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ABSTRACT

This study, conducted with second grade pupils of an inner city public elementary school, sought to investigate the extent to which an instructional-learning system can be effective in reducing time needed for learning while increasing the time spent on learning by the student. For this study, the individualized instruction program in a developmental school for the Learning Research and Development Center (LRDC) of the University of Pittsburgh was altered from a prescribed time-block instructional system to a pupil self-schedule system, with no specific time block designated for tasks in any given subject area. It was hypothesized that, given the responsibility for scheduling their own activities, pupils would complete more tasks in less time and would exhibit more on-task behaviors while completing the task. Analysis of data collected from (1) observation of student and teacher classroom behavior, (2) measures of student task performance, (3) measures of self responsibility, and (4) measures of time, supported the hypotheses in that pupils under the self-schedule system completed more tasks in less time, and exhibited more on-task behavior. They also had fewer management and more instructional interaction with teachers. Other independent variables, falling under "time spent" and "time needed" categories were also investigated. Appendices include a discussion of the LRDC Individualized Instructional Program, and the format of a pupil schedule sheet for aiding the student in planning and tracking learning tasks to be completed. (MJB)

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Abstract

The present study was carried out to investigate the effectiveness of an instructional-learning management system designed to minimize the "time needed" for students to complete a specified number of learning tasks and to maximize the "opportunity" for the individual students to complete the tasks. The results supported our hypotheses about the role instructional design can play in achieving the goal of making effective and better use of the teachers' and the students' school time.

MAXIMIZING THE EFFECTIVE USE OF SCHOOL TIME BY TEACHERS AND STUDENTS

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The relationship between time spent in learning and learning outcomes has been a topic of much concern for educators and researchers. This interest has received increasing attention since Carroll's initial presentation of his model of school learning (Carroll, 1963). Recent policy-oriented research also suggests that time spent in school has an effect on learning outcomes (Cooley & Leinhardt, 1975; Wiley & Harnischfeger, 1974; Cooley & Emrick, Note 1). Thus, on both theoretical and empirical grounds, the use of time is thought to be a critical aspect of the educational process.

Both Carroll (1963) and Bloom, in his analysis of the application of the Carroll model in the context of mastery learning (Bloom, 1968), view learning time as the key determiner of the amount or degree of school learning. Carroll notes that schooling involves two kinds of time: "time needed in learning" and "time spent in learning." According to the Carroll model, the student's aptitude, his/her ability to understand instruction, and the quality of instruction determine the amount of time needed by a particular student to learn a particular task. The time allowed for learning (opportunity) and the time the student is willing to spend in learning (perseverance) determine the amount of time the student will actively engage in learning. Therefore, according to Carroll, if the student were provided with the amount of time needed to learn a task, and if the student were willing to spend the amount of time needed to learn the task, the student should be able to learn the task.

Bloom pointed out that when treating time as a central variable affecting school learning, the task for the instructional designers is ". . . to find ways of altering the time individual students need for learning as well as to find ways of providing whatever time is needed by each student" (1968, p. 7). In other words, it is the job of the developers of instructional programs to allow enough time (opportunity) for every student to achieve mastery of the program objectives and to minimize time needed to acquire mastery of a given task by each individual student.

The amount of time needed to learn a given task differs from student to student and from situation to situation. According to both Carroll and Bloom, time needed can be modified by increasing the quality of instruction and by developing instructional intervention strategies to modify the student's aptitude to learn or to help individual students function more efficiently in the learning environment.

The Study

While working with the design and evaluation of an individualized mastery learning program, the author has been concerned with: (a) the problem of measuring student learning rates under such a program (Wang, 1968; Wang & Lindvall, 1970), and (b) the documentation of the use of school time by teachers and students under such an instructional program (Wang & Brictson, Note 2; Wang, Mazza, Haines, & Johnson, Note 3). Based on the notion of learning time as defined in the Carroll model, the present study was designed specifically to investigate the extent to which an instructional-learning management system would be effective in minimizing time needed for learning while maximizing time spent on learning by the individual student.

The Setting

The study was carried out in a second-grade classroom of a public elementary school located in an inner-city neighborhood of Pittsburgh, Pennsylvania. The majority of the students in the school came from low-income Black families. The school, serving as one of the developmental schools for the Learning Research and Development Center (LRDC), implemented the LRDC individualized instructional program in all the classes from preschool through the third grade.

Briefly, the LRDC individualized instructional program includes two major components, the prescriptive learning component and the exploratory learning component. The prescriptive learning component of the program includes math and reading. Activities in the prescriptive learning component of the program are assigned to students on the basis of former diagnostic test results. The exploratory learning component of the program includes a variety of student-initiated activities. They are generally open-ended independent learning projects that may relate to such subject matter areas as math, science, social studies, reading, writing, pre-reading in language arts, creative arts, construction, and other perceptual related skills. Exploratory learning activities are generally selected independently by students on the basis of their own interests. For a more detailed description of the LRDC individualized instructional program, see Appendix A.

Subjects

All students enrolled in the particular second-grade class in which the study was carried out served as subjects for the study. There were 11 boys and 10 girls. The mean chronological age for the class at the time the study began was seven years, seven months.

Design

An instructional-learning management system, the Self-Schedule System (Wang, 1974), was designed as an intervention strategy to achieve, among other outcomes, better use of student and teacher school time. The system was adopted during the experimental period of the study.

During the five weeks prior to the implementation of the Self-Schedule System, the school day for the second graders was broken into block periods for the various components of the LRDC individualized instructional program. The block periods included separate periods for reading, math, exploratory learning, and group learning which included curriculum areas such as spelling, social studies, etc. During the baseline period, students were required to engage in learning activities for a given subject area at the time specifically scheduled for that subject area. Students who had completed their assignments prior to the end of the period scheduled for a given subject area were given either additional assignments in that subject area or some seat work to occupy their time until the end of the period.

When the Self-Schedule System was adopted, students received the same number of daily assignments for each subject area. The day was divided into specific time blocks, thereby allowing the same amount of total work time for assignments in the various curriculum areas as they had during the baseline period. However, no specific time block was designated for working on tasks of any given subject area. Students could work on learning tasks prescribed by the teacher in any of the subject areas or work on exploratory learning tasks of their own choice in any time block during the day except during group lessons involving the entire class (e.g., physical education). Therefore, the only change made during the experimental period was that students were given the responsibility to decide when to do which of their assignments and when to do exploratory tasks of their own choice during the school day.

We predicted that when students were given responsibility for scheduling their own learning activities, they would complete more tasks in less time and would exhibit more on-task behaviors while completing the task. We further predicted that since students would have several alternative tasks available to them at any given time, it would be unlikely that more than one-half of the class would engage in prescriptive activities requiring teacher attention. Therefore, under the Self-Schedule System, the teacher could spend more time with those individuals who require more intensive teacher assistance, thus providing for those who need additional opportunities to learn. It was reasoned that since students would be taking over some of the classroom management responsibility under the Self-Schedule System, the teacher would have more time to devote to instructional matters. Therefore, an increase in instructional interaction between teacher and students under the Self-Schedule System in the experimental period was predicted.

Four measures were obtained to assess the effects of the Self-Schedule System on the use of school time by teachers and students. The measures were obtained during the baseline period as well as during the first five weeks of the experimental period.

1. Observational measures of student and teacher classroom behaviors. Systematic observations were conducted using two observational instruments, the Teacher Behavior Observation Schedule (TBOS) and the Student Behavior Observation Schedule (SBOS), which were designed to characterize the effects of the Self-Schedule System on student and teacher classroom behaviors (Wang, 1974). Specifically, our observations included the following variables: (a) student on-task behaviors--the extent to which the student actually spent his/her learning time performing the prescriptive or exploratory tasks; (b) student off-task behaviors--time spent distracted from completing the task at hand; and (c) teacher behaviors--observed teacher/student interaction for instructional, management, and group instruction purposes.

2. Measures of student task performance. Weekly task completion rates (tasks completed correctly per week) were calculated to assess the learning performance of each student. The rates were calculated from the number of assignments completed divided by the number of assignments prescribed per week.

3. The measure of self-responsibility in school learning. Students' perceptions of self-responsibility for school learning were measured through the use of the Self-Responsibility Interview Schedule (SRIS) designed by Wang (1974). The SRIS was constructed to assess students' knowledge about what they do in school and whether they perceive that they, rather than the teacher, are responsible for managing their own learning. The term "self-responsibility for one's school learning" is defined for the present study as the ability to: (a) make decisions about when to do what in school; (b) recognize that although the student is responsible for choosing many of his/her own activities, some portion based on diagnostic test results is specified by the teacher and must be included in his/her learning plans; (c) structure one's learning plans and environment for carrying out the learning plans; and (d) recognize that the tasks included in his/her learning plans must be completed within the specified amount of time (e.g., an hour, a day, a week, etc.).

Specifically, the SRIS included 21 questions designed to obtain information on the students' knowledge about their learning in school, sense of control over the school learning environment, ability to evaluate their own learning, and preference for operating under a Self-Schedule System or a Block Schedule System. The test-retest reliability was obtained from two sets of SRIS scores given to 40 students two weeks apart. The reliability coefficient for the SRIS was .59. The percent of inter-rater agreement on the scoring of SRIS was 98%.

4. Time measures. Time allotted for learning during the baseline period was calculated from the teacher's daily schedule of the actual amount spent on each subject area. The teacher was asked to

keep an accurate record of any change she had made in this pre-planned schedule. Time spent in the various curriculum areas by each student during the experimental period was collected using a time clock. Students were asked to use the time clock to record the time when they began a given task and when they completed a task correctly as checked by the teacher. An example of the time record for the experimental period is included in Appendix B.

Procedure

1. Observation of classroom behaviors. Systematic observations of student classroom behaviors were obtained during baseline and experimental periods. Using the SBOS, every student in the class was observed for three 1-minute intervals. A total of 18 minutes of observation was made for each student during each of the two periods. A predetermined observational sequence was set up to insure that three 1-minute observation intervals from each hourly segment of the school day would be made for each student. No observation was carried out during group lessons (e.g., music, gym, spelling, etc.).

Teacher behaviors were also observed using the TBOS during each of the periods. Each teacher was observed for a total of forty 1-minute intervals during each period. A predetermined observational sequence was set up to insure that each teacher was observed for five 1-minute intervals during each hourly segment of the school day. All of the observations were conducted by a trained research assistant. An interobserver reliability was obtained during the beginning of the baseline and the experimental periods. Their percentages of agreement were 94% and 95%, respectively.

2. Student interviews. The SRIS was administered to students during the third week of the baseline and experimental periods. All of the SRIS interviews were conducted by a trained research assistant. The interviews were administered orally and individually in a space

outside the classroom and away from distraction. Student responses to each item were recorded verbatim on the interview form. The SRIS interviews took approximately 10 minutes to administer per student.

3. Student learning performance and time spent on task. The task completion rates for each student and the time spent by each student on the various tasks were collected on a daily basis by a research assistant. Students were taught to use the time clock prior to the beginning of the experimental period. A built-in mechanism was implemented to insure the accuracy of time recordings of students. As the teacher circulated among the students, she was asked to double check and remind students frequently that they should punch in the time on their schedule sheet when they began a new task. The teacher was also asked to be sure that time was recorded prior to checking a student out of a task. A random check of the accuracy of students' time recordings at the beginning of the study was made by an observer. The observed time a student began and completed a task was compared with the child's record at the end of the day. In general, students' time records were found to be quite reliable. While there were a few cases where discrepancies in the amount of time spent on a given task (within a minute) were found, most mistakes were found in students forgetting to punch in as they began a new task. Those records with incomplete time recording were excluded in our analyses.

Results

Table 1 shows the *t*-test results of the differences in the various measures obtained between the baseline and the experimental periods. As predicted, during the experimental period when students were operating under the Self-Schedule System, they completed more tasks ($p < .05$) in less time ($p < .01$), exhibited more on-task behaviors ($p < .05$), had fewer management interactions with teachers ($p < .05$), and had more instructional interaction with teachers ($p < .01$). Students perceived themselves as having self-responsibility for planning and carrying out their learning in school during the experimental period ($p < .01$).

Table 1

Summary of Means and Standard Deviations of Selected Variables

($N = 21$)

Variables	Baseline Period		Experimental Period		t*
	Mean	SD	Mean	SD	
Task completion rate	51.62	15.20	73.52	17.39	$p < .01$
SRIS score	15.26	2.49	17.62	2.09	$p < .01$
Percent of time observed on task	.73	.19	.84	.10	$p < .05$
Percent of time observed distracted	.16	.14	.10	.10	NS
Minutes spent on completing tasks per week by the entire class	222.14	.64	148.00	14.06	$p < .01$
Management interactions with teacher	.04	.05	.02	.03	$p < .05$
Instructional interactions with teacher	.10	.07	.06	.05	$p < .01$

* t test of correlated means

Contrary to our prediction, the patterns of distracted behavior during the experimental period did not change significantly. As shown in Table 1, the number of distracted behaviors decreased to some extent, although the differences were not statistically significant.

It is of interest to point out the large difference found in the standard deviations of minutes spent completing tasks by students between the baseline period (.64) and the experimental period (14.06). Since the results indicate there was variation in the time spent by students, it is reasoned that the opportunity to learn was provided adaptively to meet the needs of individual students under the Self-Schedule System. That is, those who needed more time were able to spend more time in completing their tasks, and those who did not require as much time were permitted to spend less time in completing their tasks.

Interrelationships Among the Variables

To investigate the nature of the interrelationships among the various measures obtained from the study, Pearson Product Moment correlation coefficients were calculated separately for the baseline period and for the experimental period. The intercorrelations are reported in Tables 2 and 3, respectively. Some very interesting differences in the correlation patterns between the two periods were observed.

During the experimental period, as shown in Table 3, students' rates of task completion correlated significantly with their SRIS scores ($p < .05$) and with time actually spent working on the tasks ($p < .05$). Students' rates of task completion during the baseline period, however, did not correlate significantly with those variables (Table 2). Rate of task completion correlated significantly with observed distracted behavior during both periods, $p < .05$ during the baseline period (Table 2) and $p < .01$ during the experimental period (Table 3).

One of the most interesting differences in the correlation patterns of the two periods was the r between the frequency of instructional interactions with the teacher and the time spent working on tasks. The r for the baseline period (Table 2) between the two variables was .48 ($p < .05$) while the r for the experimental period was only .08 (Table 3). These

Table 2

Intercorrelations of Scores Obtained During the Baseline Period

($N = 21$)

Variables	Task Completion	SRIS Score	On task	Distracted	Time Spent	Instructional Interaction with Teacher	Management Interaction with Teacher
Task completion rate	1.00	.23	.18	-.41*	.30	.31	.00
SRIS score		1.00	.22	-.50*	.07	-.17	-.20
Percent of time observed on task			1.00	-.67**	.23	-.13	-.15
Percent of time observed distracted				1.00	.24	.02	-.02
Minutes spent on completing tasks per week by the entire class					1.00	.48*	.18
Instructional interactions with teacher						1.00	,23
Management interactions with teacher							1.00

* $p < .05$

** $p < .01$

Table 3

Intercorrelations of Scores Obtained During the Experimental Period

($N = 21$)

Variables	Task Completion	SRIS Score	On task	Distracted	Time Spent	Instructional Interaction with Teacher	Management Interaction with Teacher
Task completion rate	1.00	.51*	.40	-.55**	.44*	.21	-.24
SRIS score		1.00	.30	-.17	.14	.04	-.03
Percent of time observed on task			1.00	-.71**	.27	.17	-.42*
Percent of time observed distracted				1.00	-.38	-.11	.22
Minutes spent on completing tasks per week by the entire class					1.00	.08	-.32
Instructional interactions with teacher						1.00	.04
Management interactions with teacher							1.00

* $p < .05$
** $p < .01$

results suggest that the amount of time a student spent working on task depended a great deal upon the number of instructional interactions with the teacher during the baseline period. Time spent on task was independent of the number of instructional contacts with the teacher during the experimental period.

Relationship Between Task Completion Rates and Certain Selected Independent Variables

Multiple correlation analyses were performed to further investigate the relationship between the dependent variable, rate of task completion, and the independent variables included in the present study. A separate analysis was performed for the baseline and the experimental periods.

The independent variables included in the present study are classified into the two major categories of variables defined in the Carroll model, that is, variables related to the "time spent" category and variables related to the "time needed" category. When the LRDC instructional program is used, whether operating under the Block Schedule System or the Self-Schedule System, the students are allowed as much time as needed to complete their tasks. Therefore, opportunity is a given and the only variable that can be classified under the time spent category is the measure of the amount of time the student spent completing a given task. This measure is probably the best indicator of the student's willingness to persevere, that is, willingness to spend the time working on the task when given the opportunity to do so.

The independent variables that are classified under the "time needed" category in the present study include some aptitude variables as well as variables related to the quality of instruction. The aptitude measure included: (a) scores obtained from the SRIS, (b) the frequency of observed on-task behavior exhibited by the student, and (c) the frequency of observed distracted behavior exhibited by the student. The

SRIS scores and the on-task behaviors have been found to be related to the extent that the student can profit from the learning environments designed under the Self-Schedule System. Distracted behaviors have been found to be negatively related to student learning (Wang, Note 4).

Two variables are classified under the "quality of instruction" category: (a) the frequency of instructional interactions between the teacher and the student, and (b) the frequency of management interactions between the teacher and the student. These variables are considered as quality of instruction variables because they are, to some extent, indicators of classroom processes that contribute to the characteristic differences between the Block and the Self-Schedule Systems. These differences have been observed to have some effect on the student's rate of task completion (Wang, 1974, Note 4).

Table 4 summarizes the results of the multiple correlation analyses performed between task completion rates and six independent variables included in the study. The table reports the multiple R's, R^2's, and the structure R's obtained from the baseline and the experimental data. As indicated in Table 4, a statistically significant multiple R with 58% of the variance in the criterion explained ($R^2 = .577$) was found, using the measures from the experimental period. The multiple R obtained from the baseline measures was not significant. Only 31% of the variance in the criterion was explained ($R^2 = .30$). The results of the multiple R analyses suggest that under the more optimal learning condition, as in the case during the experimental period of the present study, the student's "aptitude" and the "quality of instruction" are related significantly to his/her task completion rates.

In examining the structure R's, distinct differences in the patterns of the relative contributions of the two independent variables and the criteria variable are found between the two periods. The two variables are "instructional interaction with teacher" and "on-task behavior exhibited by the student." As shown in Table 4, the structure R for the variable instructional interactions with teacher during baseline was only .28. The difference in the relative contribution of this variable can be

Table 4

Summary of Multiple Correlation Analysis with Task Completion Rates as the Dependent Variable

Task Completion Rate	Multiple R	R^2	Structure R: SRIS	Structure R: On-Task Behavior	Structure R: Time Spent	Structure R: Distracted Behavior	Structure R: Instructional Interaction with Teacher	Structure R: Management Interaction with Teacher
Baseline Period	.554 (N.S.)	.307	.55	.32	.54	-.74	.56	.01
Experimental Period	.759 ($p < .01$)	.577	.68	.53	.58	-.72	.28	-.31

interpreted as further supporting the results found in the simpler r's. Task completion rates are highly related to the instructional interactions with the teacher during the baseline period. The amount of instructional interaction with the teacher played a lesser role in affecting task completion rates during the experimental period.

Since teacher time in the schools is limited (for example, length of school day, the number of instructional staff, and class size), it may be more realistic to try to increase student learning rate through the implementation of the Self-Schedule System than to try to increase teacher instructional time.

From the instructional design point of view, the differences found in patterns of structure R's between the baseline and the experimental periods for the amount of observed on-task behaviors are most interesting. The results suggest that the student's ability to attend to the task at hand may play a more important role in the student's rate of learning under the Self-Schedule System than under the Block Schedule System. Therefore, when the student's on-task behavior is treated as an aptitude measure, one effective way to maximize student learning rate is to identify and develop instructional strategies to increase student on-task behavior.

To summarize, the multiple correlation results suggest that in order to increase student learning under either the Block Schedule System or the Self-Schedule System, one should attempt to design learning environments that are conducive to (a) increasing the time the student is willing to spend on learning, and (b) developing in the student the ability to take self-responsibility for learning. However, if the program is operating under the condition similar to that of the Block Schedule System, one may want to focus on developing strategies to increase the time the teacher spends on instructional interaction with students. If the program is operating under the conditions similar to that of the Self-Schedule System, it may be more effective to focus on developing learning conditions that would increase student on-task behavior.

Discussion

In order to bring about a better match between time needed and time spent variables to improve student rate of learning, the instructional designer or the teacher can use either of two approaches. One is to reduce the time needed for learning by increasing the quality of instruction. Another is to develop instructional intervention strategies that modify the student's aptitude for the task and help the student develop learning habits that make maximum use of school time. The present study was designed with the focus placed on both approaches, and perhaps to a greater extent on the latter (i.e., maximizing the use of school time by teachers and students through instructional design).

It is important to recognize the pilot nature of the study and the limitations one must bear in mind when interpreting the results. However, the data does suggest that there are some distinct differences in the patterns of the relative contributions made by certain independent variables to the rate of student learning under different learning conditions. Furthermore, the results seem to support our notion about the important role instructional design can play in maximizing the use of school time by students and teachers to improve each student's rate of learning.

As predicted, the time spent and time needed variables included in the present study affected student learning differentially under the two treatment situations (the Block Schedule System and the Self-Schedule System). When the time spent variable is treated as a given (as in the case of the individualized instructional program implemented under both the Block Schedule System and the Self-Schedule System), the quality of instruction and student aptitude for learning under different learning conditions may be differentially modified to maximize student learning. Based on the results from the multiple correlation analyses, one may want to focus on maximizing the use of teacher instructional time to increase student learning when operating under environments that closely resemble the Block Schedule System. At the same time, one may want to focus on designing strategies to maximize the use of student learning time under the Self-Schedule System.

The teacher's instructional time in school settings is usually finite. Under normal school conditions, we can neither increase school time nor increase the number of teachers in our schools. Therefore, the question is whether it would be more fruitful to focus on increasing student learning time through instructional design that would increase student on-task behavior.

It is important to point out that the variables included in the present study are selected and classified according to the author's interpretations of the variables defined in the Carroll model and Bloom's analysis of Carroll's variables in mastery learning situations. It is hoped that the rational analysis of the selected variables in the context of the Carroll model, coupled with the statistical analysis of the relationships among the variables, will provide some information on the basis of which certain instructional design work can begin. The usefulness of this approach to studying the differential effects of instructional practices under experimental conditions is evident. As we begin to develop more valid and reliable measures of the variables, and as we study and delineate effects of instructional designs on student learning under experimental conditions through iterative processes, we may be better prepared to systematically manipulate the quality of instruction and student aptitude variables to maximize student learning.

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APPENDICES

APPENDIX A

The LRDC Individualized Instructional Programs

by

Margaret C. Wang

The LRDC individualized instructional programs include the Individually Prescribed Instruction (IPI) program for children of elementary grades (grades one through six), and the Primary Education Project (PEP) designed for children of early childhood age (ages three through seven). Both IPI and PEP were developed to provide educational experiences that are adaptive to the learning needs of the individual student. The programs were designed with the basic assumptions that: (a) children display a wide range of differences in their entering abilities and in the ways in which they learn and acquire competencies; and (b) to provide educational experiences that are adaptive to individual differences means providing learning situations (e.g., classroom organization, learning materials, etc.) that can accommodate the needs of the individual student and, when needed, teaching the prerequisite abilities demanded by the learning situations (Glaser, 1972).

The LRDC individualized instructional programs are designed with the following guidelines (Glaser, 1968, 1972): (a) The goals of learning are specified in terms of observable student performance and the conditions under which this performance is to be manifested; (b) the learner's initial capabilities relevant to forthcoming instruction are assessed; (c) educational alternatives suited to the student's initial capabilities are presented to him and the student selects or is assigned one of these alternatives; (d) the student's performance is monitored and continuously assessed as he learns; (e) instruction proceeds as a function of the relationship between measures of student performance, available instructional alternatives, and criteria of competence; and (f) as instruction proceeds, data are generated for monitoring and improving the instructional system.

Curriculum components of the IPI program include the Individualized Mathematics curriculum (Lindvall & Bolvin, 1966), the Individualized Science curriculum (Klopfer, 1970), and the New Primary Grades Reading System (Beck & Mitroff, 1972). Curriculum components for PEP include beginning math, classification and communication skills, perceptual skills, and the exploratory learning skills (Resnick, Wang, & Rosner, 1975).

Aspects of curriculum developed for each of the curricular components include: the specification of curriculum objectives, the sequencing of the objectives, the design of instructional and learning activities and materials, the specification of teacher and student behaviors, and the specification of procedures for diagnosing and monitoring student learning progress. Provision for the diagnosing and monitoring of individual student learning progress is at the core of the individualized instructional programs. Procedures and instruments (e.g., Cox & Boston, 1967; Wang, Note 1) for diagnosing and monitoring student learning have been designed to provide teachers with the information necessary for adapting the use of the program components to the individual students, as well as to communicate, on a substantive basis, with parents and others concerned with the learning progress and the development of the student.

The implementation of the LRDC individualized instructional programs in classroom settings ideally requires two adults in each class, a teacher and an aide. During the instructional period, the adults generally perform two basic roles, the "traveling" role and the "testing and tutoring" role. The traveling role requires the teacher or aide to circulate among the students, helping with their learning tasks and checking them off as they are completed, as well as interacting in various ways, generally for quite brief periods of time. The testing and tutoring role requires the teacher or aide to work intensively with individuals or small groups of students for such purposes as administering diagnostic tests, tutoring individual students, giving group lessons, or working with a group of students on a special learning project. The roles described above are "idealized" descriptions; in practice, the two adults fluctuate from one role to the other as need arises.

There are two basic sets of teacher functions, both necessary for smooth and effective implementation of the LRDC program in classroom settings. These are the management functions and the instructional functions. The management functions are concerned with the establishment of an effective system for classroom management. They include such functions as: the provision of materials and equipment for the various components of the program; the physical arrangement, display, storage, and maintenance of materials; demonstrating and explaining rules and the use of materials; and praising or otherwise reinforcing students for appropriate self-management activities.

Two sets of teacher instructional functions have been identified: the "didactic" and the "consultant" functions. The didactic instructional functions are related to the administering of tests associated with the formal curricula, prescribing learning tasks on a daily basis, checking prescriptive activities, and giving help on them as required. The teacher and/or the aide also assume, under the didactic instructional functions, the responsibility to conduct special tutoring sessions on certain specified curriculum objectives, as well as large or small group lessons as dictated by the various curricula and by the needs of the students.

The consultant functions are less highly structured, but like the didactic functions, they are carried out in the course of both traveling and testing and tutoring. These functions require the teacher and/or the aide to focus on observation of students' learning processes beyond what is provided in the formal tests; to use questioning and probing techniques to stimulate development of self-reflection in problem-solving activities on the part of the students; to engage in planning with students, helping them decide what to do and how to do it; to pose problems for students to work on and to help them in planning and carrying out solutions; and to engage in games and other forms of play with the students.

No clear distinction can be made in practice between management and instructional functions--every act contributes to both. Similarly, the teacher should fulfill both didactic and consultant instructional roles. Nevertheless, the distinctions are useful as a means of describing the range of functions that teachers must meet when implementing the LRDC individualized instructional programs. The distinctions between the two functions also serve to characterize, in a general way, the teacher behaviors to be observed in an LRDC classroom.

The role of the student under the LRDC individualized instructional program centers around the management of one's own activities in learning situations (Wang, 1974). In general, the student is expected to:

1. Work on and complete certain tasks prescribed by the teacher. (The nature and the amount varies from student to student and depends on the learning needs and individual student characteristics.)

2. Work on and complete certain tasks of the student's own choice.

3. Make decisions about when to do what work. (The range of the options and the degree of control varies from age to age and from class to class.)

4. Take diagnostic tests when asked by the teacher.

5. Participate in tutoring sessions when asked by the teacher.

6. Participate in group activities when required.

7. Ask the teacher to check the work as one completes the assignments.

8. Ask for help (from the teacher and/or peers) when needed.

9. Assist others (initiates and/or when requested) for management as well as for learning purposes.

10. Follow classroom management rules.

11. Locate learning materials and equipment independently.

12. Carry out material management responsibilities (e.g., clean up, return equipment, etc.).

13. Take turns and share activities and materials with others.

14. Interact with peers for personal as well as school related activities.

15. Tolerate disruption of the activities at hand for attending certain group activities and/or certain testing or tutoring sessions.

16. Attend to the task at hand and ignore distraction from the different activities being carried out by others at the same time.

17. Budget one's own work time to meet the time constraints established for certain tasks.

The student roles listed above are behaviors required for effective functioning in the LRDC individualized instructional programs. However, the ability to carry out the roles is not assumed to be a part of the entering behaviors of all students. Students are taught to acquire the minimum level of competence required to assume these self-management and independent learning roles.

Reference Notes - Appendix A

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APPENDIX B

Schedule Sheet

The Schedule Sheet is used to help the student plan and keep track of the learning tasks s/he is to complete. The sheet includes all activity areas set up in the classroom. It is divided into two parts, the prescriptive and the exploratory sections.

The prescriptive section is indicated on the top part of the sheet. The teachers makes an entry of half slash ⧅ to inform the student of the prescriptive area tasks s/he has prescribed for the student. The attached schedule sheet shows that on Monday, November 17, Michael's prescriptive assignments were in math and reading.

The exploratory section is indicated on the bottom half of the sheet. The student may choose any of the 11 areas s/he would like to work in for the day. Michael chose the computer and the play deck as his exploratory activities.

When the student is ready to work in a particular area, s/he punches the sheet with the time clock in the appropriate space. After the tasks have been completed and checked by the teacher, s/he completes the slash forming a ⊠ to indicate that the student has correctly completed a task in that area. The student punches the clock again in the same place on the sheet, indicating to the teacher how much time was spent to perform the tasks. The students may choose whatever order they would like to do their work.

For example, on Wednesday Michael chose to do his spelling first. He worked from 8:43 a.m. to 9:55 a.m. His second choice was math, and he worked from 9:56 a.m. to 11:04 a.m. This timing procedure is followed for each of the tasks performed.

Appendix B (Cont'd)

Name Michael

Week Nov. 17

	m	t	w	th	f
reading	17 NOV 75	18 NOV 75	20 NOV 75	20 NOV 75	21 NOV 75 / 22 NOV 75
math	17 NOV 75	19 NOV 75 / 19 NOV 75	19 NOV 75 / 19 NOV 75	20 NOV 75	[illegible]
perceptual					
spelling		18 NOV 75 / 19 NOV 75	19 NOV 75 / 21 NOV 75		
exploratory					
science		18 NOV 75 / 18 NOV 75		21 NOV 75 / 21 NOV 75	21 NOV 75 / 21 NOV 75

	m	t	w	th	f
1. math games					
2. library					
3. listening					
4. writing					
5. art					21 NOV 75 / 21 NOV 75
6. construction					
7. games					
8. make-believe					
9. computer	17 NOV 75 / 17 NOV 75		20 NOV 75 / 20 NOV 75		
10. play deck	17 NOV 75	11:40 / 11:20		21 NOV 75 / 21 NOV 75	21 NOV 75
11.		18 NOV 75		21 NOV 75	21 NOV 75