the time-on-task classroom returned to their regular classroom on a full-time basis and ten different students were randomly assigned to the time-on-task classroom and to a control group in each school. Three separate eight-week intervention phases were conducted in both schools.

As a measure of achievement in the study the Metropolitan Achievement Test was used as a pretest, posttest, and follow-up test (follow-ups at eight weeks and sixteen weeks after returning to the regular classroom). To compile baseline data on student time-on-task, each subject was observed during reading instruction in the regular classroom using the Walker Observation Scale for a ten day period before intervention began. Two other preparatory tasks completed prior to a student's intervention were an orientation session on the rules and procedures of the time-on-task classroom and the writing of an individualized program of reading instruction for each student by the time-on-task classroom teacher.

Intervention procedures in the time-on-task classroom were organized around the individual instructional program for the subjects. At the beginning of each day the subjects received an individual packet of assignments, with instructions for completion. The basic premise of time-and-learning theory is that the amount of time needed is "student specific." Carroll (1963) points out that when a student's ability to understand instruction is less than optimal the amount of time needed by a student is likely to increase. The ability of a student to understand instruction then must be given consideration in this study due to the individualized approach that is used.

The methodology of this study also included a positive reinforcement technique that was designed to condition attending behavior. The fact that it was used in the time-on-task (intervention) classroom and not with the comparison group made the experimental environment even more atypical than usual. These researchers should have considered using a second experimental group to discern the effects this behavior modification technique had on time-on-task. The procedure that was employed confounded the findings of the study.

There was a significant difference in the reading achievement in the experimental and controlled groups. Students in the intervention classrooms at both schools had higher scores than students in the comparison classroom. These achievement levels remained significant throughout the eight week and sixteen week follow-up periods for the students who were able to be included in this comparison.

The prediction that students in the time-on-task classroom would spend higher percentages of time-on-task was upheld. Students in the time-on-task classrooms had an increase in mean time-on-task that ranged from 25% to 85%. The increase in time-on-task for students in comparison groups ranged from 25% to 40%. Throughout the follow-up period, all students in the study maintained a higher percentage of time-on-task. The increase in time-on-task by students in the control groups results from a phenomenon known as the "Hawthorne Effect" (Roethlisberger & Dickson, 1939). The teachers of comparison group students were simply aware of the fact that an effort was being made to increase reading achievement by increasing time-on-task.

Wyne and Stuck concluded that the findings of their study gave empirical support to Carroll's (1963) theoretical position on the relationship between the time variable and acheivement. Wyne and Stuck cite some 200% increase in percentage of time-on-task from pre-intervention to the conclusion of intervention. These results however, require some qualifications. Previous research (Anderson, 1973) has established that higher ability students spend a greater amount of time-on-task than lower ability students. The subjects in Wyne and Stuck's experiment were of average ability so this must be taken into consideration when examining the increase in percentage of time-on-task. In addition, the subjects were taught in homogeneous groups using individualized methods and subjected to positive reinforcement techniques to condition attentiveness. All of these factors certainly enhanced the causal affect between time-on-task and achievement.

Nevertheless, the Wyne and Stuck study did support the theoretical position of an associational and causal relationship between time-on-task and learning.

Summary

Walberg and Frederick (1982) have concluded that "learning is produced in schools in a context of many variables. One variable operating is time--time spent in homework, on a lesson, in a school year, or in a lifetime of schooling" (p. 7). The time models discussed in this chapter have been helpful in organizing the array of variables that may explain differences in achievement outcomes. These models have been conceptually sound and have been essential for guiding the research for causal relations between what happens in classrooms and what students

learn. Their basic premise has been that students must be engaged actively in the act of learning in order to achieve. The models have achieved their purpose of explaining the variation in pupil achievement as a result of the pupils' use of instructional time.

Carroll's (1963) model has served as the basis for the construction of other models of time and learning. Carroll's model emphasized that pupils will tend to learn what they spend time trying to learn and will tend not to learn what they do not spend time trying to learn. Bloom's (1974) adaptation of the Carroll model addresses the variation among pupils in time needed to achieve a criterion level of performance. The BTES model (Fisher et al., 1978) has as its main construct academic learning time (ALT) in which student engagement time is the major determinent in student achievement. Finally the model of achievement by Harnischfeger and Wiley (1976) considered teacher and pupil time to be a primary resource in education and advocated that policy decisions should focus on optimizing the allocation of instructional time.

Each one of these models was an important step toward understanding the process of student learning within our schools. Each possessed the unique feature of relating school and teacher characteristics to achievement through the intervening variable of pupil pursuit of learning (time-on-task). These four frameworks suggested new research questions regarding the way in which organizational factors affect teacher activity and the way the behaviors of the teachers within the classroom determine student opportunities to learn.

The research questions posed by these conceptual frameworks have been answered through empirical research studies that examine the

hypothesized relationships in both naturally occurring and experimental environments.

Six empirical studies were examined. All but one (Kiesling) used a direct observational technique that allowed the researcher to examine engaged time as well as allocated time. In each model discussed the effective use of time by students (student engagement) was the crucial factor in increasing achievement gains.

Anderson (1973) established associational and causal relationships not only between the amount of time engaged in learning (time-on-task) and achievement, but also between teacher and student characteristics (antecedent variables) and the amount of time engaged in learning.

An inordinate amount of time was devoted to the review of the Anderson (1973) study because of its twofold purpose: (a) to establish that an associational relationship existed between time and learning as had been theorized by Carroll (1963), Bloom (1974), Harnischfeger and Wiley (1976), and the BTES (Fisher et al., 1978); and (b) to establish that a causal relationship existed between student and teacher characteristics and time-on-task and between time-on-task and achievement. This study was considered to be the empirical guide for assessing and evaluating other studies (Jacobson, 1980; Kiesling, 1978; Wyne and Stuck, 1979) discussed in the review.

Grader, Thurlow, and Ysseldyke (1982) conducted a review of literature on the relationship of engaged time (time-on-task) to learning. Their review supported the review of literature of the present study. They wrote: "studies of the importance of time as a variable in learning stem from the work of Bloom (1974), Carroll (1963), Wiley and

Harnischfeger (1974) . . . ." These authors acknowledged that most studies on time and achievement have focused on the variable of engaged time. However, they did not discount the importance of allocated time. They point out that studies of engaged time must rely on direct observation to determine whether a student is engaged. The Beginning Teacher Evaluation Study (Fisher et al., 1978) was cited as an example of a major direct observation research effort. The cost of this federally funded study was approximately eight million dollars. Other such studies have cost far less; nevertheless, there is a substantial cost factor that prohibits the conduct of these studies in public schools without funding assistance.

The empirical studies discussed in the present study examined the direction and strength of the relationship between time and learning. Each supported the contention that time devoted to school learning is a predictor of achievement and that the strength of the relationship would vary according to several variables.

CHAPTER III

METHODOLOGY

Pre-Experimental Designs and Validity

The validity of an experiment is a direct function of the degree to which extraneous variables are controlled. The failure to control such variables makes it difficult to evaluate the effects of the manipulated or independent variable and the generalizability of the effects. A true experimental design provides for the control of these extraneous variables. A pre-experimental design cannot control for all sources of invalidity (Glass & Stanley, 1970).

The one group pretest-posttest design is a type of pre-experimental design which uses a pretest, exposure to a treatment, and a posttest. In this design the success of the treatment is determined by comparing the pretest and posttest scores. There are many sources of invalidity not controlled for in this design. However, when the analysis of data is done in conjunction with other evidences, valid conclusions can be drawn.

Gay (1976) observed that the validity of a test is simply the degree to which the test measured what it is supposed to measure. Gay wrote: "there is no quality or virtue of a test that can compensate for inadequate validity" (p. 87). Cronbach (1971) supported Gay's statement and wrote: "validation is the process of examining accuracy of a specific prediction or inference made from a test score . . . validation examines the soundness of all of the interpretation of a test" (p. 433).

Cronbach likens validation to the evaluation of a scientific theory in which the evaluation is an opportunity to modify or extend the theory. Validation then "is more than corroboration; it is a process for developing sounder interpretations of observation" (Cronbach, 1971, p. 443).

The validation of a research study, like the validation of a test, can be determined by the degree to which it measures what it is supposed to measure. Research studies like tests are designed and constructed for many purposes. This means that a test or a study would have to be validated with a specific purpose foremost in mind. The validation process then has to be specific to the purpose of the test or study. To address the problem of purpose, several types of validity (content, construct, concurrent, and predictive) are applicable to research studies and tests.

Cronbach (1971) observed that construct validity determines the degree to which certain explanatory concepts or constructs account for performance on tests. Construct validation then calls for evidence and asks if an explanation can be given for test behavior and what it implies for behavior in other situations (inference). Repeated reference has been made to tests in this section. However, these references apply to all procedures for collecting and summarizing data. Research studies which involve a construct can be substituted for tests and such studies are only valid to the extent that the measure of the construct involved is valid. Construct validity then is a validation procedure that can be used to control for invalidity in pre-experimental designs.

An empirical investigation starts from a theory about behavior or mental organization derived from prior research. In the research studies

discussed in the previous chapter the construct of "time-on-task" was said to have an observable affect on student achievement. Naturalistic and experimental designs were used in these studies to support this hypothesis. In the present study a pre-experimental design was used to investigate this relationship between time and achievement.

Construct validation in support of pre-experimental research should begin with the claim that the given construct accounts for certain observable behaviors. The process of validation calls for evidence in the form of convergence of indicators that lend support to the claim. A convergence of indicators may be (a) observable changes in subjects after treatment or intervention, (b) observation of behavioral changes of students in similar situations, (c) the lack of observable changes in subjects in different situations, (d) reports from other researchers working with the same constructs, and (e) comments from persons charged with the implementation of systems to test the construct.

An attempt to demonstrate construct validity starts with a reasonably definite statement of the proposed interpretation of the effects of the construct. This interpretation should outline what evidence is most worth collecting to demonstrate the convergence of indicators. The researcher should then be able to integrate the hypothesis of findings with the evidence and offer a conclusion as to the soundness of the construct and its inferential usefulness.

This technique of construct validation will be used to support the findings of the present study in the succeeding chapters.

The Scheduling Model

The employment and utilization of teachers with specialities (teachers for learning disabled children, mentally handicapped children, speech impaired children, etc.) has caused the school day to become more and more fragmented. This fragmentation has hampered the instructional program by sharply dividing the instructional time for students going to specialized programs and altering the times scheduled for students who do not attend such programs.

An attempt was made at Brown Summit Primary School, in Browns Summit, North Carolina (in the Guilford County School System) to remedy the effects of fragmentation by employing a model of flexible scheduling termed Parallel Scheduling. The Parallel Scheduling Model was designed to address the fragmentation of the school day by scheduling small teacher directed reading groups at times when they did not conflict with support service activities such as remedial reading classes or a support service class. Support services tend to create a fragmented primary school day. Figure 1 and Table 1 illustrate how this schedule works. The scheduling procedure was also designed to reduce the heterogeneity of the classroom by providing for, generally, only two homogeneous reading groups per 26 student class. This provided for, generally, a teacher/pupil ratio equal to 1:13 during directed reading time. Reducing heterogeneity also enhanced the grouping by students for other subject areas and classroom projects.

The scheduling procedure involved developing a master schedule (Figure 1) that allocated approximately 50% of the instructional day to language arts activities. From this master schedule were derived other

schedules (reading laboratory schedule, media center schedule, and support service schedule for Title I reading, special education, gifted and talented education, and physical education). These schedules are shown as Figures 2, 3, and 4.

With a schedule in place and the fragmentation of the instructional day lessened, students were able to move in concert--and not haphazardly--to support service programs. Each teacher was then able to allocate forty minutes per day for teacher-directed reading groups, forty minutes per day of large-group language arts activities (where all the students were in their own classroom), and to schedule any student who qualified for a support service for an additional forty minutes of instructional time that did not conflict with the student's directed reading time or with the class large group language arts time. Additionally, each student who did not qualify for a support service program received an allocation of forty minutes of reinforcing activity from a paraprofessional on a daily basis.

It was postulated that by reducing the fragmentation of the school day, by increasing the homogeneity of the classroom, and by causing small teacher/pupil ratio during directed reading time, a greater opportunity for increasing academic learning time (ALT) was provided. It was also argued that the effective use of this increase in time with the smaller group would be the key factor in increasing reading achievement.

Description of Population

The Brown Summit Primary School is located in Guilford County approximately twelve miles north of Greensboro, a city of approximately 155,000 people. The Brown Summit-Monticello School Zone crosses the

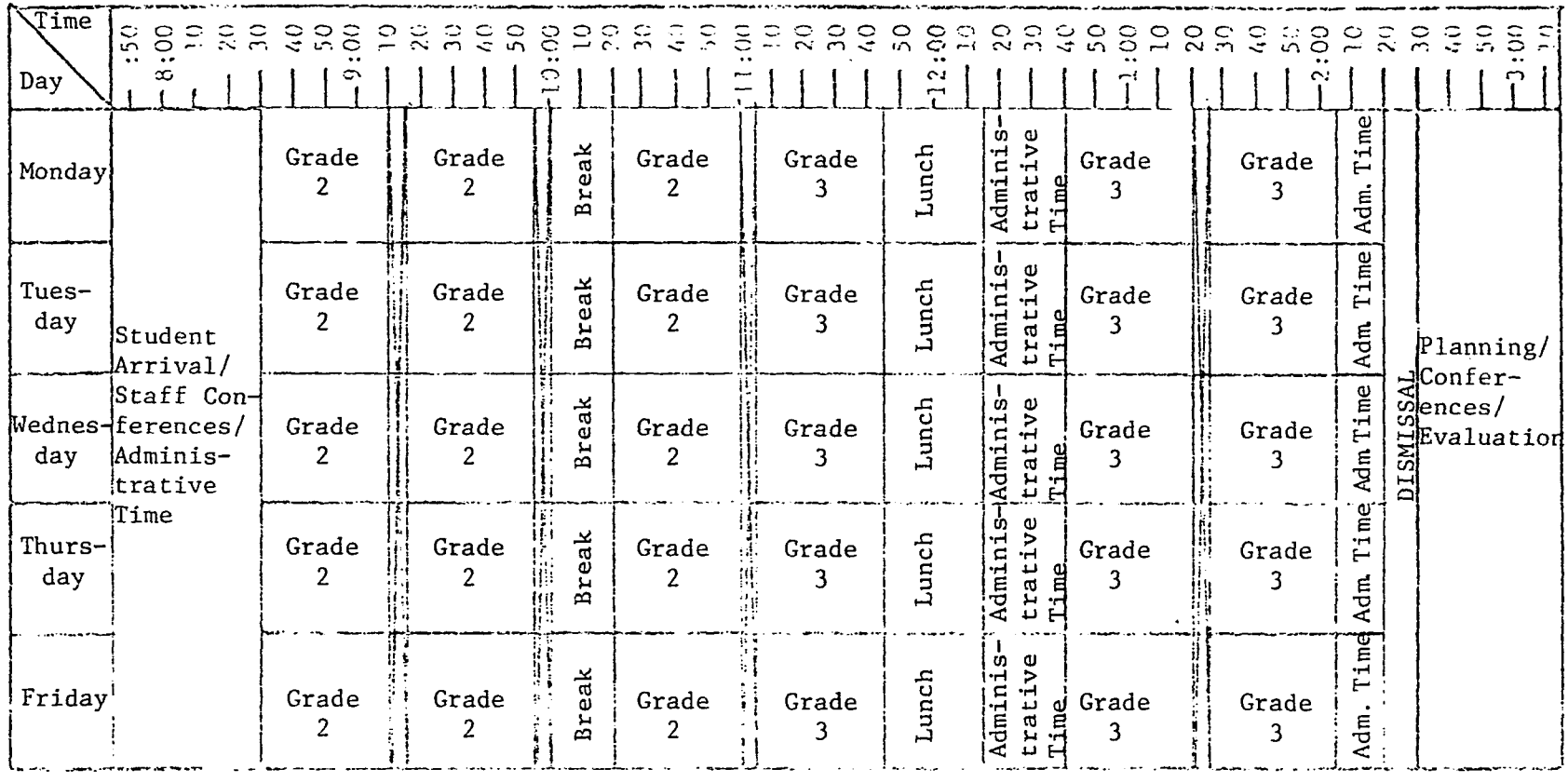


Figure 2. Reading Evaluation Center (Lab) Schedule for Brown Summit Primary School.

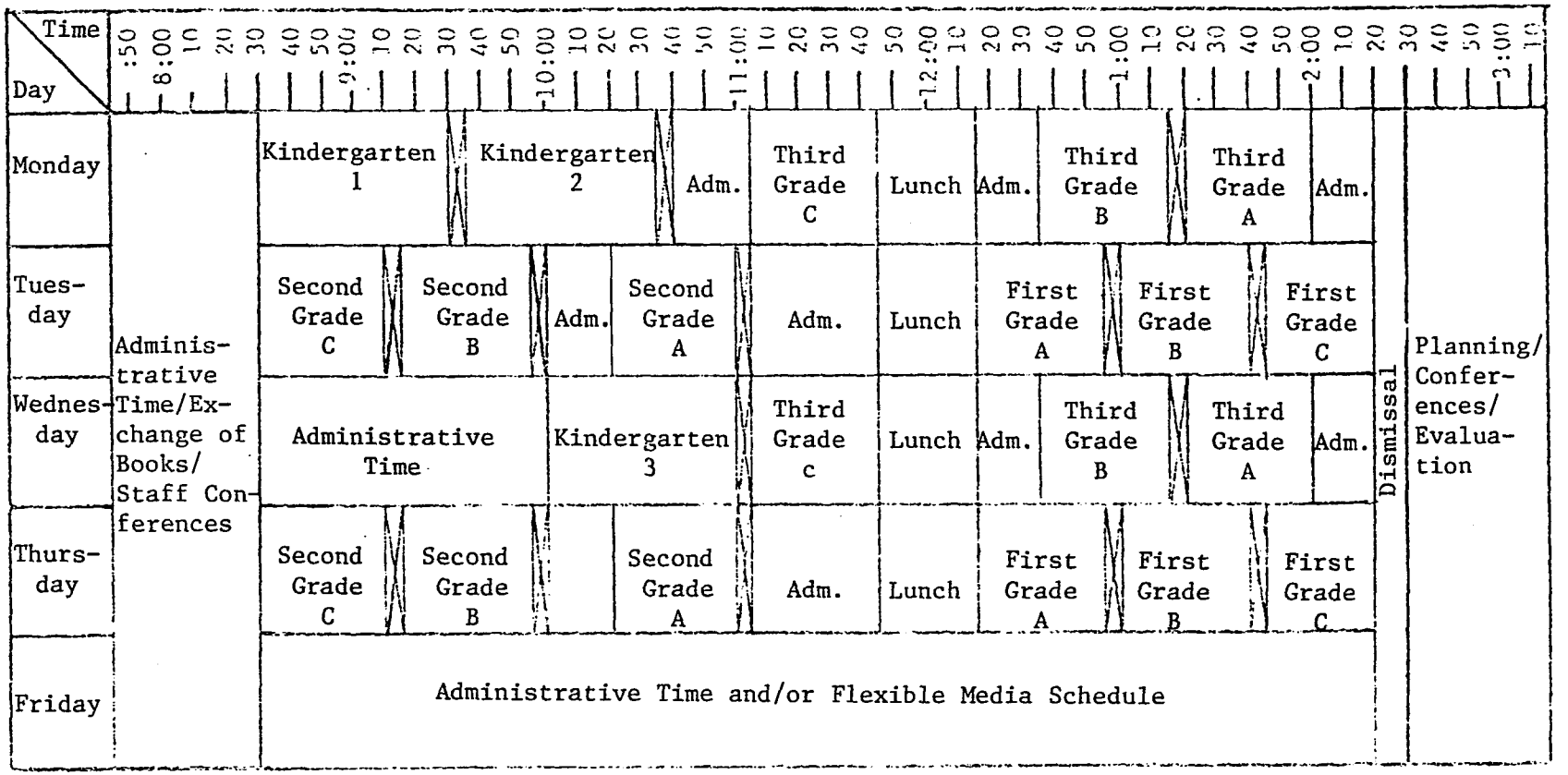


Figure 3. Media Center Schedule for Brown Summit Primary School.

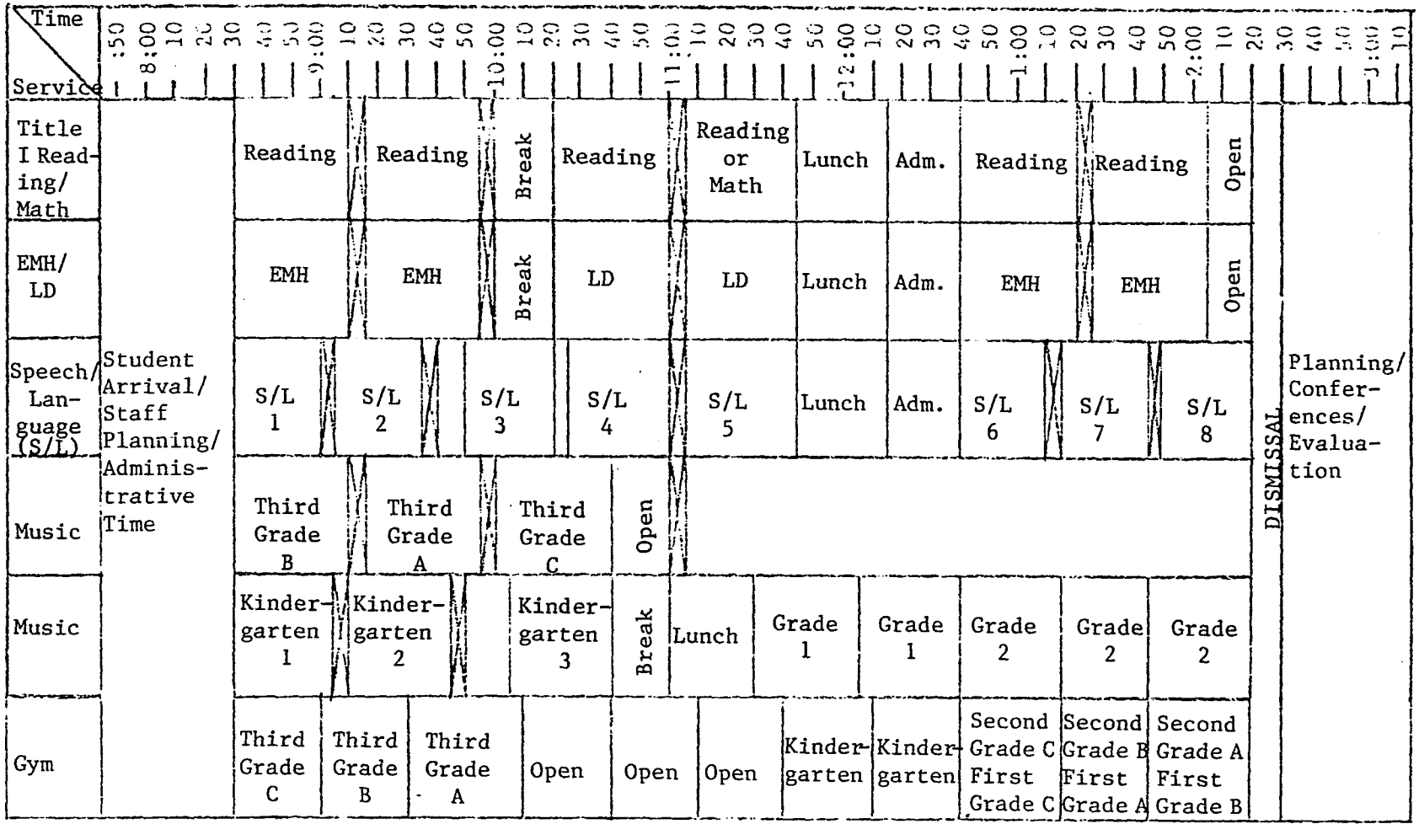


Figure 4. Support Service Schedule for Brown Summit Primary School.

northern half of three of the 15 townships of the county. These townships are Monroe, Madison, and Washington Townships. Four other schools, Brightwood Elementary (Grades 3-6), Poplar Grove Primary (Grades K-2), Monticello Elementary (Grades 4-6), and Madison Elementary (Grades K-6), are also located in the three townships.

The 1980 Census of the Population and Housing Characteristics of Persons (Bureau of the Census, 1980) lists the population of the three townships as 12,606 persons (Monroe, 7,354; Madison, 3,308; and Washington, 1,944). Of these residents, 80% are white and 19% are black. All of the residents in the Madison and Washington Townships are classified as rural residents, and 95% of the residents in the Monroe Township are classified as rural residents. The townships have a total of 3,565 families and 4,245 households with 72% of the families being classified as married couple families. Of these, 48% are classified as married couple households with two or more children residing in the household.

The median age of persons in each township is approximately 30 years of age, and 12% (1,477) of these residents are children of primary school age (5-9 years old). Approximately 16% (250) of these students attend the Brown Summit Primary School.

Selection of Sample

The sample is this study consisted of 70 second-grade students in three classrooms enrolled at Brown Summit Primary School for the 1980-81 school year. The students were of different ability levels in reading, ranging from two levels below grade level to one level above grade level. The students were not randomly selected for the experiment nor were they

randomly assigned to classrooms. Since the sample and the population were the same and since the students were stratified by reading ability levels, the sample was considered to have the effects of randomization and the 70 students to be representative of all students in the population and the school. There was diversity among the subjects in terms of socio-economic status, race, intelligence level, aptitude, and other such characteristics as are typically controlled by random sampling. Nineteen of the subjects were black and 51 were white. Twenty of the subjects qualified for the Free and Reduced Lunch Program. There were no data available for the subjects on IQ or aptitude. Achievement data for 46 of these students as first graders are shown in Appendix D.

Data Collection

Test Scores on Children

A pre-experimental research design--pretest, treatment, and post-test--was used to collect data for the present study. Two test instruments were used to measure reading skills: a norm-referenced test, the California Achievement Test (CAT) reading subtest (McGraw-Hill), Forms 13D (1978), 13C (1978), 12C (1977), and 11C (1977); criterion-referenced test, The Prescriptive Reading Inventory (PRI) (McGraw-Hill), Level Brown (1976), Level Green (1972), Level Blue (1972), and Level Orange (1972). The CAT measures achievement in the area of reading, among other areas, for students from beginning kindergarten to twelfth grade. The PRI is designed to do this for reading in grades kindergarten through twelve. Pretests were administered in mid-October.

Functional level testing (testing each student with materials of appropriate difficulty) was an important concern in the development of

this study. To facilitate functional level testing with the CAT, a brief locator test available from the CAT battery was administered initially to each student. The results from the locator test was used to select the best level of the CAT (the functional level) for each student in the experiment. Following this determination of functional level (by use of the locator test), each student was administered the functional level of the CAT in the area of reading to determine their initial placement. The following week, for three days, each student was administered the criterion-referenced instrument (PRI) at the same functional level. This test yielded a diagnostic profile for each student showing the areas of strength and weakness in reading and provided information with which each teacher could make decisions about the instructional program for each student or for student groupings. The data collected from the criterion-referenced test were placed in computer storage so that they could be easily updated and printed for teacher use.

Comparison Test Scores

Forty-six of the 70 subjects in the study were first-grade students at Brown Summit Primary School during the 1978-79 school year and remained through the 1981-82 school year as third-grade students. Each of these students had an estimated achievement score for the California Achievement Test that was predicted from their results on the Primary Reading Inventory taken during the first-grade year, and an actual achievement score on the California Achievement Test (taken during the third-grade year). These scores were compiled so that achievement gains could be analyzed. For comparison, the same type of data were collected from four other schools in the school system: Brightwood Elementary

(Grades 3-6), Poplar Grove Primary (Grades K-2), Madison Elementary (Grades K-6), Gibsonville Elementary (Grades K-6), and Sedelia Primary (Grades K-3). These schools were chosen because they had similar school populations, similar school communities, and a similar demographic make-up as the Brown Summit Primary School and school community (see Table 2). Students who attended Poplar Grove Primary School for grades K-2, attended third grade at the paired Brightwood Elementary School. One point to be noted here is that all students who attended third grade at Brightwood Elementary School did not necessarily attend Poplar Grove Primary School for the first grade year or the second grade year. It is conceivable that these third grade students at Brightwood Elementary School could have attended any other primary school in the district or out of the district for the first three years of schooling.

Questionnaire

There were 10 teachers involved in the implementation of the model of flexible scheduling at Brown Summit Primary School and the evaluation of that model during the 1980-81 school year. An open-ended questionnaire was devised which solicited teacher comments on the effectiveness of the scheduling model in reducing the fragmentation of the school day, increasing the homogeneity of the classroom, and providing additional time allotments to the language arts component and the subject area of reading. The questionnaire was mailed to nine of the 10 teachers involved in the 1980-81 evaluation to be completed. Along with the questionnaire, a letter of instruction was sent that included a summary statement on the model of flexible scheduling and what it purported to do in reducing the fragmentation of the primary school day. In an attempt

Table 2

Data on Five Townships in Which Comparison Schools are Located

Category	Townships				
	Madison	Monroe	Washington	Jefferson	Rock Creek
Population	3,308	7,354	1,944	10,296	5,366
Rural Residents	3,308	7,021	1,944	8,846	3,390
White Residents	2,329	6,069	1,734	7,811	4,238
Black Residents	967	1,258	206	2,379	1,117
Median Age of Residents	29.6	29.8	31.8	30.5	29.6
Primary School Age Children	399	884	194	1,165	601
Number of Families	889	2,141	535	2,862	1,483
Number of Married Couple Families	475	997	263	1,315	670
Number of Households	1,040	2,583	622	3,555	1,863
Number of Married Couple Households	774	1,830	473	2,400	1,222
Number of Single Family--No Husband or No Wife	115	204	62	309	161

to maintain anonymity of response, the teachers were requested to complete the questionnaire and return it in a postage-paid envelope to a typist who would transcribe their responses and return the handwritten questionnaire to the respondents (see Appendix D for the letter of instruction, Appendix E for the summary, and Appendix F for a copy of the questionnaire).

Intervention

Each teacher involved in the study conducted an instructional program within the confines or time limits specified by the master and auxiliary schedules and as specified by local and state curriculum guides. Unique in this instructional program was the diagnostic profile that had been determined for each student. The profile provided a basis for each teacher to concentrate efforts on student weaknesses with direct instruction, by using the paraprofessional or the teachers of support service classes. The profile also provided a basis for teachers to select content areas or learning tasks that were strong and only in need of enrichment or enhancement activities. This type of instructional program continued from mid-October 1980 through mid-March 1981. The posttest measure (the same functional level of the CAT) was administered during the last week of March and the first week of April 1981.

It is important to note, with regard to the treatment, that even though each teacher was following the curriculum guides, was working within the confines of the same scheduling procedure, and had the same amount of time allocated to reading and language arts activities, methodologies and approaches were specific to the individual teacher. The only control factors here were frequent observations of the teachers, support

teachers, and paraprofessionals by the principal that rendered the performance of all of the individuals concerned to be well within acceptable limits.

The principal, who was the author of this study, was the advocate for scheduling changes being a solution to the problems of fragmentation and heterogeneity. The principal, with input from other staff members, devised the master schedule and other auxiliary schedules for the school. The principal also made the assignment of students to reading groups and reading groups to teachers to make up a classroom. As assignments were being made to the teachers, the principal assigned students for attendance to support service classes so that there would not be a conflict of time for teacher-directed reading.

Analysis of Data

A pre-experimental design was used to conduct the study, and data were collected over a six-month period of time. Data consisted of a summary of allocated time that was provided through use of the model of flexible scheduling, achievement scores for the 70 students at Brown Summit Primary School and 187 students at the four comparison schools, and responses to a questionnaire that were completed by the teachers involved in the 1980-81 evaluation of the model of flexible scheduling at Brown Summit Primary School. These data were analyzed as shown below.

Measures of Allocated Time

The master and auxiliary schedules for the school gave time allocations for all components of the school program to include time allocations to support services. These schedules were reviewed to determine the total allocation of time per day to the language arts components, to

the subject area of reading, and to support service classes (Title I Reading classes, speech and language classes, special education classes and extension activities). From these analyses, an allocation of time in minutes per day was determined for each component or subject area.

Achievement Scores

Achievement scores were reported as scale scores (scale = 000-950) because these scores allowed the measurement of student progress between successive testings. A mean scale score was computed for each group, and a gain score was obtained by finding the differences between the two means. A *t* test was used to compare the actual mean difference and to determine whether the two means were significantly different at a selected probability level. The October 1980 pretest score and the April 1981 posttest score for the 70 subjects at Brown Summit Primary School were analyzed to determine their progress along a grade-level continuum for that six-month period of time. This examination attempted to determine whether each student made the equivalent of six months of academic progress during the course of the study. A *t* test was used to examine these data. Additionally, the correlation between the mean gain score for the 70 subjects at Brown Summit Primary School and the average number of days absent for these subjects were examined for their relationship. The Pearson *r* was used to examine these sets of data.

Response to Questionnaire

Responses to the open-ended questionnaire were analyzed by giving the percentage of return, the number of respondents to each item, and by providing a summary of the response by the respondents. No attempt was made to relate the experience or background of the respondent to the questionnaire items.

CHAPTER IV

RESULTS

The data collected by the procedures described in the previous chapter were used to examine the hypotheses of the study. This chapter presents the results of the study in the context of each hypothesis. The hypotheses of the study are as follows:

1. The use of the model of Parallel Scheduling will reduce the fragmentation of the school day, thereby increasing the time allocation to language arts and to reading instruction.
2. With more opportunity to learn in reading and language arts, with smaller and more homogeneous reading groups, and with more direct and continuous reading instruction, academic learning time (ALT) will increase for reading and result in more reading achievement.

Reduction of Fragmentation

The master schedule for the school shows that in grade two, language arts was scheduled during the morning hours and for grade three during the afternoon hours (see Figure 1). The model also shows that classes were composed of only two homogeneous reading groups (see Table 1). Pull-out programs and heterogeneity were considered to be the primary causes of fragmentation in the school day. Alternating the language arts block (morning and afternoon) and reducing the heterogeneity of the classroom addressed the problem of fragmentation.

In examining the Schedule Model for Reading Groups and Extension (Table 1), one can observe that a student in grade two, with Teacher A, would be scheduled for directed reading from 8:30 a.m. to 9:10 a.m. If that student qualified for Title I Reading, a speech and language class, or a special education class, the student would be assigned to attend that support service class from 9:15 a.m. until 9:55 a.m. The student then would not have a conflict between teacher-directed reading and Title I Reading. Additionally, the same student would not have a conflict between large group language arts activities and support service class. The schedule, in fact, provided for a distinct teacher-directed reading period of 40 minutes per student, a distinct period for support service activities or reinforcement activities of 40 minutes per student, and a distinct period for large group language arts activities of 40 minutes for all students. During the large group language arts period, in the instance of Teacher A from 10:20 a.m. until 11:00 a.m., the classroom teacher would be assured of having all of the students in the classroom at the same time.

Three items on the questionnaire completed by teachers related to the fragmentation of the school day. Six of the nine questionnaires (67%) were returned (verbatim responses to each item are included in Appendix G). The consensus of these respondents was that the fragmentation was reduced. One respondent commented: ". . . students who qualify for support services are pulled from one of the extension periods. This prevents a student from missing any classroom instruction." The respondents appeared to favor having master and auxiliary schedules that preplanned for student assignment and attendance to support services,

thus relieving teachers of having to coordinate these assignments. The responses also indicated that there was a recognition of the importance of adequate time allocations to support service classes as well as adequate time allocations to teacher-directed reading instruction in the regular classroom.

Increased Time Allocation to Language Arts and Reading

The master schedule was examined to determine time allocations in general, and especially to the language arts component in grades two and three. This examination revealed that 360 minutes of instructional time was available during the school day. Of this time, 42% (150 minutes was scheduled for the language arts component. When transition and break timewere taken into account, the resulting amount of actual instructional time for language arts was 120 minutes (33%) per day. The total amount of actual instructional time allocated per student for teacher-directed reading, support services or extension activities, and large group language arts was equal to the product of the minutes per day (40) and the number of days (120) of the study. Each student could have received 4,800 minutes (80 hours) of instruction and/or reinforcement in reading, large group language arts, and/or support service extensions. It should be noted that for two days per week during a large group language arts period each second and third grade class attended the Media Center. The instruction during this period of time was conducted by the media specialist, and the objective of the Media Center, in addition to teaching media skills, is to support each instructional component of the school program. On some days when these students attended the Media Center, the instruction may have related to

language arts, while on other days it could have supported some other subject area. Table 3 shows these time allocations.

Table 3

Daily Time Allocations to Subject Areas and to Management

	Large Group[a] Language Arts	Math	Science/ Social Studies	PE	Read-ing[a]	Lunch	Manage-ment
Minutes (%)	40(11%)[b]	50(14%)	50(14%)	30(8%)	80(22%)[c]	40(11%)	70(19%)

[a]These two areas combined totalled 120 minutes (33%) of the instructional day.

[b]For two days per week at this time, the students attended the Media Center.

[c]Each student received 40 minutes per day of teacher-directed reading and 40 minutes per day of support service or extension activities.

The model of flexible scheduling was instituted because fragmentation from pullout programs limited the amount of actual instructional time that could be provided per student in reading and other language arts activities. From the preceding section it was determined that the fragmentation of the school day was substantially reduced. This finding, along with the findings on time allocations provided by the use of flexible scheduling, shows that the time allocation per student for reading was increased.

Seven of the teachers surveyed were employed at the school prior to its using a model of flexible scheduling. Each of the six respondents

commented on the questionnaire item related to increased time allocation to reading instruction. Two of the respondents commented that increased time allocated to reading was "not applicable" to them. The consensus of the remaining four was that the time allocated to reading was increased. One respondent commented: ". . . by reducing the fragmentation of the school day, and having two reading groups, more time was allocated to each group." Another respondent compared the time allocation for reading at Brown Summit Primary School to other schools and commented: ". . . with observations [I have] made in other schools I can easily see where [flexible scheduling] could increase the time for reading."

Reduction of fragmentation and increased time allocation to reading instruction were two components of the first hypothesis of the study. The information obtained from the review of the master and auxiliary schedules, and the perceptions of the respondents given on the questionnaire support this hypothesis.

Increased Academic Learning Time (ALT) in Reading

With increased allocated time to reading, the hypothesis that the academic learning time would increase in reading was examined. The construct of academic learning time (ALT) is four dimensional, consisting of allocated time, engaged time, error rate, and task relevance. Engaged time can only be determined from direct observation of students in an instructional setting by an independent observer. This was not a provision of the present study. The contention was that the classroom teachers would use any increase in allocated time to increase the engagement rate of their students on relevant tasks that would decrease the number of errors on those tasks.

At the beginning of the study each student was administered an appropriate level of the Primary Reading Inventory. This diagnostic technique was used to determine an individual instructional profile for each student from which relevant prescriptions could be made. This individual inventory, along with homogeneous grouping, was to provide the opportunity to increase engagement time. The students' progress was monitored during the course of the study and their performance on the objectives of this criterion-referenced instrument charted. A thorough examination of these progress charts showed that there was an increase in the number of students obtaining mastery of objectives during the timeline of the study as was expected. These increases are graphically shown in Figure 5.

One item on the teacher questionnaire asked teachers if they were able to increase their students' engagement time in reading as a result of increased time allocations. Three of the six respondents felt that the item was "not applicable" to them. Three respondents felt that they were able to increase their students' engagement, citing fewer distractions and reduced teacher-student ratios as the primary reasons.

Achievement in Reading

Achievement was measured in the present study by the difference in pretest and posttest scores for the six-month study and by the difference in a score obtained on the Primary Reading Inventory in grade one and a score obtained on the California Achievement Test in grade three. Seventy students were pretested in October 1980 and posttested in April 1981. Twenty-four of these students were either not enrolled at Brown Summit Primary School as first graders before the intervention or not

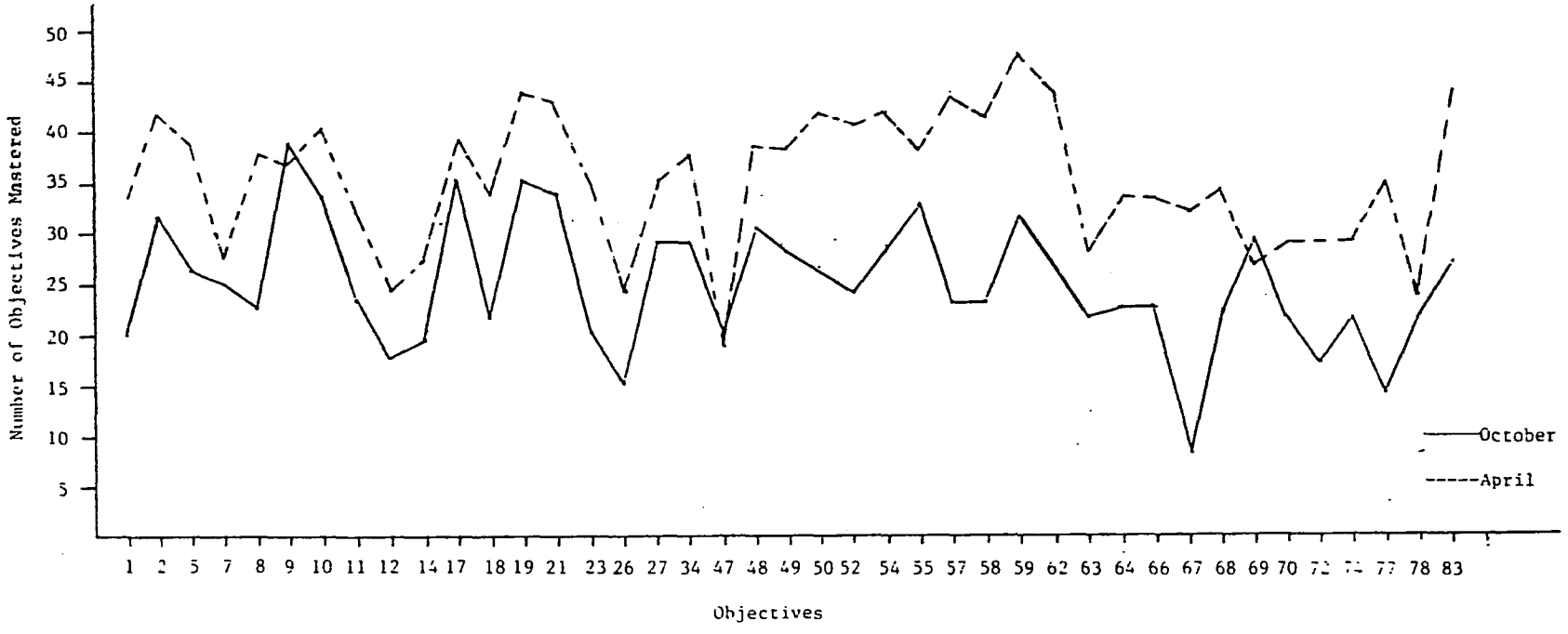


Figure 5. Changes in the Number of Objectives Mastered on the Primary Reading Inventory, Level Green.

enrolled as third-grade students after the intervention. The mean increase in scale score points for these students on the California Achievement Test was 35.83 points. This was a very significant increase ($p \leq .0001$). The 46 remaining students were enrolled at Brown Summit Primary School as first graders and remained enrolled through the 1982 school year as third grade students. The mean increase for these 46 students on the California Achievement Test was 39.04 scale score points. This was also a very significant increase in the achievement score ($p \leq .0001$). These data are shown in Table 4 for both groups of students.

Table 4

Mean Increase in Scale Scores for Students at Brown Summit Primary School on the California Achievement Test for the October 1980 - April 1981 Testing

n	Mean	Standard Deviation	t
24	35.83	26.62	6.59*
46	39.04	25.28	10.47*
70	37.94	25.60	2.45**

*$p < .0001$

**$p < .05$

These same 46 students were tested as first-grade students at Brown Summit Primary School and again as third-grade students at the end of the 1981-82 school year. The difference in their first-grade test and the third-grade test showed a 99.04 scale score point increase ($p \leq .0001$), a very significant improvement over the three-year period.

During the six-month study a scale score gain of 30 points would have represented normal progression for a student along a grade level continuum. An analysis of the data showed that 45 (64%) of the students made six months of progress during the study. The mean achievement score for the 70 subjects (37.94 scale score points) during the six-month study was compared with the norm score of 30 points for significance. A *t* test was used as a test of significant difference between the two means. The 70 subjects made significant gains in achievement during the six month study.

The scores of the 46 students who remained at Brown Summit Primary School for the three year period of time were compared with students from four other schools for the same time period. Two schools employed a type of flexible scheduling in an attempt to increase allocated time while two schools did not have any type of special scheduling model. The results of this comparison are shown in Table 5. The achievement gain for each of the four schools over the three-year period was highly significant.

When the scores of the 46 students at Brown Summit Primary School were compared for significance against the 187 students at the four comparison schools, there was not a significant difference between the means of the two groups. A similar comparison between the 46 students at Brown Summit and the 86 students of schools that did not have any type of special scheduling model showed no significant difference (see Table 5).

Achievement in reading at Brown Summit Primary School did show highly significant gains at the end of the intervention. This led to a further examination of the performance of these students. The 70 students were separated according to beginning grade level placement

Table 5

Comparison of Mean Scale Score Increases for Five Schools Over a Three-Year Period on the Primary Reading Inventory and the California Achievement Test

School	n	Mean	Standard Deviation	t
Experimental School				
Brown Summit Primary	46	99.04	33.04	20.33*
Schools with some scheduling model				
P/B	39	103.77	31.78	20.39*
S	62	82.30	32.41	19.99*
Schoolw without any type of scheduling model				
G	51	93.47	37.98	17.57*
M	35	94.14	26.81	20.77*
G and M combined	86	93.74	33.71	-00.87
All schools	187	92.04	33.64	-01.28

*p .0001

(below grade level, at or above grade level) from their scores on the pretest and final grade level placement according to their scores on the posttest. Twenty-six of the students were below grade level at the pretest and 44 were at or above grade level at the pretest. The corresponding numbers for the posttest of the study were 24 and 46 respectively. There was a net change of only two students between levels and there was not a significant difference between the mean scores of the levels on the pre- and posttests.

The findings show that there was not an inordinate amount of upward or downward progression by the subjects. Progression, for all but four

students, was within the grade level range. It was not expected that there would be a large percentage of upward progression by the subjects. For students at or above grade level, Kiesling (1978) found that some of these students reached a saturation point in terms of achievement in a subject area. Thus, additional amounts of time was of no consequence when that point was reached. Kiesling also found that students working below grade level benefited more from additional time than from teacher and paraprofessionals.

The research of Kiesling (1978) supports these findings--that is, that students at or above grade level as well as students below grade level, progressed along a grade level continuum making a minimum of six months of academic progress in reading during the six-month study (see Table 6).

Table 6

Beginning and Final Grade Level Placement for 70 Subjects at Brown Summit Primary School at Pretesting and Posttesting

		Posttest: Above	Posttest: Below	Total
Pretest	Above	9	0	9
	Below	2	13	15
	Total	11	13	24

		Posttest: Above	Posttest: Below	Total
Pretest	Above	33	2	35
	Below	2	9	11
	Total	35	11	46

The number of days absent during the timeline of the study was compiled for each subject. Subtracting the time allocation for the days absent gave a more proximate measure of the actual instructional time received by each student. The 70 subjects were absent for an average of 5.9 days during the study, and the number of days ranged from zero to 19. When mean days absent were correlated with the mean scale score gain of 37.94 points on the California Achievement Test, there was a very small relationship between the two means ($r = .17$)--an inconsequential effect.

The teacher questionnaire contained one item on achievement which asked teachers whether they felt that any growth in achievement was due to a scheduling change. Five of the six respondents commented on the item. Each of these respondents felt that achievement gains in their students were due in part to scheduling changes that had provided more time for teacher-directed instruction and more homogeneous groupings of students.

It appears that this hypothesis was not supported by the findings of the study. The findings show that more time was allocated to language arts and reading instruction and that more task relevant instruction was possible. However, there was not a definitive measure for engaged time to support a claim of increased academic learning time and resulting increases in reading achievement.

CHAPTER V

DISCUSSION

Chapter V will be divided into six sections: a review of theoretical models and empirical investigations, a summary of the results of the present study, an examination of the results of the present study, future research, the implications of the results, and the conclusion of the study.

The Theoretical Models and Empirical Investigations

The perennial model in studies of time and learning is the Carroll (1963) model of school learning. Other theorists, Bloom (1974), Harnischfeger and Wiley (1976), and Fisher et al. (1978) have expanded the Carroll model and developed their own models of time and learning. Carroll (1963) defined time as the central variable in school learning. According to Carroll, the time that a student is actively engaged in learning is a better predictor of achievement than elapsed time. Along with effective use of time by a student, Carroll (1963) saw the quality of the instruction by teachers and the aptitude of the student as determining factors in student achievement. Bloom's (1974) study called the time that a student spends engaged in learning a task the time-on-task. Like Carroll, he believes that this measure of time is the best predictor of achievement. Bloom also feels that prior learning, a student's perception of self, and instructional quality have effects on achievement.

Anderson (1973) and Wyne and Stuck (1979) conducted empirical investigations to test the relationships postulated in the Carroll (1963)

and Bloom (1974) models. Anderson conducted both a naturalistic study and an experimental study that established associational and causal relationships between student and teacher characteristics and time-on-task, and between time-on-task and achievement. Anderson reconceptualized the models of Carroll and Bloom and developed his own model to explain these relationships. Wyne and Stuck (1979) found that increased time-on-task resulted in achievement gains and concluded from their experimental study that their findings gave support to the Carroll (1963) model.

Harnischfeger and Wiley's (1976) model of school learning, like those of Carroll and of Bloom, stated that students' active learning time on an instructional topic was the most important determinant of achievement. The Harnischfeger and Wiley model focused on teacher activities in the teaching-learning process as being factors in student achievement. Teacher planning, grouping, and time allocations are considered to have significant affects on student achievement. Jacobson (1980) and Kiesling (1978) conducted studies that supported the research done by Harnischfeger and Wiley. Jacobson (1980) and Kiesling (1978) found wide variations in the time allocated to students in schools and to students of differing ability levels.

The Beginning Teacher Evaluation Study (BTES) (Fisher et al., 1978), like Harnischfeger and Wiley (1976), focused on research on classroom conditions and learning activities that increased student achievement. The BTES, the most comprehensive of the time and learning studies, developed a model for conceptualizing school learning. Its Academic Learning Time (ALT) model has as its central construct academic learning

time. This is a four-dimensional construct which states that the amount of time that a student is engaged in a relevant task, making few errors, is the best predictor of achievement.

In addition to being a theoretical research effort, the BTES included an empirical investigation to test the Academic Learning Time (ALT) model. This empirical investigation supported the theoretical position that engaged time was the most important determinant of achievement.

Summary of the Results of the Present Study

The first hypothesis of the present study states that the model of flexible scheduling will reduce the fragmentation of the school day and increase the time allocation to language arts and reading. The results indicated that fragmentation was reduced and that time allocation to language arts and reading were increased. Conflicts between scheduled instruction in the classroom and support service classes were eliminated. The elimination of these conflicts reduced the fragmentation, resulting in increased time allocations per student in language arts and reading instruction. The resulting allocation was 120 minutes (33%) per day of actual instructional time to language arts and reading instruction.

The second hypothesis of the study states that increased allocations of time to reading will provide for an increase in academic learning time (ALT) which in turn will increase achievement in reading. The results indicate that only three of the components of academic learning time were provided for by the flexible scheduling. There was no data on engaged time, the central variable of academic learning time. There was a significant increase in reading achievement by the 70

subjects at Brown Summit Primary School during the six month study. There was a significant increase in reading achievement by 46 of these students over a three year period of time. However, when the scores of these students were compared with the scores of 187 students from four comparison schools, with and without some type of scheduling procedure, there was no significant difference between the scores of the two groups. The results thus indicate that the hypothesis was rejected.

An Examination of the Results of the Present Study

The present study reported on an innovation, a scheduling model, that attempted to bring about a change in the allocation and use of time during the school day. Innovations most often come to schools or school systems because of mandated changes. Sarason (1982) wrote ". . . the potent source of change has come not from within the school system . . . . [and] schools have had little option about assimilating and accommodating to change" (p. 9). Changes that mandated special education programs, lunch and breakfast programs, and other such remedial or compensatory education programs resulted in the problem of fragmentation that was addressed in the present study.

Uniquely, the impetus to address the problem of fragmentation at Brown Summit Primary School with the use of a model of flexible scheduling came from within (from the school staff) rather than a mandate from outside the school. The question should certainly be raised as to why the innovation was not successful.

The research on instructional time and learning demonstrates that time is a modest predictor of achievement but it also cautions that there is a need to clarify the conditions under which more time spent does

indeed produce more learning (Frederick & Walberg, 1980; 1982). Before the intervention with the model of flexible scheduling, fragmentation was assessed by the school staff as being the primary cause of the limited amount of instructional time available for language arts. After the innovation, that is, flexible scheduling, it was concluded that the assessment was correct and that the innovation selected was an appropriate one. It is important now to answer the question as to why the innovation was not successful and to look at ways that success could have been achieved. There was not an awareness that change was a process rather than a singular action in implementing the flexible scheduling model. In effect, an oversimplified diagnosis was made that resulted in the placement of a scheduling model at the school without any other considerations. Diagnosis, writes Sarason (1982), "is problem-locating, problem-solving, decision-making, and action-producing . . ." (p. 51); thus, there should have been a diagnostic process that clarified the conditions under which the innovation could have resulted in greater gains in reading achievement than in comparison schools. The diagnostic process should have planned for ways to effect change in teaching behaviors and to enhance the abilities of the teachers to effectively use and manage any additional allocations of time.

The researcher of the present study had knowledge of a school in each of three school systems in the state of Virginia that used a type of flexible scheduling to reduce fragmentation of the school day. None of these schools had collected data to evaluate the effects of the scheduling on time use and achievement.

In summary, innovations alone do not work. This was the fundamental error in reasoning of the present study. It was assumed that the pre-service teacher preparation and experiences of the staff members were adequate enough for them to make practical use of the tenets of time and learning theory without in-service training.

The findings of the present study appear to have inferential usefulness only to Brown Summit Primary School and to the school system within which it is located. These findings stand in isolation because there were no baseline data on the amount of instructional time available, student characteristics and background, teacher characteristics and background, or the effective use of instructional time prior to conducting the study. These types of data were not available for Brown Summit Primary School or for the four comparison schools used in the study.

Future Research

To make the results of a study, such as the present study, generalizable to other populations it is suggested that the present study be examined as if it were a pilot study and examined in light of what features should be added. As discussed before, it was concluded that the staff of the school selected an appropriate innovation to address the problem of fragmentation of the school day. However, the implementation of the innovation was inadequate. A review of the methodology used in the present study revealed that three considerations, if included in a future study, would provide an adequate study on the use of flexible scheduling as a means of increasing instructional time and thus increasing achievement. The three considerations are (1) an examination of factors that effect innovations, (2) the collection of

process data (teacher behaviors) and observational data of students, and (3) the use of data other than traditional standardized measures to determine the worth of the innovation.

Factors That Effect Innovations

It has been pointed out that simply instituting an innovation will not bring about change. There are several factors that must be in operation before an innovation can be effective. These are (1) monitoring of the implementation, (2) feedback on the implementation, (3) administrative support to the practitioners, (4) student orientation to the new procedure, and (5) in-service education relative to the innovation (Wiles & Bundi, 1979). Any innovation attempted must be monitored and feedback given on its operation so that the necessary adjustments can be made as time progresses. Administrative support to the innovation is just as vital as any other factor, both from a psychological and a logistical point of view. Just as an innovation would be new to a practitioner, the procedures would be new to the student. Thus, there is a need to orient the student to the procedure. The one factor that would provide the knowledge and training to the persons implementing the innovation to provide for all of the factors is in-service education. This factor will be discussed in more detail below.

In-service programs are used to improve teaching--to increase and up-grade content knowledge in areas of specialty and to increase teacher effectiveness in the teaching-learning situation (Palmer, 1978). In-service programs must then be designed to satisfy the needs of the participants with rewards and incentives that will provide for and stimulate the motivation of the participant.

The improvement of instructional methodologies are useless if their benefits are not incorporated into the classroom (Rubin, 1978). Educators, regardless of how good their preservice preparations may be, need to be able to make continual readjustments to new demands placed upon them. The effective use and management of increased allocations of instructional time was the demand imposed on the teachers at Brown Summit Primary School. The only form of in-service provided for the staff prior to the use of the model of flexible scheduling was on a very limited basis, and consisted of a consultant's presentation and explanation of flexible scheduling as a remedy to fragmentation. There was no in-depth in-service on how to use any additional time derived. Additionally, teachers were not afforded the opportunity to explore this new area and become fully aware of all aspects relative to it before implementing the innovation. The teachers did, however, visit a school with a model of flexible scheduling in operation to make observations. In-service education on the essence of time and learning theory, classroom management techniques such as effective use of paraprofessionals, planned transitional and managerial time, physical arrangements of classrooms, the use of the diagnostic process, and the interrelatedness of all factors that affect innovations would provide for the clarifications of the conditions under which more time could increase achievement. With these pieces in place, the innovation alone does not have to be relied upon to bring about the desired change.

The Collection of Process and Classroom Data

In an ongoing teaching-learning situation, or one using an innovation, what happens between the teacher and the student is important. The

collection of process data should focus on the classroom behaviors of the teacher--that is, the frequency and quality of these behaviors and their relationship to student achievement (Fisher et al., 1978). Behaviors such as teacher feedback to students and its warmth and frequency, the attitude of the teacher, the teacher's concern and consideration for students' feelings and worth, the teacher's efforts to make learning enjoyable, and the teacher's efforts to make the classroom facility completely and totally suitable to student learning are factors that should be observed and evaluated in relationship to their contribution to student achievement. Recall that each of the theoretical frameworks reviewed held the quality of instruction as being an important determinant of time used for instruction. Process measures of the teacher would then be measures of the quality of the instruction.

Karweit and Slavin (1981) have examined measurement choices in studies of time and learning and outlined four measures used--scheduled time, actual instructional time, engaged time, and engaged rate. They have concluded that "the engagement measures produced the more consequential effects of time on learning. Nonetheless, measures of allocated time are still important because they provide the constraints within which the results for engagement time must be interpreted" (p. 157). Cotton and Savard (1981) supported Karweit and Slavin's contention of the importance of allocated time and wrote:

> there is a positive relationship between the amount of allocated time for studying a subject and achievement in that study . . . . most of the supportive studies reveal a "modest, but persistent" relationship between allocated time and achievement, especially for low ability students and especially if greater time allotments are spent in interactive activities with the teacher [or a paraprofessional] rather than on homework and seatwork. . . . (p. 3-4)

Karweit and Slavin's findings support the postulates of each of the theoretical models reviewed in the present study. Each model advocates that the active use of time by students is the best predictor of achievement. The empirical investigations reviewed proved these suppositions by showing a moderate and positive relationship between engaged time and student achievement.

An equally important position has been taken by Karweit and Slavin, that is, that without the adequate allocation of time to a subject or content area, engagement time would be minimal. Allocated time then would become critical for low ability students who, generally, require a longer period of time to achieve. Anderson (1973) posited that, given necessary amount of time, most students could achieve. Harnischfeger and Wiley (1976) also pointed out that learning was student specific--that the time required to achieve varied with students. Karweit and Slavin also favored the additional allocations of time being spent in interactive activities with the teacher. Thus, they supported the theoretical position of the BTES (Fisher et al., 1978) and of Harnischfeger and Wiley (1976).

Nonstandardized Measures

Student cognitive achievement, assessed with paper-and-pencil tests, is often times the major criterion for determining the success of an innovation. The frequency with which such standardized measures and "yes/no" assessments are used could cause an otherwise effective innovation to be thrown out. While standardized measures are useful there are many other contributions that an innovation can make to a school program. The contribution that an innovation makes to the professional growth and

development of a teacher or staff member should be considered. Likewise, the effects that an innovation has on enhancing an existing curricular area or establishing the solvency of that curricular area should also be considered. These types of measures can lead to the modification of a program or the partial implementation of an innovation that can add strength to the total school program. When the topic of evaluation of an innovation is discussed in the in-service sessions, all aspects of the innovation that could effect the school program should be considered.

Summary

If the present study were to serve as a pilot study on the use of flexible scheduling to increase the time allocation to a curricular area and the amount of time that students are engaged in the learning tasks of that curricular area, the preservice preparation and experiences of the teachers would have to be enhanced with in-service on the foundations of time and learning theory as well as with techniques on how they could effectively use the additional time to increase achievement. A well planned in-service program, along with plans to collect antecedent data on time usage, process data on teacher behavior, and classroom observational data on the use of time should provide a broad and solid base from which the innovation could be launched and evaluated.

Implications of the Results

Several implications that should be of concern to educators in the elementary school follow from this study. These implications center around the use of time, the collection of data, and funding restraints.

The findings of the present study indicate that teachers and administrators should pay close attention to the effects of fragmentation on time allocations, to the allocation of time to curricula areas, and to the effects of transition and managerial time on the availability of the actual instructional time. More academic knowledge is acquired by students who spend the greater percentage of time engaged in learning. The amount of allocated time sets the upper limits for this engaged time. It becomes necessary, then, for administrators (principals, in particular) to take an active interest and to participate in the scheduling of time, the assignment of students, and monitoring of activities in the school. Time management becomes a critical factor of time allocation.

Considering that support service programs, to address the special needs of some students, will continue to be a part of school programs and that time allocations to these programs are as important as time allocations to other subject areas, administrators and teachers should plan to make these programs viable entities of the total school program. Effective scheduling procedures appear to be the means of accomplishing adequate allocations of time to support service programs.

Transition time can disrupt the time flow in classrooms but it can be structured so as to minimize these disruptions. This, too, should be a concern of teachers and administrators when scheduling time for subject areas. Transition time characterized by smoothness of flow provides for the continuity of the instructional program.

Another important implication of this study is the need to enhance preservice preparations with in-service education on a continuous basis. It was very evident from the findings that in-service training should be

a necessary and vital part of any efforts to put in place innovations in the school program.

The BTES (Fisher et al., 1978), the Jacobson (1980) study, the Wyne and Stuck (1979) study, and the Kiesling (1978) study were all observational studies that received funding assistance from the federal and/or state levels. This enabled the researchers to provide compensation to participants, to employ observers, to employ statistical consultants, and various other persons to assist with the research effort. The cost of conducting studies that attempt to collect data on student engagement time and to measure its effects on achievement then becomes a prohibition. It is quite evident that the compilation and tabulation of such data to conduct a study would represent a substantial cost factor to a researcher or to a school system. Researchers contemplating this type of research must consider these factors and seek funding assistance along with the cooperation of schools and school systems to conduct the research.

Conclusion

It was the contention in the present study that increased allocated time, with properly grouped students and more interactive activities between the teachers or paraprofessionals and students, would increase student engagement. The findings of the present study support the hypothesis that flexible scheduling increased time allocation to reading instruction. For low ability students, the findings show that twice the amount of time was allocated to reading and the additional time was used for teacher-directed instruction.

How classroom time is spent is an indication of the effectiveness of the classroom in terms of student achievement. Research has documented that schools differ in how time is allocated and spent in classrooms. It has been documented that student engaged time is the best indicator of student achievement. The author of the present study was aware of the importance placed on engaged time from the review of the literature. This importance was not discounted in the present study; rather, it was taken into consideration by providing the opportunity, through increased time allocations, for teachers to increase the engagement time of their students.

The present study, using a sample of 70 students from three classrooms, examined how scheduling procedures could address the fragmentation of a school day and increase the time allocation to the language arts components and the subject area of reading. The study also showed that teacher-directed instruction and reinforcement by paraprofessionals were factors to be considered in increasing student achievement. The study also showed that the effects of allocated time on achievement cannot be measured without measures of the effective use of student engaged time. Measures that assess individual students' engaged time show the strongest relationship with achievement.

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APPENDICES

APPENDIX A

SUMMARY OF SCORES AND ABSENTEE DATA FOR 70 SUBJECTS IN EXPERIMENT

Person	Scale Scores: Pretest	Scale Scores: Posttest	Days Absent
1	392+	477+	2
2	363	432+	8
3	403+	466+	3
4	421+	459+	9
5	377+	432+	10
6	419+	477	6
7	286*	334*	10
8	377+	476+	2
9	419+	456+	4
10	421+	476+	6
11	392+	419+	6
12	311*	334*	2
13	361	421+	6
14	260*	290*	8
15	339	377	4
16	363	396	5
17	335	459+	19
18	321*	368	0
19	299*	311	11
20	354	363	3
21	365+	397	15
22	299*	347*	2
23	323*	368	7
24	381+	396	3
25	326*	337*	5
26	337	377	11
27	286*	346*	6
28	419+	491+	10
29	368+	423+	5
30	309*	336*	1
31	315*	328*	6
32	335	355	5
33	385+	396	1
34	346	368	2
35	306*	357*	6
36	286*	354*	14
37	411+	432+	4
38	400+	419+	7
39	379+	376	7
40	423+	466+	8
41	343+	384	4
42	359	391	1
43	434+	415+	4
44	321*	357*	3
45	341	359	7
46	428+	440+	4
47	403+	459+	0
48	330*	363	9
49	275*	306*	7
50	403+	412+	7
51	275*	352*	5
52	384+	423+	4
53	245*	293*	4
54	330*	381	3
55	381	444+	8
56	295*	320*	5
57	286*	336*	6
58	374+	432+	3
59	506+	545+	9
60	377+	411+	6
61	466+	491+	7
62	303*	317*	2
63	311*	329*	7
64	295*	350*	13
65	350	377	6
66	343	366	13
67	286*	309*	14
68	434+	506+	3
69	477+	447+	1
70	306*	352*	1

*Below grade level.

+Above grade level.

APPENDIX B

SUMMARY OF SCORES FOR SUBJECTS ENROLLED AT BROWN SUMMIT PRIMARY SCHOOL FOR THE PERIOD FROM 1979-80 SCHOOL YEAR THROUGH 1981-82 SCHOOL YEAR

	Experiment		Annual Testing	
Person	Pretest	Posttest	1979-80	1981-82
1	392	477	344	454
2	363	432	355	413
3	403	466	372	478
4	421	459	372	492
6	419	477	372	509
7	286	334	273	389
9	419	456	372	509
10	421	476	372	445
12	311	334	315	304
15	339	377	299	413
16	363	396	326	465
17	335	459	372	454
18	321	368	315	409
20	354	363	332	429
22	299	347	258	386
23	323	368	292	392
24	381	396	338	429
26	337	377	335	398
28	419	491	355	509
29	368	423	359	437
30	309	336	288	365
32	335	355	305	398
33	385	396	364	465
34	346	368	308	437
35	306	357	355	392
36	286	354	284	405
37	411	432	348	454
38	400	419	364	465
39	379	376	338	423
40	423	466	372	478
41	343	384	341	418
42	359	391	294	395
43	434	415	372	478
45	341	359	326	423
46	428	440	351	478
47	403	459	351	437
50	403	412	372	465
51	275	352	236	337
52	384	423	359	454
58	374	432	332	528
59	506	545	372	492
60	377	411	372	429
62	303	317	308	350
64	295	350	290	409
65	350	377	328	437
66	343	366	285	373

APPENDIX C

SCALE SCORES FOR 1980 PRIMARY READING INVENTORY (PRI) TESTING AND 1982 CALIFORNIA ACHIEVEMENT TEST (CAT) TESTING FOR FOUR COMPARISON SCHOOLS

	School PG		School M		School S		School G	
Person	PRI	CAT	PRI	CAT	PRI	CAT	PRI	CAT
1	276	360	326	429	289	378	312	383
2	351	528	299	418	289	392	296	352
3	359	445	316	409	313	315	299	413
4	305	418	335	418	330	429	324	465
5	351	478	338	386	297	370	338	418
6	324	395	332	454	351	454	338	423
7	302	437	338	423	296	378	372	492
8	292	398	320	423	291	315	301	413
9	318	454	335	429	315	383	276	386
10	308	386	344	386	302	401	326	398
11	322	423	310	429	322	429	301	383
12	372	492	348	454	359	437	372	509
13	318	413	368	478	254	347	348	405
14	338	389	302	401	302	389	236	352
15	277	332	344	437	313	429	309	345
16	281	413	297	429	359	429	262	398
17	326	445	313	413	372	509	332	401
18	295	360	318	478	348	395	270	347
19	316	405	338	405	259	378	309	429
20	364	528	338	429	320	383	335	418
21	368	423	330	398	286	342	355	409
22	328	445	355	465	341	437	280	347
23	308	375	277	337	301	347	238	312
24	372	492	324	423	341	401	304	392
25	372	478	368	478	302	365	344	465
26	280	409	335	370	316	370	359	478
27	277	398	299	392	233	378	372	478
28	304	405	335	409	335	405	355	367
29	281	375	359	478	344	413	296	324
30	316	413	306	398	298	405	324	418
31	335	429	318	398	324	386	348	373
32	328	398	301	395	338	454	359	528
33	298	465	338	454	296	367	289	418
34	351	445	293	345	226	285	320	509
35	302	381	341	465	297	355	368	465
36	338	454			328	437	313	423
37	294	375			335	405	372	492
38	348	509			328	423	359	429
39	355	429			305	386	318	373
40					330	386	291	304
41					328	405	322	445
42					330	445	277	357
43					320	395	286	395
44					335	492	341	409
45					305	381	291	370
46					372	465	313	423
47					372	381	338	454
48					348	423	305	478
49					316	409	348	454
50					316	409	372	465
51					301	337	296	392
52					261	335		
53					355	405		
54					348	465		
55					320	478		
56					316	389		
57					359	509		
58					297	405		
59					291	312		
60					291	373		
61					299	367		
62					300	401		

APPENDIX D

LETTER OF INSTRUCTION

#4 Acorn Court
Greensboro, North Carolina
27406

February 15, 1983

Dear Colleague,

As a faculty member at Brown Summit Primary School during the 1980-81 school year, you were involved in the evaluation of the scheduling model employed at the school and the effects that it had on any achievement gains in reading for grades two and three. That evaluation is being expanded as a part of a Doctoral Dissertation, and I would like to ask that you complete a short questionnaire that will give your perceptions of the scheduling model.

Please read the summary statement on the back of this letter, complete the questionnaire, and return it in the postage-paid envelope provided. The typist will transcribe your comments and return the handwritten questionnaire form to you by mail.

Thank you in advance for your cooperation.

Sincerely,

Fred S. Wood, Jr.

APPENDIX E

TIME AND LEARNING

Summary Statement

Time devoted to school learning is a predictor of achievement--there is a positive relationship between the two variables (time and learning). The strength of this relationship varies according to other variables, such as the ability of the student, the affective characteristics of the student, and the quality of the instruction.

During the 1979-80 school year a model of flexible scheduling, termed Parallel Scheduling, was instituted at Brown Summit Primary School. The objective of the model of flexible scheduleing was twofold: (1) to reduce the fragmentation of the school day that resulted from "pullout programs" (Title I Reading and Math classes, EMH/LD classes, and speech and language classes), and (2) to increase the time allocation to the language arts component of the school program.

These two objectives were to be accomplished by increasing the homogeneity of the classroom (providing for, generally, two reading groups of approximately 13 students each per class) and scheduling a student's teacher directed reading period at a time other than when he would be required to attend a support service class (pullout program). These two procedural changes were to result in an increased allocation of time to the language arts component and provide for generally interruption free reading periods with the use of an extension concept.

It was then intended that the increased allocation of time to reading; the increased homogeneity of the reading group, and the reduction of the classroom distractions would provide for more direct and

APPENDIX F

QUESTIONNAIRE

Flexible Scheduling

Instructions: READ THE SUMMARY STATEMENT. Please respond to each question below in the space provided. Your most candid response is requested and will be appreciated. RETURN IN THE ENCLOSED ENVELOPE BY FEBRUARY 21, 1983. Thank you.

- WAS FRAGMENTATION REDUCED BY THE FLEXIBLE SCHEDULING?

- WAS TIME ALLOCATED TO READING INCREASED BY THE FLEXIBLE SCHEDULING?

- IF ALLOCATED TIME WAS INCREASED, WERE YOU ABLE TO INCREASE YOUR STUDENTS' ENGAGEMENT TIME IN READING INSTRUCTION?

- WAS THE HOMOGENEITY OF THE CLASSROOM INCREASED?

- IS HOMOGENEITY AN ENHANCEMENT TO READING INSTRUCTION?

- DO YOU FEEL THAT ANY OF THE GROWTH IN READING ACHIEVEMENT WAS DUE TO A SCHEDULING CHANGE?

APPENDIX G

RESPONSES TO QUESTIONNAIRE BY RESPONDENTS

Item 1. Was fragmentation reduced by the flexible scheduling?

Respondent 1. Yes, it was reduced. It would give each child the allotted time, and opportunity to be in a teacher directed reading group each school day.

Respondent 2. Yes--because students who qualify for support services are pulled from one of the extension periods. This prevents a student from missing any classroom instruction.

Respondent 3. Yes. It was not necessary for me to confer with teachers to schedule students. This was worked into the schedule beforehand.

Respondent 4. Most definitely, fragmentation was reduced. By having special programs at times that coincided with the language arts block, children were able to attend these programs without interruption with their reading group.

Respondent 5. N/A.*

Respondent 6. Yes. Enabled teacher to meet needs of all students. More time to individualize reading program.

Item 2. Was time allocated to reading increased by the flexible scheduling?

Respondent 1. Yes, by reducing the fragmentation of the school day, and having two reading groups more time was allocated to each group.

Respondent 2. Yes--each student receives forty-five minutes of directed reading from the classroom teacher daily.

APPENDIX G

(Continued)

Respondent 3. Not applicable.

Respondent 4. Not having worked at the school before flexible scheduling was instrumented, I am not aware of how much time each teacher allocated for reading, but with observations I've made in other schools, I can easily see where f. s. would increase the time for reading.

Respondent 5. N/A.*

Respondent 6. Yes reading groups' time increased. Provided time for students to increase directed reading time.

Item 3. If allocated time was increased, were you able to increase your students engagement time in reading instruction?

Respondent 1. Yes, more skills and directed instructions were taught, since there were no interruptions in the class with the use of an extension concept.

Respondent 2. Yes--because teacher-student ratios in the classroom during reading time was reduced.

Respondent 3. Not applicable.

Respondent 4. Since I did not work in a regular classroom, I do not feel I can answer this question. I have specific time periods for each group I work with.

Respondent 5. N/A.*

Respondent 6. Yes. The program provides time for teacher to work with smaller groups. Students moved quickly because they knew what to do.

APPENDIX G

(Continued)

Item 4. Was the homogeneity of the classroom increased?

Respondent 1. I think so. Each child felt as if he were achieving to the best of his ability.

Respondent 2. Yes--Because students are assigned to classes on the basis of reading instruction levels. The objective is that no teacher will have over two reading groups.

Respondent 3. Not applicable.

Respondent 4. Yes, although, I feel that some errors were made in the judgment of just what reading level a child was in when he started the school year.

Respondent 5. N/A.*

Respondent 6. Yes, in that the program allows smaller groups.

Item 5. Is homogeneity an enhancement to reading instruction?

Respondent 1. Yes, I think it makes each child feel important, and he tries very hard on his ability level.

Respondent 2. Yes--because teachers can be better prepared and provide higher quality instruction.

Respondent 3. Not applicable.

Respondent 4. Overall, I feel it makes it easier on the teacher to plan for individual differences when there is less diversity in abilities and skills; however, I am not certain that it always has a positive influence on the child or his ability toward learning.

Respondent 5. N/A.*

APPENDIX G

(Continued)

Respondent 6. Yes. Provides a balanced approach in developing proficiency in reading.

Item 6. Do you feel that any of the growth in reading achievement was due to a scheduling change?

Respondent 1. My experience in teaching I do feel that the growth in reading achievement has increased in many ways due to a scheduling change.

Respondent 2. Yes--because we are able to work longer in our groups. We have fewer reading groups because assignments are made on the basis of reading levels and because the extension provides reinforcement activities as well as enrichment.

Respondent 3. Because students are not taken out of their regular reading lessons to attend special classes, there should be a growth in reading achievement.

Respondent 4. Yes--since a teacher can meet the individual needs of her students more easily in homogeneous situations, the children would show more achievement and have the opportunity to meet more skills.

Respondent 5. N/A.*

Respondent 6. Yes. The program proved beneficial to me as it allowed students enough practice with a particular skill, enough practice for students to master them. Also allowed more time for directed, homogeneity based reading instruction.

*Respondent 5 stated: "I am a speech therapist so I cannot make comments applicable to a classroom teacher. It was, however, a great

APPENDIX G

(Continued)

help in scheduling students. There was no question as to when they would receive resource help."