    FAILURE OF A CLASSROOM EXPERIMENT IN PROGRAMED
INSTRUCTION SCHEDULING BASED ON A CONTINGENCY CONTRACT
BETWEEN TEACHER AND PUPIL WAS ATTRIBUTED TO LACK OF
COMMUNICATION BETWEEN EXPERIMENTERS, TEACHERS, AND
ADMINISTRATORS (TEACHER ATTITUDES DID NOT CHANGE), AND LACK
OF OPTIMUM CLASSROOM CONDITIONS. TO CORRECT THESE, A NEW
UTILIZATION MANUAL EXPLAINING CONTINGENCY MANAGEMENT, CONTROL
OF MOTIVATION, PERFORMANCE TESTING, AND ALTERNATE TEACHING
METHODS WAS DRAFTED FOR USE IN THE NEXT PHASE OF THIS
PROJECT. (LH)

A DEMONSTRATION OF THE

USE OF SELF-INSTRUCTIONAL AND OTHER TEACHING TECHNIQUES

FOR REMEDIAL INSTRUCTION OF LOW-ACHIEVING ADOLESCENTS

IN READING AND MATHEMATICS

Technical Progress Report No. 2

Activities to January 1, 1965

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A Demonstration of the Use of Self-Instructional and Other Teaching Techniques for

Remedial Instruction of Low-Achieving Adolescents in Reading and Mathematics:

Technical Progress Report No. 2

This report specifies the progress of work under contract from October 1, 1964, to January 1, 1965. During this period Phases II and III of the project were begun. Phase II, the follow-up on the students taught in the six-week literacy course, is still in progress. The regular teachers of these pupils were contacted after the students returned to classes in the fall. The teachers were told of the experiment and asked to cooperate in the procurement of the follow-up data required. During this period, standard interview forms and questionnaires were constructed.

As a result of experiences in Phase I, the general system of program administration and scheduling for motivation was outlined. Contact was made with the Esperanza School to test these procedures at the first in-school setting. It was believed that the motivational and administrative systems that had been devised could be easily communicated. Teachers were presented with the written outline and were given, in addition, several lectures on the techniques and underlying principles.

Purpose of the In-School Demonstration

The purpose of this demonstration was to test the program administration and instructional systems developed or refined during Phase I in a school setting, and to determine the best way to communicate the approach to classroom teachers.

Description of the In-School Setting

The Esperanza School was established by the Albuquerque School System to provide a regular classroom curriculum for those youths sentenced to the Detention Home.

The Students

All students attending the Esperanza School are there because of a court order.

The violations of these youths are generally considered minor. More serious violations result in sentencing to the State Correctional School. The most common violations are truancy, petty larceny, drunkenness, glue-sniffing, etc. Most of these boys are first offenders. A typical sentence at the Detention Home is ninety days.

The Esperanza School is located on the same grounds as the Detention Home. Each morning the boys are taken to the Esperanza School for regular classroom activities. Some boys are allowed to live at home on probationary status and attend Esperanza School.

The grade level of the curricula was approximately junior high school. The ages of the students range from ten to fifteen.

Staff

A principal and four classroom teachers constitute the staff. They are paid by the Board of Education of Albuquerque, New Mexico, and function under the same provisions as the regular Albuquerque classroom teachers.

Results

If one only considers the progress made in changing the teachers' attitudes, or in imparting the knowledge of the systems for effective program administration, then the demonstration failed. But in two important areas it succeeded. The demonstration proved that the system is practical in a school setting if properly administered, and we gained a great deal of insight into the problems of communication with teachers.

There were three main reasons for failure:

1) We failed to make the systems explicit enough to communicate with the teaching staff.

2) We failed to establish the classroom conditions necessary to allow the system to succeed.

3) We failed to convince the Esperanza staff to use the prescribed methods in all aspects of their interactions with the students.

As a result of these reasons, the demonstration got out of hand. The experiment operated under highly compromised conditions. Instead of the proposed individual instructional system, the staff was forced to use an ill-conceived adaptation of lockstep group instruction.

1) Communication

At Esperanza, the nature of programed instruction was not communicated. The goals and the means to reach these goals were not explained. To further compound this failure, it was apparent that the principal and the faculty were unable to understand, and unable to use, the principles of contingency management set forth in the initial orientation periods. Since using the principles of contingency management in conjunction with programed administration is the heart of the system that was being tested at the Esperanza School setting, any attempts to apply the method without this knowledge could only result in an ineffectual presentation.

The initial orientation consisted of three half-hour sessions. The first session was a lecture to familiarize the teachers with the characteristics of programs. The frame was defined and general construction and administration of programed material was discussed. Since this was completely new information, most of the teachers listened with interest.

The second session was devoted to the motivational and administrative systems. This session proved troublesome. First, the teachers took the attitude that there was nothing they could learn. One comment which typifies this attitude was, "We learned all about this in college psychology." Letting the teachers read the outline and Appendix A of Technical Progress Report No. 1 did not produce the effect we had hoped for.

The third session was equally disappointing. We attempted to rectify the erroneous impressions of the second session, but were only partially successful. It was hoped that on-site training could compensate for lack of adequate communication.

One of the reasons for the failure in communication can be attributed to the type of school setting. Since this was connected with a correctional institution, it was not possible to persuade the staff of the necessity of the use of positive consequences in activity management. The teachers had been working for some time with juvenile delinquents, and, as a result, believed that the only effective means of control was punishment. One often heard the instructor verbally punishing the students by shouting, by threatening, or by lecturing them on what miserable human beings they were. On many occasions the TMI Institute staff witnessed the instructors threaten students with paddling.

2) Failure to establish ideal conditions

The Institute did not make it clear to all concerned what the duties, responsibilities, and authorities of the individuals concerned were. It was not clear who should control the experiment. The principal and staff of Esperanza continually maintained that the experiment was ours and that we were fully responsible, but they seldom allowed us to dictate, or even to suggest the conditions necessary for success in this experiment. As a consequence, we were forced to conduct a badly patched-up experiment on their terms. Most of the suggestions made by Institute staff during the course of the experiment were

politely refused. When it was suggested that the experimental students all be located in one class in order that one teacher could be responsible for all the students, the response was negative. When it was appropriate to introduce the contract into the classroom, the principal politely vetoed the idea.

3) Problems in teacher-student interaction

We failed to convince the staff and principal at the Esperanza School to adopt the techniques of contingency management in their student interactions. Frequently, hostility between the faculty and the TMI Institute liaison staff was observed. In many cases, these feelings were not latent, i.e., in some cases, words of anger passed between the staff and liaison people. The liaison staff failed to convince the teachers, especially the principal, that the experimenters really knew what they were doing. When the procedure of using motivational programs in conjunction with the math programs in the math class was broached, it was turned down by the principal. The principal became so upset, he refused to speak to the liaison man responsible for two days. It was his firm opinion that only mathematics should be taught in mathematics classes; only punctuation in punctuation classes; and only reading in reading classes. Consequently, it was not possible to schedule at least seventy-five per cent of the programs provided for the Esperanza School setting. If the class lasted an hour, the student was expected to work on his mathematics program for the full hour as in any conventional approach. Naturally, most students quickly tired of their programs. They soon discriminated that there were no consequences for working diligently on their programs. Since we had failed to convince the teachers of the necessity of using performance rather than time contingencies, the Ss were content to sit in their chairs and occasionally talk with their neighbors. Toward the end of the experiment, some students even refused to do one frame in the program. Because we were unable to employ our proposed system in the experiment, we did not consider it of any value to obtain post-test data on the students.

Since it is, in our opinion, a necessity to communicate, and to convince those who would try our system of the necessity of contingency management of performance scheduling, we can only consider that we were the ones, in fact, who failed at Esperanza. What this part of the project revealed was that a different sort of engineering was required to get the system used. To this end, a first approximation of a new utilization manual was prepared. A rough draft of this manual is included with this report as Appendix A. The manual will be tested and revised on the basis of further work in Phase III.

Appendix A

TABLE OF CONTENTS

Appendix A

INTRODUCTION

Although the concepts of individualized instruction and programed learning are not new, the techniques involved in the operation of an individualized classroom are new. In the early rush to produce good programs, the problems of administration and motivation were ignored. As a result, programs were thrust into teachers' hands and the teachers were told to do the best they could. Generally the learning results were good, but the administrative problems led many teachers to conclude that programs were not worth the extra effort.

As a result of recent research, tentative answers to these problems have been gained. This Manual presents the requirements for a successful system. They are:

1) Excellent learning material, including the best available programed courses or graded readers.

2) Control of student performance by frequent progress checks.

3) Control of motivation by proper scheduling and by providing consequences for all learning activities.

The first requirement is self-explanatory. Since much program technology is rapidly changing, it is almost impossible to use the criteria of good programing set up in many currently published texts. Many people have used "face validity" as a criterion and have looked only at what was taught. This technique does not evaluate the program's efficiency or effectiveness, however. As an aid to program selection we have included a section which deals with programing considerations.

Most of the administrative problems in individualized instruction center around

control of student performance. The best method of control is periodic tests—offering

feedback to the student regarding his progress—(evaluation). These tests are keyed to

the materials just learned and are, therefore, termed progress checks.

Since managing motivation hinges on the scheduling techniques employed, various

options should be considered. These options will be discussed in the Motivation section

of this Manual.

What Is Programing?

Programing is a special method of presenting a body of material for the purpose of

learning. Programing is based on learning principles of recognized soundness. A program

is designed to provide the student with all the advantages of a private tutor. A subject to

be programed is analyzed and divided into small steps suitable to almost any learner.

Programs are designed and prepared to provide the most efficient, pleasant, and permanent

learning.

Programed or self-tutoring instruction makes sure of active participation, which is

not possible by merely attending a lecture or by reading a textbook.

Since its advent, many attempts have been made to define programed instruction.

The usual form of such attempts is a list of principles of programed instruction. Usually

cited are such factors as immediate confirmation, small steps, self-pacing, student testing,

and active responding. While it is true that these attributes are often descriptive of

classes of programed materials, for the most part they are not definitive. A program can

best be defined by contrasting it to existing educational techniques.

1) A program is not a textbook. A textbook contains the subject matter, but it is organized primarily to aid in references. A program, however, not only contains the subject matter but it is deliberately sequenced in such a way to make <u>learning</u> as easy as possible.

2) A program is not a workbook. The purpose of a workbook is to practice already established skills, while the purpose of a program is to aid in the acquisition of those skills. Material in programs is carefully selected and sequenced, employing techniques derived from principles studied in the learning laboratories of psychology.

3) A program is permanent. It exists in such a form that it can be repeated in the same form many times. The program is a complete presentation. In its validation phase it must stand alone, independent of any other instructional inputs. The program also provides a complete record of the students' responses. This allows the program to be tested and validated. During this testing phase, if it is found that certain segments of the program are not functioning properly, they may be modified and retested. Thus, the property of permanence in providing accounts of instructional input and student responses allows us to perform this validation.

Normally, in a lecture situation, it is impossible to determine if students sitting passively at their desks are interacting with the materials the lecturer is presenting. We know from psychological data that learning only occurs when students are <u>doing</u>. This <u>doing</u> may take the form of overt action, thinking, analyzing, drawing conclusions, and so forth. In an efficient learning system it is necessary to guarantee that the student is interacting

with the proper material. In lecture situations we have no such guarantee. Programing, however, does provide such response control. In a good program it is impossible for the student to complete the material without having interacted with the significant portions of that material.

We can now give the definition of a program. A program consists of scientifically analyzed and sequenced content presented in a permanent form that allows testing, validation, and revision, and which guarantees that the student interact with the significant material by using various techniques of response control.

A list of definitions of some of the terms used in any material concerning programed instruction follows.

Definition of Terms

Program Terms

FRAME—A discrete segment of a program, usually giving a stimulus to which a response must be made.

PROGRAM—Scientifically analyzed and sequenced subject content presented in a permanent form.

NECESSARY PROGRAM—Basic Reading and Arithmetic programs administered for remedial purposes.

PROGRAMED TEXTBOOK—A book requiring the learner to respond to systematically arranged materials. There are many different forms used in programed textbooks, some samples of which are included at the end of this section.

PROGRAMING—The process of arranging material to be learned into a series of se-

quential steps; usually moves the student from a familiar background into a com-

plex and new set of concepts, principles, and understandings.

GROUP METHOD (Reasons for use:)—In some cases it is necessary for the entire group

to proceed through a program in group fashion. This is necessary in the following

conditions.

    1) absence of reading ability

    2) purposes of review

    3) scarcity of programs

PREFERRED PROGRAMS—Any program which a student asks to go through is considered a

preferred program. Spanish, Russian, and Hebrew have been highly preferred pro-

grams for many students.

Supplement Terms

PRE- AND POST-TEST—A supplemental progress check or test with questions relating to

the whole course or to units.

PROGRESS CHECK—Short test given to the student to determine the extent of his learning

and retention. There are two types of progress checks: external and internal.

    1) External progress checks—A progress check that is administered as a

    supplement. This includes course and unit pre- and post-tests, and

    progress tests that ideally are administered every 40-50 frames.

    2) Internal progress checks—There is currently only one type of internal

    progress check. It is usually signalled by the words "test" or "practice."

    A test or practice frame is one that has no confirmation. Since there is

no confirmation, it is assumed that the student must have requisite
knowledge to correctly answer.

STUDENT REFERENCE BOOK—A workbook containing progress checks, pre- and post-
tests for both the course and each unit in the course, and progress charts.

PROGRESS CHART—Graphs that enable a student to plot and graphically determine his
progress.

TEST FRAME—An internal progress checking device having no confirmation. It is
assumed that requisite knowledge has been attained when test frames are answered
correctly.

General Terms

BRANCHING—A style of programing in which selection of the next frame to be presented
depends on the response given in the current frame.

CONSTRUCTED RESPONSE—A response that is composed by the student. The program,
however, may limit the response to a general type, such as words or numbers.

DIAGNOSTIC PROFILE—Profile of deficiencies and knowledge gaps based on test perform-
ance of the student.

ERROR RATE—The number or percentage of a given group of students incorrectly responding
to an item in the program. A high error rate would probably indicate a need for
revision in the program.

FEEDBACK—The function of the confirmation area of a teaching machine or program that
provides the pupil with "knowledge of results."

GAIN SCORE—Score on post-test minus score on pre-test.

LINEAR PROGRAM—A program that has a single, predetermined sequence of steps. Error

responses are not corrected or immediately repeated.

PACE—The rate at which the subject is permitted to work through the programed material. (The pace may be determined by the learner or by a pacer.)

PEER TUTOR MATERIAL—A teaching aid technique that enables a student to function as a controlled tutor. The student's input, output, and response evaluation are regulated by a prepared script.

REINFORCEMENT—The preferred consequence the student is allowed to perform after completing a task.

RESPONSE MODE—The kind of response the pupil makes while working on a program. Examples: constructed response or multiple-choice response.

Examples of Programing Format

The following pages are reproduced from actual pages taken from different programs. Frame format and presentation of frames may vary from program to program depending upon the particular subject programed.

These Introductory Frames, pages xxxi and xxxiii, must be taken before the student begins any of this course.

A

If your answer to a question is a single word, you will see a single

line like this: _____ .

George Washington was the first President of the United _____ .

States

B

If your answer is two or more specific words, you will see two or more

lines like this: _____ _____ .

There are 50 states in the _____ _____ .

United States

C

If your answer is to be given in your own words, you will see a broken

line like this: _____ .

What did George Washington chop down? _____

a cherry tree

D

When your answer should be a number, symbol, or letter (or collection of

numbers, symbols, and letters as in an equation) you will see three

asterisks like this: ***. The number coming before 10 is ***.

9

E

If you should give two or more answers consisting of numbers, symbols,

or letters, you will see two or more sets of asterisks.

1 + 1 = ***   2 - 1 = ***

2   1

F In a multiple choice question the possible answers are often shown as a series of items

separated by slashes.

George Washington was the (1st/2nd/3rd) President of the United States.

1st

G In some multiple choice questions the possible answers are listed as:

A. _____. B. _____. C. _____. D. _____.

You are asked which answer is correct. (There _may_ be more than one.)
The capital of the United States is:
A. New York City.   B. Washington, D.C.   C. Albuquerque.   D. Paris.

B. Washington, D.C.

H Some frames will list the answers as:
A. _____. B. _____. C. both   D. neither

For example, 6 divided by 3 may be written:
A. $3\overline{)6}$ B. 6 ÷ 3   C. both   D. neither

Since A and B are both correct, you should write C or <u>both</u> for your answer.

GO TO NEXT FRAME.

I Some questions are test questions. The answer is not given but the word "TEST"

is written in.

Who is President of the United States now? _____

TEST

J You are now ready to start _Introduction to Modern Mathematics._ Good Luck.

GO TO FRAME 1 OF UNIT 1.

xxxiii

2173. On figure 203 we next draw the line _____.

AD

2174. AD will be _____ to the line *m*.

perpendicular

2175. Compare your completed construction on figure 203 with that of figure 205. Is your construction essentially correct? Answer yes or no.

2176. Next with your ruler draw as dotted lines AB and AC. If your construction on figure 203 is correct you may use figure 203, otherwise use figure 205. We know that AB and AC are _____.

equal

2177. We know that AB and AC are equal since they are _____ of the same circle.

radii

2178. On the same figure draw the lines BD and BC as dotted lines. We know that BD=_____, since they are radii of the two equal circles with centers at B and C.

CD

2179. Now consider the line segment BC. The points A and D a· ·ach _____ from the endpoints of that line ··ent.

equidistant

2180. Two points each equidistant from the endpoints of a line segment determine the _____ _____ of that line segment.

perpendicular bisector

2181. On figure 206 we see a triangle, △_____.

PQR

2182. The word "altitude" means height. An altitude of a triangle is the distance from a vertex to the opposite side. An altitude of △PQR on figure 206 would be the distance from the point P to the line _____.

QR

2183. The altitude from the point P to the line QR is a line through _____ (let.) and _____ (wd.) to the line QR.

·P,
perpendicular

Plane Geometry

2184. On figure 206 let us construct the perpendicular from the point P to the line QR. You may need to extend the line QR. We extend QR by placing the ruler with its _____ along the line QR and then drawing a dotted line to the left of the point Q.

edge (or synonym)

2185. We next draw a _____ whose center is P and which meets the line QR in two points which we will call X and Y.

circle

2186. We now draw arcs of two circles with the same radius whose centers are the points _____ and _____.

X,
Y

2187. Let these two circles intersect at the point S. We draw the line _____.

PS

2188. We do not need to draw the entire circles. We need only draw the _____ of the circles near where the intersection takes place.

arcs

2189. Let A be the point where PS meets the line QR. PA is called an _____ of the triangle PQR.

altitude

2190. The side of a triangle to which an altitude is drawn is called the base of the altitude. The altitude and the base meet at _____ angles.

right

2191. We may also draw an altitude from the vertex R to the side _____.

PQ

2192. The altitude from the vertex R to the side PQ will be _____ to the side PQ.

perpendicular

2193. On figure 206 let us construct the altitude from the point R to the side PQ. We first extend PQ by placing the ruler with its _____ along PQ and then drawing a dotted line in both directions.

edge

2194. We next draw a circle whose center is _____ and which meets the line PQ in two points, say F and G.

R

223   *Plane Geometry*

10.   We can add the ending <u>est</u> to the word <u>high</u>.

high<u>est</u>

We can make the word <u>high</u> [gr--].

A

---

0. est
    or
    high<u>est</u>

31.   John had <u>more</u> than <u>two</u> test marks.   They
were 75, 64, 87, and 98.

His [low---] mark was [   ].

B

---

1. most

52.   Which is [cold—], winter or summer?

C

grow

11. The word <u>high</u> can grow. <u>High</u> is a

| r___ | word.

est
or
lowest
64

32. The mark that was <u>most</u> low or | low___ |
was 64.

○

er
winter

53. Which is | short___ |, a year, a week, or a day? C

a choice (one "yes" and two "no's")	**109.** What do you think? (Only one question can be answered "yes.") SNOWBALL has two parts: SNOW and BALL. Is SNOW a prefix?_____ (yes or no) Is BALL a suffix?_____ (yes or no) Are SNOW and BALL, *both* roots?_____ (yes or no)
110. ➤ together	**110.** COM· = "together" and POUND = "put." A compound word, therefore, is one that has been "put _____."
111. ➤ compound	**111.** A *compound word* is a word made up of *two words.* The word BALLROOM is made up of two root words, BALL and ROOM, so BALLROOM is a _____ word.
112. ➤ words *or* root words *or* roots	**112.** The word SNOWBALL is a compound word. Both SNOW and BALL are _____.
113. ➤ no (*It has a suffix.*)	**113.** The word SKYSCRAPER is made up of two words. SKY is a word and SCRAPER is a word. SKY is a root word. Is SCRAPER a root word? _____.
114. ➤ two	**114.** We will save the label COMPOUND WORD for one kind of word. A word that has only a prefix and a root is not a compound word. A word that has only a root and a suffix is not a compound word. To be a compound word, a word must be made up of _____ words. *(how many?)*
115. ➤ is not ➤ is not	**115.** INSPECT has a prefix and a root, so it [is, is not] a compound word. MANUAL has a root and a suffix, so it [is, is not] a compound word.
116. ➤ roots	**116.** A compound word is built by putting two words together. A compound root is built by putting two _____s together.
117. ➤ compound	**117.** The word MANUSCRIPT has two roots. MANU is a root and SCRIPT is a root. So MANUSCRIPT has a c_____ root.
118. ➤ roots *or* words	**118.** A compound word *cannot* be a root word, because it has two parts. A root word is a word, such as TEACH, that cannot be taken apart. But a compound word like SNOWBALL can be taken apart into two _____s.
119. ➤ can	**119.** A compound root *cannot* be called a root, because it has two parts. A root is a unit, such as MANU, that cannot be taken apart any further. MANUSCRIPT is not a root word because we [can, cannot] take it apart.

Chapter Two

120. ▶ does not	120. A root of a word [does, does not] have to be a word by itself (without a prefix or a suffix).
121. ▶ is not (*It is not a word.*)	121. The word MANUSCRIPT has two roots. One of the roots is never a word by itself. The root MANU, meaning "hand," [is, is not] a root word.
122. ▶ un ▶ manu ▶ two ▶ five	122. Look at the word UNMANUFACTURED. It has a prefix, _____. It has a root, _____. It has another root, FACT. It has a suffix, -UR. It has another suffix, -ED. How many *roots* does it have? _____ How many *parts* does it have? _____
123. ▶ root	123. A *compound word* is made up of two words. A *compound root* is made up of two roots. The word MANUSCRIPT, therefore, has a compound _____.
124. ▶ two roots	124. The word UNMANUFACTURED has five parts. Two of these parts, MANU and FACT, are roots. Although it has parts that are *not* roots, we still say it has a compound root because it has _____. _____. *(how many?)* *(what?)*
125. ▶ is not (*It can be taken apart.*) ▶ does not (*It has one root.*) ▶ is not (*It is not a word.*)	125. SWER is the root of ANSWER. AN- is a prefix. ANSWER [is, is not] a root word. ANSWER [does, does not] have a compound root. SWER [is, is not] a root word.
126. ▶ is ▶ is ▶ is not (MANU *is not a word.*)	126. MANUSCRIPT has a compound root. MANU [is, is not] a root. SCRIPT [is, is not] a root. MANUSCRIPT [is, is not] a compound word.
127. ▶ is (*It is a root and a word.*) ▶ is (*It is made up of two words.*) ▶ is not (*It has a suffix, -s, which has to come off before it becomes a root word.*)	127. BROOM is a root of BROOMSTICKS. STICK is a root. BROOM [is, is not] a root word. BROOMSTICKS [is, is not] a compound word. STICKS [is, is not] a root word.

You have now completed Chapter Two.

APPLICATION OF PROGRAMED INSTRUCTION

Enlarging the Teacher's Scope

The introduction of programed learning into the classroom changes the role of the teacher but does not change his goals. He is still a teacher. The purpose of the mathematician in today's complex society is much the same as it was before the invention of the abacus, the adding machine, the calculator, and the computer. It is impossible to compare the efficiency of the mathematician of yesterday with the mathematician of today. The quality, standards, and efficiency of the mathematician have changed. Undoubtedly, machines have replaced mathematicians. However, they are not an extinct breed and never will be.

It has been demonstrated that a man using an abacus competing against a man using a calculator can solve a limited class of problems in the same amount of time. Why is it then that we use the calculator instead of the abacus, when the calculator is so many times more expensive? The answer is simple. It is easier and less expensive to train a man to run a calculator than it is to train him to operate an abacus.

The goals of the housewife of 1900 have not changed in 1965. If anything, the goals of the 1965 housewife have been extended; she is more efficient in keeping house than ever before. The fact that she subscribes to a diaper service does not mean that she loves her child any less. The fact that she has running water in the kitchen does not mean she loves her husband any less because she does not have to go out and get water from the stream or the well.

Many efforts are being made today to make the teacher more efficient. The concern

that many classroom teachers have about automation in the classroom is highly predict-
able. The role of the teacher will change. He will be able to manage a classroom with
an efficiency that is unheard of even today. He will become an experimenter, an inventor,
and a highly specialized person who will create a specifiable technology to train other
teachers. He will invent a technology for teaching so keen that the words "slow learner"
will remain in our language only as an historical oddity.

With the use of programed instruction in the classroom, the teacher will be able to
spend more time teaching and less time in time-consuming tasks such as roll keeping and
handling discipline problems. Here are a few things the teacher will be able to do in the
programed instructional system. The teacher will have a student take roll for him. This
will be a high probability behavior for the student, a preferred behavior. (See Motivation
section of this Manual.) Not taking roll saves the teacher approximately seven minutes of
class time. The teacher will spend more time with the Diagnostic Profiles and work assign-
ments for the current day and the following day, and he will be able to plan farther and
more efficiently in advance. The teacher will also be able to spend more time giving in-
dividual attention to students. If a student is unable to make the discriminations required
in a given section, the teacher will 1) work with the student on that particular part of the
program or 2) will assign a student who has tested very high in this particular subject to
work with the student having trouble.

The teacher will also be able to spend more time grading progress checks and
marking the grades in the grade book. If students have any deficiencies in areas that are
not covered by programs, the teacher will have more time to spend helping the students
learn these areas.

By eliminating most of the trivial tasks, the teacher can keep in constant touch with each of the students and will know how each student is progressing. When students need extra help, the teacher will have the time to give the individualized attention needed.

Selection and Training of Teacher Aides

The teacher may select teacher aides to assist him in the administration of the system.

How to Select Teacher Aides

What factors make a student a good teacher aide? In order to initiate students into the role of a teacher aide, the teacher should look for:

1) Leadership qualities. Students tend to follow instructions from a natural student leader almost as readily as they follow instructions from a teacher; however, as the system becomes well established, the need for innate leadership diminshes.

2) High level performers. An important consideration in selecting teacher aides is to attempt to select those who can keep ahead of the rest of the students in the class, or at least stay even with the average by working part time. Since any duties will prevent the aide from using the full instructional period, this is a necessity.

3) Motivational factors. It has often been noted that being given the opportunity to play the teacher role is a motivating activity for many students. The formal teacher aide system provides such an opportunity. To determine if, in fact, the role of teacher aide

is a preferred consequence, the teacher may talk to the student about the possibilities of using him in this capacity. If the student indicates he might like to try it, the teacher should make learning how to perform the duty one of the preferred consequences in the student's contract. If the student continues to show interest, the preferred consequence can become the actual performance of teacher aide duties. The teacher can modify the student's contract so that the administration of progress checks might continue for one hour or more.

The considerations of motivation nullify to an extent the necessity of the first two requirements for a teacher aide. A highly motivated teacher aide can learn to perform his duties adequately even if he is not a "born" leader. Since acting as a teacher aide is contingent on completing his assigned tasks, many students will work much harder than under ordinary circumstances.

4) Teacher aide duties. Whether teacher aides are taught one specialized task or taught all the tasks necessary to be a teacher substitute should be left to the teacher.

The duties vary. The student could be trained to distribute, correct, and record progress check scores in the record book, or his job could be as menial as passing out programs, paper, pencils, and masks.

How to Train Teacher Aides

The most important consideration in training teacher aides is the gradual increase in responsibility for administrative tasks. Only a few students should be trained at any one time. The first administrative duty to be learned is the distribution of progress checks. When the student can perform this duty adequately, he can be promoted to the second duty

of material distribution.

Each aide can learn to function in all phases of program administration or, alternatively, a teacher aide may only be responsible for one specific administrative duty.

Necessity of Diagnostic Profile

A requirement prior to introducing programed instruction in the classroom is the pre-testing of all students, using an accepted, standardized achievement test. There are two main reasons for doing this.

1) The pre-test will provide a base line from which the improvement of each student can be measured.

2) The test will serve as a diagnostic tool to help the teacher pinpoint each student's specific problems.

Although the teacher may have a general feeling about each student in the class, the pre-testing will provide him with an exact record from which he can work.

Making the Diagnostic Profile

After the tests have been graded, the teacher can begin making a file on each of the students. This file need not be elaborate or complicated, but a simple statement of facts about each student. The teacher should list the weak subjects for each student; for example, punctuation, decimal fractions, common fractions, and so forth. Under these topic headings, the teacher may also make notes. Under fractions he might write, "This

student has trouble with addition and subtraction of fractions because he does not understand common denominators." Another note under the topic of fractions might be, "The student does fine in fractions but he does not understand how to reduce fractions to the lowest terms." Another student's record might read, "Weak in fractions only because he gets in trouble when he works with mixed numbers."

Also on this record sheet, the teacher should list the strong points that the student has. For example, a student who is poor in arithmetic may be doing very well in punctuation. This gives an idea of which students may be used as teacher aides to help students who are weak in punctuation.

Study the example below.

```
Punctuation — comma fault
Decimals     — decimal fractions
Fractions    — common denominators; mixed numbers
SRA          — level green
Practice Sheets
Spelling     — Wilson's
Strengths:     music, algebra, and biology
```

Using the system of Diagnostic Profiles assures the teacher that he is not assigning unnecessary work to a student, assignments in which the student does not necessarily need practice. In this way, the student can make the best use of his time working on programs that are necessary for him specifically.

There is no reason that the teacher cannot discuss the diagnostic profile with the student and show him his weaknesses. We recommend that the teacher also point out the student's strengths. The profile record may be given to the student to keep in his own personal student reference book.

Physical Arrangement of Classroom

Any conventional classroom can be used to administer programed instruction. Modifications to the regular classroom are few and simple. At most, they require re-arrangement of desks and provision of specific areas for individual instruction, group instruction, and activities. This rearranging will become easier to understand once the teacher becomes more familiar with the procedures and materials to be used. There is no need to begin modifying the classroom on the first day of using programed instruction, because it is easier to do while the new system of instruction is being practiced. It is best, however, to formulate a room plan toward which to work.

The classroom should be designed to allow rapid movement throughout the room. The location of desks, storage racks, games, and areas for physical activity should be clearly designated. Under these arrangements, each student performs his activity in a well-defined area.

There should be one or two students per desk with enough room to conduct an activity designed for two students. Extra supplies, pencils, and paper should be kept in a cabinet with other materials.

Storage cabinets should be constructed with several compartments for the different materials. Each compartment should be labeled to facilitate the management of the materials.

The game and physical activity areas should not become the focal point for students who are engaged in study sessions. The area for this activity should be in the back of the room.

The room plan on the following page is a suggested arrangement of a classroom utilizing programed instruction.

Blackboard

Lecture Area

Contract Files

Teacher's Desk

Teacher Aide

Door

Storage Cabinets

Task Area

Book Shelves   (divider)

Teacher Aide (for preferred task area)

Preferred Task Area
(games and activities)

Game Table

Game Table

Talking Table

Magazine Rack
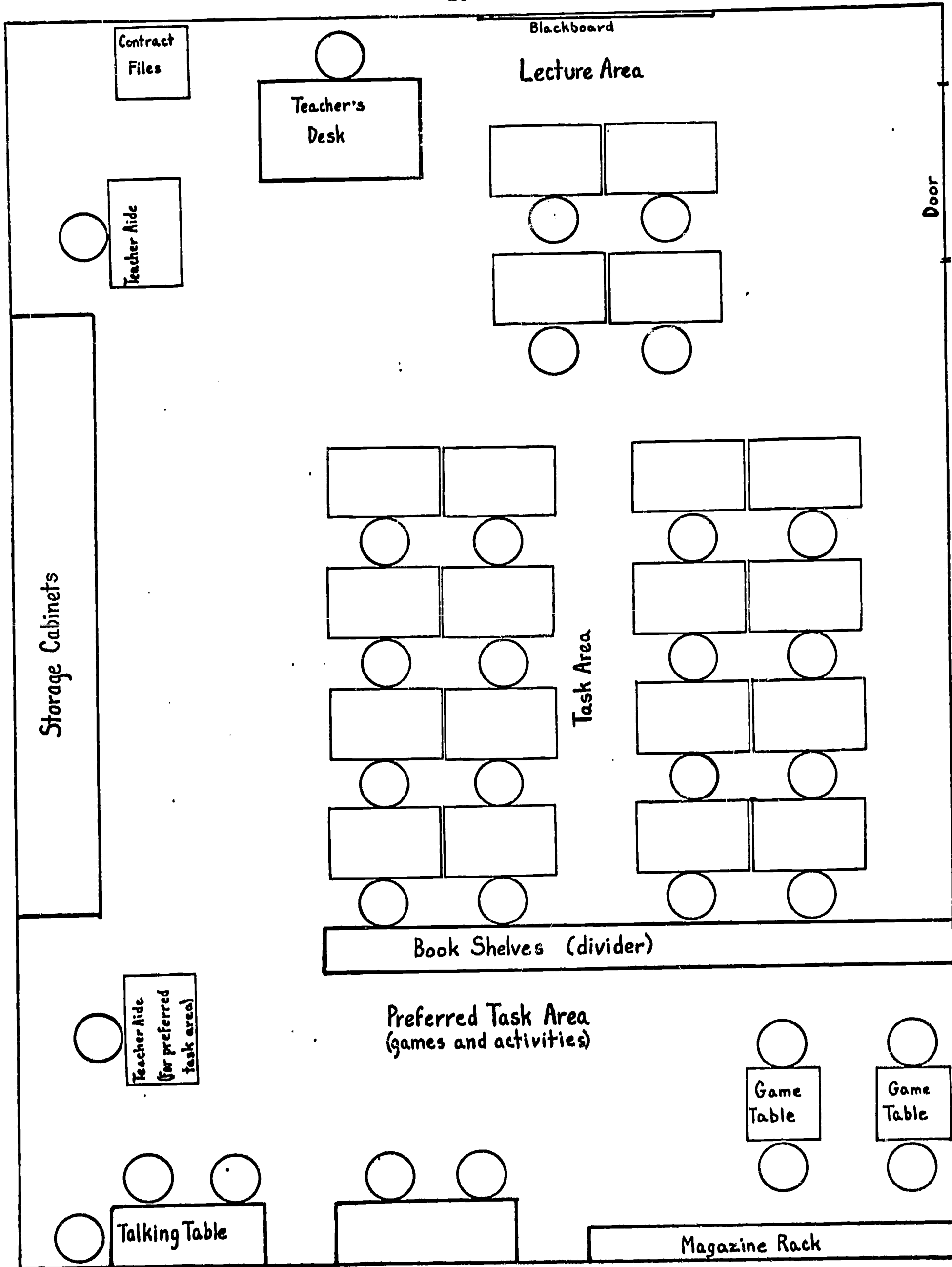
Suggested Arrangement of a Classroom Utilizing Programed Instruction

Efficient Distribution of Learning Materials

Teaching machines are not vital for the introduction of individualized instruction in the classroom. They are bulky and, in most cases, not as efficient or as inexpensive as programed textbooks.

The materials which are to be used include:

1) Programs (there are two modes):

   a. individual texts (both necessary and preferred)

   b. group texts

2) Supplemental Materials:

   a. Student Reference Books

   b. Progress Checks (course pre- and post-tests and unit pre- and post-tests)

   c. Diagnostic Profiles

   d. Progress Charts

Material must be kept in the classroom so that each student has access to it. Reading material in book form is kept on bookshelves. Programed material can be kept on book- shelves or in a cabinet. These shelves must be conspicuously marked so that the student can go directly to the material he is to do on any given day. The following figure shows how these shelves could be marked.
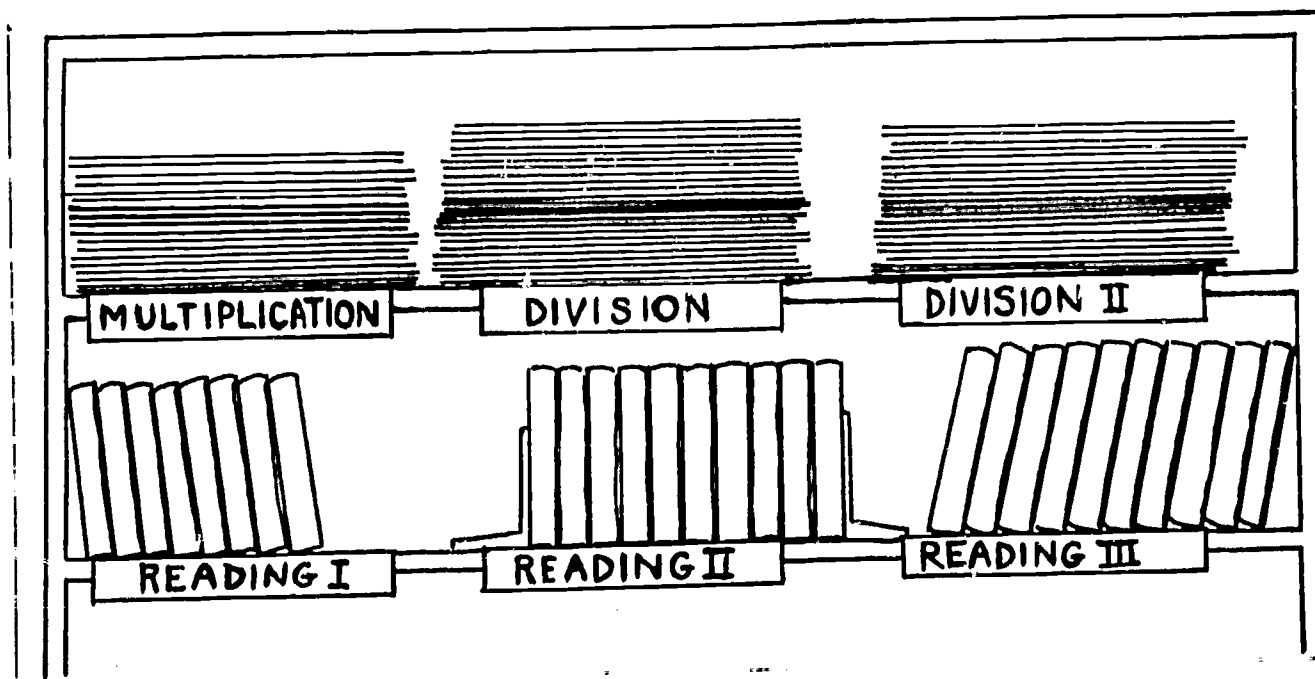
Material must not be arranged randomly but should be in logical order. As a student finishes a program and moves to the next, he must be able to find the material he needs. Note that in the above figure, Reading I is followed by Reading II, and so forth.

Although students should have free access to the shelves, material should be supervised by the teacher or by a teacher aide. The aide should keep an inventory of programs and make sure that each program is returned at the end of the period.

Students will return their programs to the appropriate shelf at the end of the period. This will reduce the amount of work the teacher or the aide has to do to maintain the shelves.

A general storage area should be designated outside of the classroom. In this storage area, extra copies of all programs can be kept, and programs may be stored prior to the time they will be needed in the classroom. Programs which have been completed can be transferred from the shelves in the classroom to the general storage area. For example, if all students have completed Addition and Subtraction by the end of the first

week, these programs can be moved to the general storage area. This will make more room on the shelves to store the new materials as they are brought in.

How to Initiate Programed Instruction in the Classroom

The task of initiating programed instruction into a classroom is not simple. It should not be introduced on a whim, but only through a carefully thought-out plan.

While obtaining the proper materials is of prime importance, there are several things which should be accomplished before a teacher can consider what materials are necessary.

1) The Diagnostic Test, which acts as a base line, should be given all students.

2) The profile of each student's weaknesses and strengths should be drawn up.

3) Potential students should be chosen to act as teacher aides.

After these things have been accomplished, the teacher can then determine what materials will be necessary.

The materials which he chooses should be dictated by the type of deficiences shown in each student's profile. If one or more students has a weakness in fractions, some sort of fractions program should be secured. If one or more students has a weakness in decimals, then a decimals program should be secured. In addition to the programs which are essential to treat student weaknesses (necessary programs), there are also preferred programs.

A preferred program does not address itself to remedying an existing weakness but

provides a source of enrichment and is used as a preferred consequence. Briefly, a preferred program is any program which a student would voluntarily ask to go through.

In order to determine which materials are actually the best, the teacher should write the various programing organizations, asking for information on their programs. From an inspection of the type of gain score, inspection of the population on which the program has been standardized, and inspection of the program, the teacher can probably determine which programs will be most effective with his students. After the teacher has determined which programs to purchase, he orders the number of programs he thinks he will need. Generally, three or four programs of any specific type will be enough for a class as large as fifteen to twenty. In this way, while students A, B, and C are going through fractions, students D, E, and F can be going through decimals. At the end of a period of time, these individuals can change programs. Meanwhile, the other students in the class can be going through a similar rotation system.

After the materials have been obtained, the teacher should concentrate on building the Color Card Task and Preferred Consequence file. After the Color Card Task and Preferred Consequence file has been established, the teacher then makes preparations to bring programed instruction into the classroom. Contracts are prepared for the students, materials are assembled, and a date on which the program will start is adopted. On that day, the students are given a short lecture on contingency management and performance scheduling; they are told what to expect. After this short lecture, the programs and con-tracts are passed out to the appropriate students, and programed instruction is ready for use in the classroom. (The following section, Motivation, contains information about contracts, contingency management, and suggested files to help the teacher.)

After the system has been introduced and is in actual practice, the physical movement of the class is under the control of the contract and under the supervision of the teacher. For instance, a student is only allowed to get a drink of water if his contingency contract allows him to. The teacher sees that each student follows his contract. A student should be allowed to go to the lavatory or sharpen his pencil only if he receives permission from the teacher.

MOTIVATION

Importance of Controlling Motivation

Motivation is one of the most important factors in human learning. We know that socio-economic class, the existence of life goals, cultural factors, family influences, and peer group influences all jointly affect the individual. Certainly these general, abstract considerations are important in the motivation of people. But when we are interested in an individual's motivation, we must concern ourselves with immediate, concrete factors.

It is true that the typist would not be in the office unless she anticipated a pay check at the end of the week, but the immediate goal of finishing a letter has more affect on her immediate behavior than does the pay check. Although long-term goals are important, behavior is most affected by immediate consequences.

All action has consequences. We may divide these consequences into preferred and nonpreferred events. The occurrence of preferred consequences acts to make the behavior which led to it more likely to occur on future occasions. Completing the letter— a preferred consequence—acts to make the previous behavior, typing, more likely. Behavioral psychologists have termed such events "reinforcements," and have extensively studied the effects of reinforcement in simple situations. Now we are taking this fundamental phenomenon in learning and systematically applying it to everyday experience.

Motivation, then, primarily involves a specific, immediate goal that we have referred to as the preferred consequence. In order to obtain the preferred consequence, there is a certain response which must be adequately performed. We might diagram it this way.

$$behavior \longrightarrow preferred\ consequence$$

In such an arrangement, if the behavior does not occur, then the preferred consequence—the goal—will not occur. We say that the preferred consequence depends upon or is contingent on the performance of the task behavior.

Everyone is familiar with such contingencies. We have all been exposed to them since childhood. "Clean up your room, then you can go out and play" is a familiar example. The preferred consequence here is to go out and play. The preferred consequence is contingent upon the adequate performance of the task of cleaning up the room. "Get ready for bed and then I'll read to you" is another familiar example. Task first, then preferred consequence.

As these simple examples clearly show, there is nothing new or startling about the principles of motivation set forth here. The examples show that there is nothing complicated about them. They are easy to understand. The only difficulty is in taking them seriously enough to apply them systematically.

To convince oneself that this is not always done, one need only return to the two previous examples. With sufficient experience in these areas, many instances of what might be called "reverse contingencies" can be detected. "You can go out and play for awhile, then you've got to clean up your room" clearly is a violation of the rules of motivation. The preferred activity is permitted to come before the task, exactly the reverse of what should be the case. Or in the other example, who has not heard (or even participated in arranging) reverse contingencies like this: "All right, I'll read one more story, then you've got to get ready for bed." Again, the order of activities is exactly the reverse of what it should be.

To sum up, the two laws of motivating a task are:

1) There must be a clearly observable, immediate preferred consequence.

2) There must be a true contingency. That is, unless the task is completed, there can be no way to achieve the preferred consequence.

The problem in the classroom becomes the selection of preferred consequences and arranging them so they only occur after the assigned task has been completed.

The following list includes a few possible reinforcing consequences.

List of a Few Possible Preferred Consequences

MACHINE MANIPULATION
Tape recorder
Stop watch
Stapler and other office equipment
Other educational equipment

RESPONSE MODE VARIATION
Writing
Thinking answers on alternate
units
Working out loud with a partner

CHANGE IN ACTIVITY AND
LOCATION
Go outside
Rest room
(Work area session)
Physical education
Leaving for home

OTHER INSTRUCTIONAL
MATERIAL
Algebra
Language
Science

PHYSICAL ACTIVITY
Exercise
Running
Isometrics

POINTS – GRAPHS – CUMULATIVE RECORDER
Progress Notebook

PROGRESS CHECKS
Written
Oral

LIBRARY BROWSING
Looking through picture books

GAMES
Tic-tac-toe
Dots
Hangman
Card games, and so forth

BREAKS
Get coffee, tea, milk, candy, and so forth
Smoking
Music (listening to radio or tape)

CONTROLLED DISCUSSION OF
THE TASK
    With peer
    With teacher

DISCUSSION (PERSONAL INTERESTS)
    Guidance
    Talk about self
    Talking to a peer

ACTING AS TEACHER AIDE
    Sharpening pencils
    Blackboard erasing
    Passing out programs
    Giving instruction

Contingency Management

There are three ways in which activities in a classroom can be scheduled.

1) Schedules can be arranged according to the passage of time. We
will call this <u>temporal</u> scheduling.

2) Schedules can be dependent upon the completion tasks. We will
call this <u>performance</u> scheduling.

3) Schedules can depend on a combination of temporal and performance
factors. We will call this <u>combination</u> scheduling.

<u>Temporal Schedules</u>

The traditional way of managing a classroom relies almost solely on temporal
scheduling. In the typical 50-minute period, the only response a student must make to
be reinforced is the waiting response. It makes no difference what the student does or
does not do, because at the end of 50 minutes class is over.

<u>Performance Schedules</u>

With the individualized instruction which programed learning makes possible, the

opportunity for performance scheduling should not be ignored. The completion of a given amount of material and a good performance on a test based on the material can be easily demanded as a prerequisite for some reinforcing activity.

Combination Temporal-Performance Schedules

For our purposes, the combination of performance and temporal scheduling is the best. It can easily turn into a high-rate schedule. By requiring a specific amount in a specific period, you have actually improved the control conditions. Presumably, requiring a student to do 10 pages of algebra would be reinforced if the student took 10 minutes, one hour, or all day. However, requiring 10 pages of algebra in 10 minutes—otherwise no reinforcement follows—puts pressure on the student to work harder and faster than he normally would have had to work.

Performance scheduling requires some extra effort, but is, in the long run, a time-saving device. This is true because of the effects of increased motivation that have a positive effect on both morale and performance rate.

Another important effect of performance scheduling is the elimination of undesirable work habits. When temporal scheduling alone is used, the termination of the period may coincide with and thus reinforce behavior incompatible with the behavior desired. The student may be daydreaming when the period ends, for example. With performance scheduling, this cannot happen. The last thing the student does has to be the specified task, and thus the behavior reinforcement follows.

There are other more subtle ways to avoid tasks which are on a temporal schedule.

For example, many students have substituted learning to control the behavior of their teachers for controlling their own learning behavior. Typically, "reinforcing the teacher" has little to do with academic achievement; it is usually incompatible with such behavior.

Suppose a student is having difficulty in solving the problem, "Two fish plus three fish is _____." The teacher or volunteer comes to assist him. If the student is aware of the teacher's interest in fishing, or if he wants to take a calculated risk, he might say, "You know, a funny thing happened to me while I was fishing the other day." Soon both teacher and student are engaged in a mutually enjoyable discussion. Conversation is not an undesirable behavior itself. However, it is incompatible with doing the job assigned.

Another method students use successfully in manipulating teacher behavior is to be mildly annoying. This student bangs his pencil on the desk until the teacher says, "Quit that, John." A pencil banged on a table cannot be used to write answers in a program.

Training instructors not to reinforce these kinds of responses is difficult and highly impractical. In our experience, even experts in behavioral control sometimes find it almost impossible not to reinforce inappropriate behavior.

Undesirable behaviors of the student can be eliminated through performance-contingent scheduling.

The Contingency Contract

The contract concept is one of the most important foundations of our social system. Suppose that a prospective client comes to an architect and asks him to draw up some plans. They enter a mutual agreement or contract. The architect is to draw up plans for a building. The client is to pay money for this. If everything goes all right— the plans suit the client, the fee suits the architect, and the building is constructed— both the architect and his client have lived up to the terms of their contract.

Traditionally, the schoolroom only vaguely approximates this kind of an arrangement. Most of the students are working to avoid aversive consequences rather than to earn some positive payoff. This is clearly revealed at test-taking time. The students are not eager because the reward of a high grade is in the offing. Far from it. They are anxious (sometimes pitifully so) because they may get a low grade.

The effects of this system of motivating students can clearly be seen. The number of school dropouts and the number of students who hate school are testimonials to its aversiveness.

The system of instruction described here uses the contract method of assigning tasks in the classroom. Of course, it is neither practical nor particularly advisable to pay for the fulfillment of a task assignment with money. But there are other means. These are the awarding of points or "merits" of some kind which can be used to buy special privileges, diplomas, badges, and so forth. But there is another class of payments for the fulfillment of a contract. This is the opportunity to engage in preferred activities.

Every teacher can think of many different activities in which all students like to engage. Lunch, recess, and going home, to mention only a few, are appealing to most

students. The opportunity to engage in these activities traditionally depended only upon whether the hands on a clock moved a given distance. In the modern concept of the contingency contract, they are permitted to occur immediately after a contract of some sort has been fulfilled. For example, the teacher, noting that it is close to lunchtime, can say, "Here are five arithmetic problems. After you have worked them all correctly, you may leave for lunch."

The contingency contract is necessary not only to create motivation but to strengthen the experience of fulfilling the terms of the contract. In the world of adult work, the employee has a job to perform, and the employer has the responsibility of paying for that job. Students must learn that, in order to receive what they want in the real world, they must perform some desired action. The contingency contract is a statement agreed to by both parties. It simulates the real-life situation wherein an employee must fulfill a contractual obligation to the employer. The teacher normally does not demand such action, nor does the teacher systematically reward performance. The schoolroom situation is rarely placed on a business-like basis. The teacher is not aware of the reinforcers available. On the other hand, the successful employer is keenly aware of how money, promotion, and so on effectively motivate the performance of his employees.

The contingency contract takes into account the unique characteristics of each student, and thus goes farther than other techniques in meeting the needs and aspirations of each student.

Contract Preparation

The teacher preparing a contingency contract should become familiar with the student in order to determine what responses are preferred consequences to him. These may be listed. In addition, the student's task assignments should also be listed, and these lists combined. For example, if Algebra, English, and Spanish are tasks, and Fractions, Breaks, and Reading are reinforcing responses, the following lists would result.

Tasks	Preferred Consequences
Algebra	Fractions
English	Breaks
Spanish	Reading

Task responses are on a ratio schedule, that is, a prescribed amount of behavior must be completed before the preferred consequence can be engaged in. Consequent activities are controlled on an interval basis; these are timed. The resulting schedule would look something like this.

Tasks	Preferred Consequences
4 pages of Algebra	10 minutes on Fractions
5 pages of English	5 minutes on Breaks
3 pages on Spanish	10 minutes on Reading

There are three problems that must be worked out for a satisfactory operation of the system. These are:

1) the selection of the preferred consequences,

2) the arrangement of the contract in the allotted times in a school situation, and

3) the administration of the contract.

The first problem can be solved by observing ongoing behavior to see what is momentarily a preferred consequence, and by observing what the student generally "likes" to do.

The actual preparation of the contract can be done by the teacher or by teacher aides. There must be a new contract prepared each day. There are two ways to prepare a contract. The first is a serial listing of tasks and consequent activities.

5 pages of Algebra

10 minutes of Fractions

4 pages of Spanish

5 minute break

3 pages of Spelling

5 pages of Spanish

10 minutes of Reading

3 pages of Algebra

Movie (If you finish before movie time, go to gym.)

Note: Two task responses (Spelling and Spanish in this instance) may be called for before a preferred consequence. We have found it best to keep the task required short on the first contracts. As the student's response rate increases, we may add to the contract gradually. For example, the first contract may call for only 3 pages of Algebra. In a few days, the contract may call for 5 pages.

The second form of contract arrangement is probably the most efficient for class

use. In this system a set of cards is prepared for each student. Some of these cards list his tasks, others list his preferred consequences. The teacher then arranges the student's consequence cards with his task cards in the prescribed manner. This schedule varies from day to day, of course, depending on the tasks and what preferred activities are available.

Such a contract may look like this.
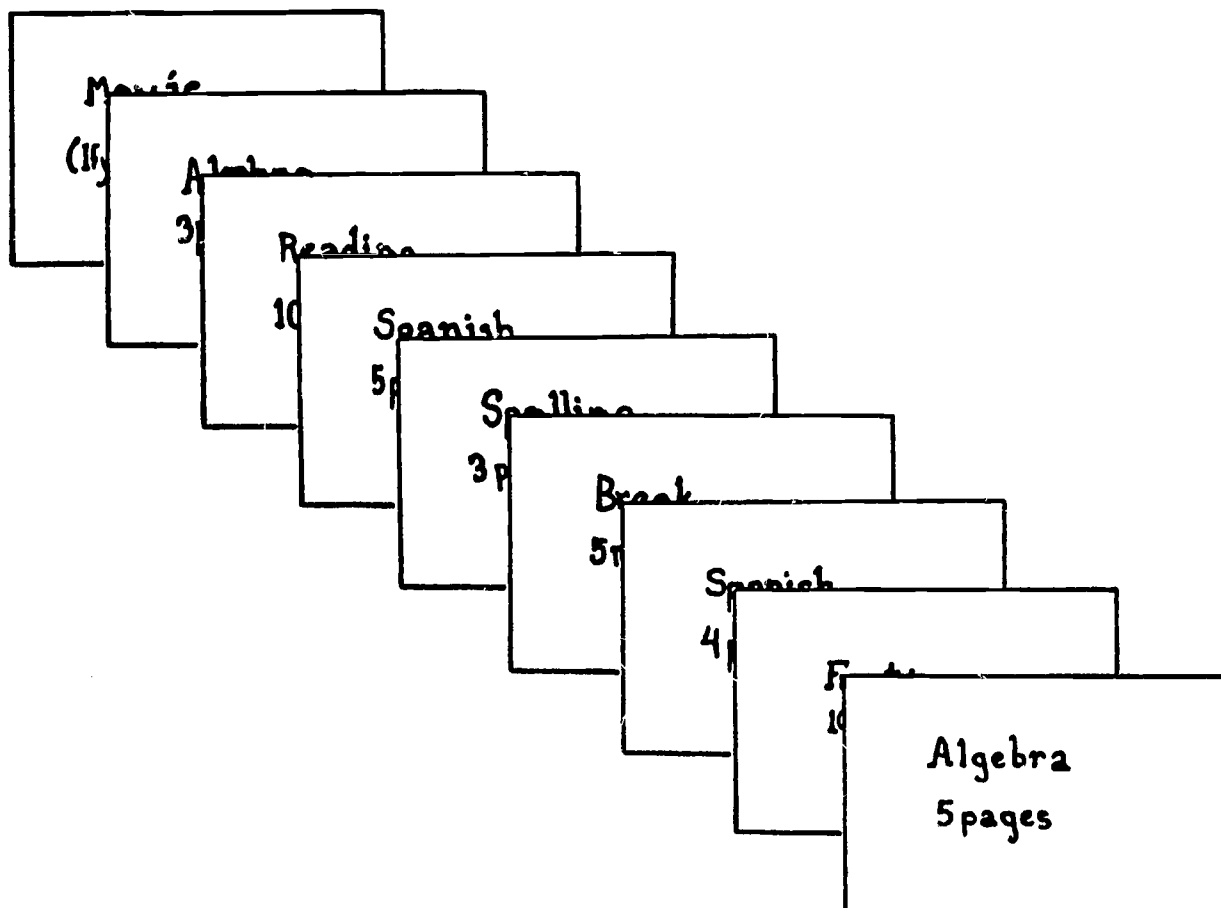
The following is a summary of steps in contingency contract preparation.

1) Make a list of reinforcing responses and tasks.

2) Task responses are put on ratio schedules (fixed number).

3) Reinforcing responses are put on interval schedules (timed).

4) Two ways to prepare contract:

    a) a list

    b) on separate 3 x 5 cards

5) Refer to the <u>List of a Few Possible Preferred Consequences</u>.

6) Gradually lengthen the amount of task required.

If a student's contract is made up by using cards rather than a list, we have found that colored cards are more efficient. The following pages give a step-by-step procedure for preparing and using such a system.

Student Contract Index Card

In preparing a contract for a student, the teacher must first find which tasks the student needs to work on and what that student's preferred consequences are. He does this by pulling that student's Student Contract Index Card, which has been made up from his diagnostic profile.

A Student Contract Index Card is a 5 x 8 card on which is listed the student's name and a list of both tasks and preferred consequences. For example, a Student Contract Index Card for Sally Jones might look like this.

		Sally Jones
Algebra	−	
English	−	
Spelling	−	
Talk	+	
Break	+	

In Sally Jones' case, tasks for Sally are Algebra, English, and Spelling; these tasks are indicated as tasks by a minus symbol. The preferred consequences which have been scheduled for Sally on the preceding Student Contract Index Card are Talk and

Break; these preferred consequences are indicated by a plus symbol.

Color Card Task and Preferred Consequence File

After looking at the Student Contract Index Card to see which tasks and pre-ferred consequences are called for, the teacher goes to a file called the Color Card Task and Preferred Consequence File.

A Color Card Task and Preferred Consequence File is a file of 3 x 5 cards which are color coded to main subjects and preferred consequences. Behind the main subjects are filed the subject breakdowns on the same colored card. For instance, consider Mathematics as a main subject, color coded green. Filed behind a green divider en-titled, "Mathematics," would be filed other green cards that would carry subjects such as Addition, Subtraction, M & D (Multiplication and Division), Fractions, Decimals, Algebra, Modern Math, and so on. If a main subject such as "Languages" were color coded orange, then behind the orange "Language" divider would be filed subjects such as Spanish, French, Russian, German, Hebrew, and so on, also on orange cards. If pre-ferred consequences were to be coded on white cards, behind that main division would be white cards on Break, Smoking, Talking, Games, Teacher Aide, and so on, including all the activities that have proved to be preferred consequences for the students. The figure on the following page illustrates such a file.

Many of these colored task and preferred consequence cards will be made up and filed for each subject. All of the cards will carry the subject's name and a definite assign-ment on them. For example, there might be 20 green cards filed under Fractions. Five of these cards might have on them "Fractions, 1 page." Another five cards might have
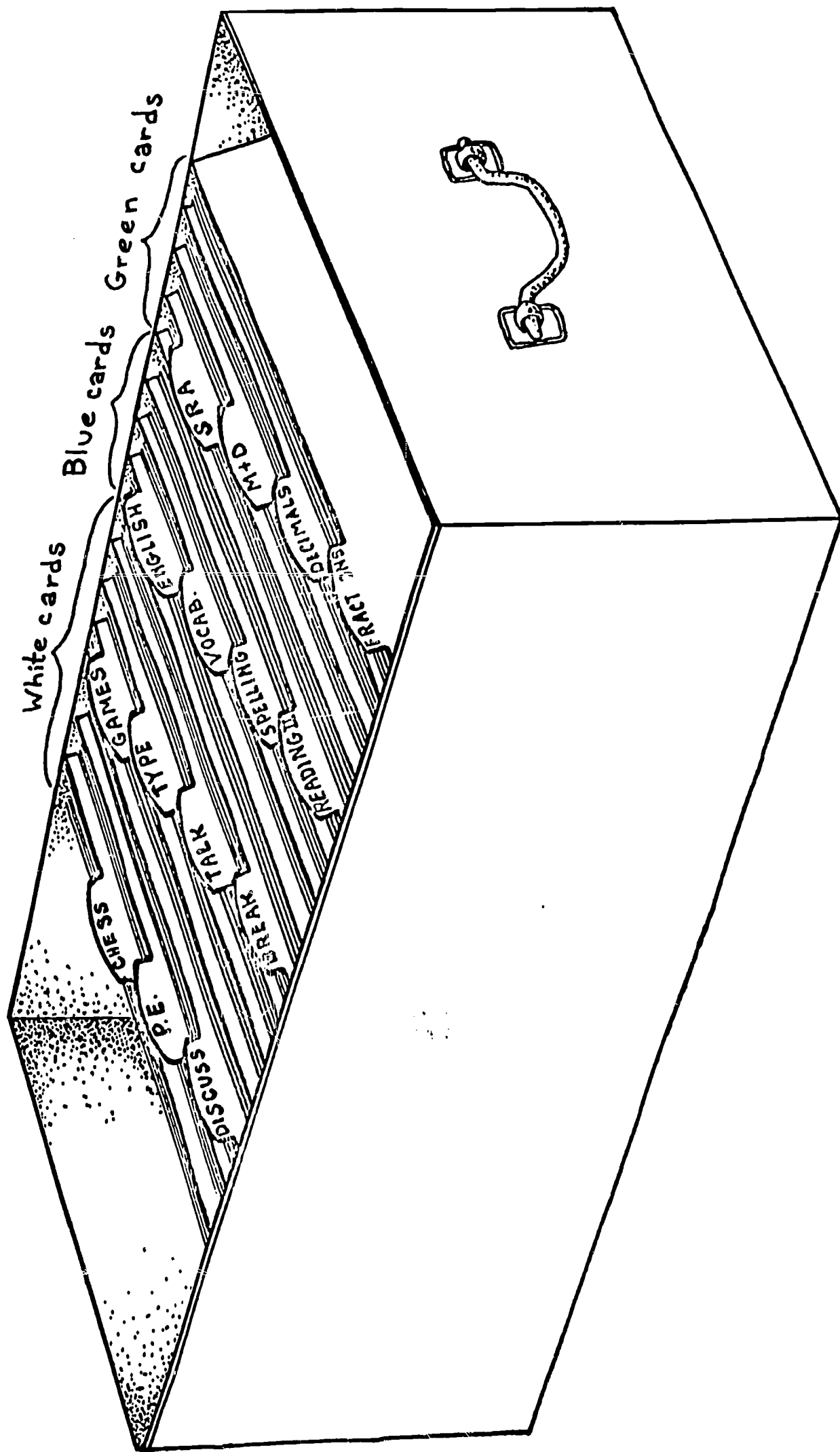
Illustration of Color Card Task and Preferred Consequence File

"Fractions, 5 pages," and another five might have "Fractions, 10 pages," and so on.

It is from this file that the student's contract is drawn. Therefore, the Student Contract Index Card is taken to the Color Card and Preferred Consequence File, and cards are pulled according to the index card. These colored cards are then arranged in the order necessary to control that student's motivation.

The student's "contract" is very simply a group of these colored cards that make up the schedule for that student for that day. The arrangement of the cards and the assignments on the cards will vary from day to day, because a new contract will have to be made each day to adjust task assignments and to utilize current preferred consequences according to that student's performance and behavior patterns.

As the student completes the assignment specified on his first task card, he returns his study material to its specified cabinet and drops his task card in the Color Card Task and Preferred Consequence box to be filed later, probably by a teacher aide. He then picks up the next card in his contract and follows the instructions on that card— accomplishing the assignment if a task card, or enjoying the activity if a preferred consequence card. After that card's directions are accomplished, his study material is returned to its cabinet, and that card also is pitched into the "To Be Filed" box of color cards. At the end of the day, all of his colored cards will have ended up, one by one, in the Color Card Task and Preferred Consequence box.

The student completes his day by turning in his Student Contract Index Card to that box of returned cards, also to be filed later by the teacher or teacher aide.

The figure on the following page illustrates a possible table arrangement for returning cards.

Color Cards
Tasks and Preferred Consequences

Student Contract Index Cards
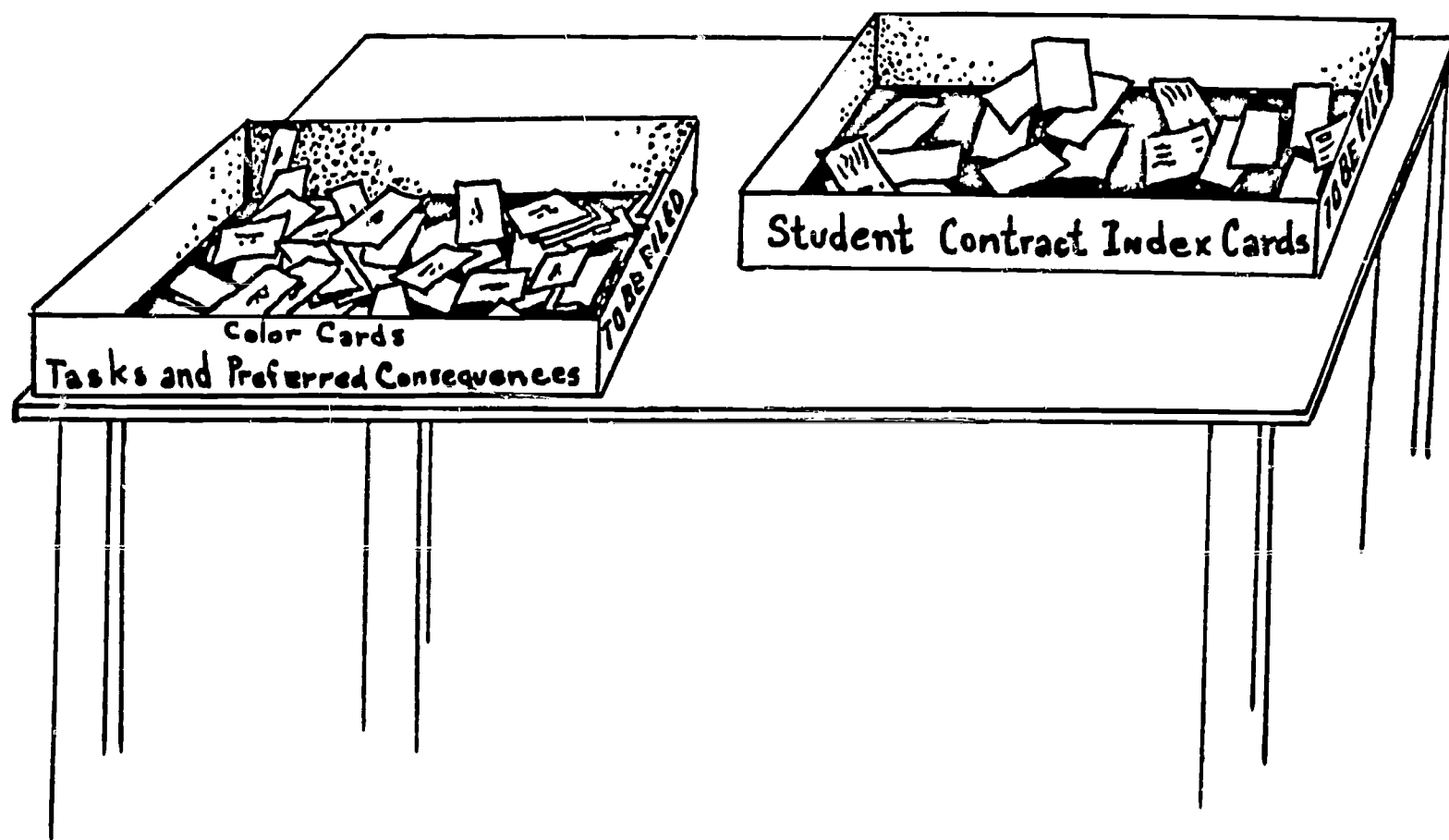
Student Reference Book

It should be noted that materials for a Student Reference Book (SRB) are not

usually supplied with programed materials and must be made up by the teacher. In doing

this, the teacher will become familiar with the class as a whole—the program range in

which his class is engaged, the variety and popularity of preferred consequences in which

his class has expressed an initial interest, and the average level of achievement at which

his class stands. Also, the teacher will become more familiar with each student in his

class as he makes up the Student Reference Book for that student. He sees that student's

position in relation to that of the class in different academic subjects, and the particular

choices of preferred consequences of that student give the teacher a personality portrait

from which the teacher can operate.

For the student, keeping an SRB has proven to be more of a preferred consequence than a task. He does his own filing in it; he plots his own progress on his charts—he doesn't have to wait for report card time to find out "how he's doing."

The SRB is invaluable to the teacher for reference in checking the student's progress and achievements. With a quick glance, the teacher can see the past and current achievements of the student, and his rate of progress.

A Student Reference Book is an ordinary binder that is used to hold information and records useful to both the student and teacher. The notebook will be indexed for easy and quick reference, since it will be used constantly by both student and teacher.

The following is a suggested index for an SRB.

DIAGNOSTIC PROFILE

This is the list of tasks and preferred consequences (with notes on each) made out by the teacher from the pre-testing prior to instituting the contract system. It is from this list that the Student Contract Index Card is made.

CONTRACT

This section is separated into subjects by colored dividers corresponding to the Color Card Task and Preferred Consequence File. For instance, following the previous color examples, the divider used for any of the "Mathematics" subjects would be green.

A Progress Check Score Chart will be drawn up by the teacher for each subject in the student's contract and should be a part of the notebook before it is handed to the student. (Whether this score chart will be a graph on which the student plots his grade or simply a sheet on which he enters his numerical percentage is

determined by the teacher.) It is suggested that the Progress Check Score Chart be affixed to the front of the divider so that the student and teacher alike need only to turn to the divider of that subject to note the progress.

The student IMMEDIATELY enters the results upon completion of all progress checks on the score chart. (This gives the student immediate reinforcement in addition to providing an up-to-date reference.) After the scores have been entered on the chart, all progress checks (Course Post-tests, Unit Post-tests, Record of Accuracy on Test Frames, Exercise Sheets, and so on) will be filed by the student behind that divider.
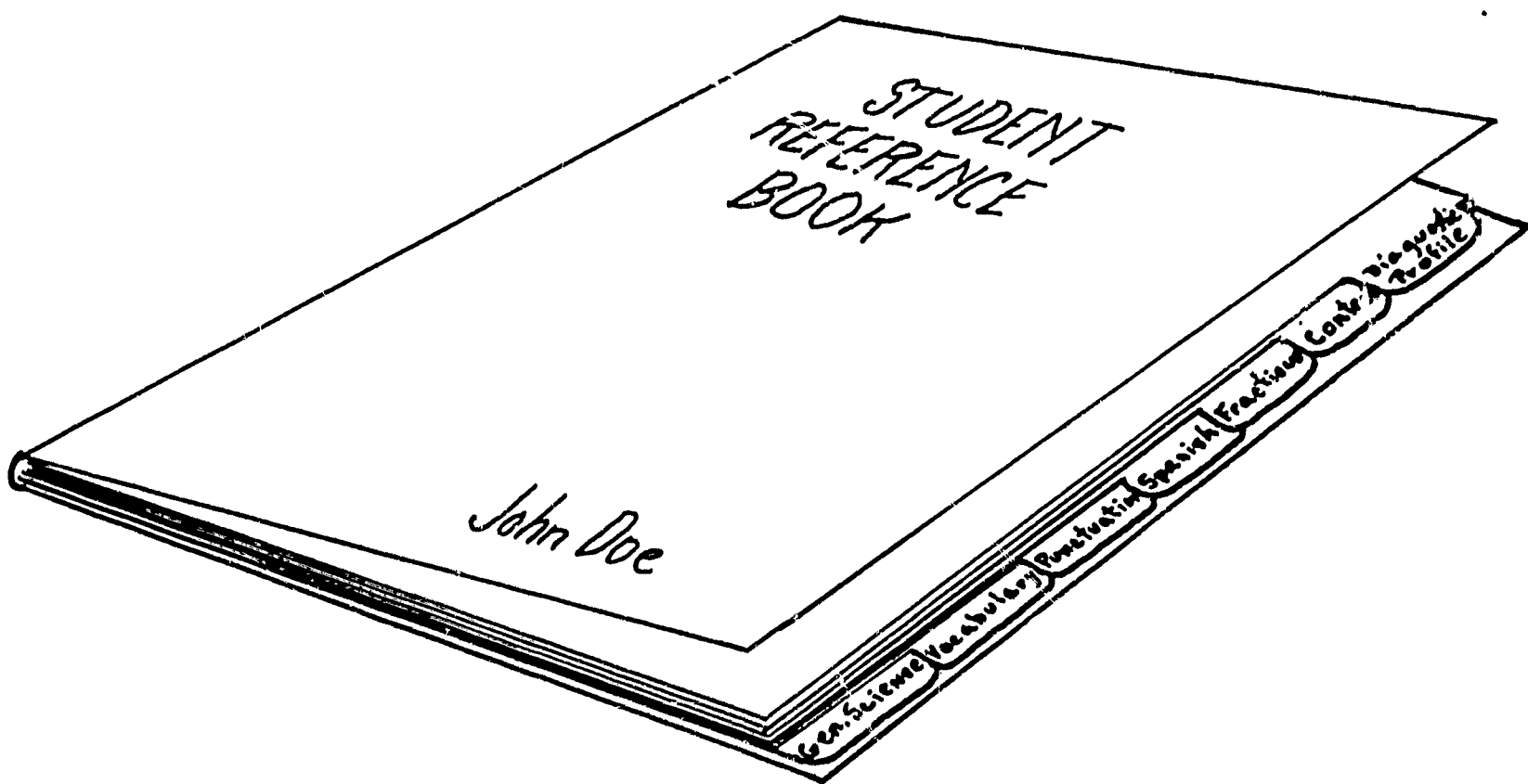
Introduction of the Contract in the Classroom

The first objective in introducing the contract into the classroom is to bring the student under control of written instructions.

A first approximation may be to write instructions on the board. For example, the first direction could be, "Take your program and turn to page 23." This might be followed by, "Now turn to page 30," or "Go through the first four frames on page 1 of the program." The next step is to explain to the students that they will, in the future, receive similar instructions on cards. Since there will be a schedule of activities for the student to perform, the student can go from one activity to the next.

The final steps involve passing out individual cards to each student in the class. Once such card might carry the instruction, "Work on your assigned program for 20 frames." Adding additional instructional cards soon brings the entire contract into the classroom situation.

Control of the Contract

The teacher or teacher aide must control the contract. The student is given the contract each day. He may at this time be allowed to indicate preferences for contingency activities. The student's indicated preferences should be evaluated when the following day's contract is being prepared. Under no circumstances, however, should the teacher modify the contract for that day.

The teacher must control two factors involved in the contract.

1) He must determine if the student has fulfilled the terms of the contract, in both amount of task completed and the adequacy of the student's performance. This is accomplished through teacher-graded progress checks.

2) He must control the amount of time the students engage in their preferred activities. The best approach is to use a form of the honor system. Each student is required to

note the time at the beginning and end of his preferred activity and cautioned to try

to limit the times as specified on his contract. Minor infringements on time may be

overlooked, but excessive and consistent infringement will require overt action on

the part of the teacher.

Distribution of the Contract

Most instructors take a daily roll. This routine operation can be used to distribute

the contracts. The teacher should go to the class c few minutes early. In these few minutes

the teacher and any aides can distribute the prepared student contracts. Contracts can be

either centrally located or individually placed. If each student is to receive his own con-

tract, then in the few minutes before class, the teacher and aides can place the correct

contract on each student's desk or work area. When the student comes to class, he should

go directly to his work area, look at his contract, get his materials, and begin working.

If there are no assigned work areas for each student, the contracts may be centrally

located on a single table. Under these conditions, each student goes to the contract table

to determine his sequence of activities.

EVALUATION

Use of Testing as a Reinforcing Measurement

Testing is an integral part of the learning process. However, traditional testing is usually for the benefit of the teacher rather than the student. This need not be the case. When the system of testing is designed to show the student the progress he has made over a period of minutes rather than days, weeks, or longer intervals, tests can be used to reinforce the student. If tests are used as a check on the student's progress rather than a method of threatening the student, testing could soon become enjoyable rather than threatening. The most critical features in making testing enjoyable are the intervals at which the tests are given and the use of test information.

Due to the nature and construction of programed instruction, although learning is easier, it is more difficult for the student to discriminate that he is learning anything. For this reason many students become discouraged, and in many cases programs are left on shelves never to be used again. However, since learning is accomplished, testing serves as a reinforcing measure and proves to be a preferred consequence rather than a task.

Diagnostic Tests

The diagnostic test covering one subject or many subjects is given before the student begins his programed instruction. It should be explained to the student that this test is for the purpose of diagnosing his strong and weak points, and that he will not be

graded on the test. He should have access to the result of his test, and it should be pointed out that he does not have a general weakness but that he is deficient in certain specific operations.

The diagnostic test should be a standardized achievement test. There is no "grade" in diagnostic testing, and it should not even be discussed with the student because it could be punishing, since the student has been oriented to the fact that grade placement is important to the general educational community. The diagnostic test will merely determine what material each particular student should work on. In programed learning the student's goal is to learn one operation in mathematics instead of obtaining a three-year's gain in mathematics; therefore, his goal becomes a short-range project requiring a few hours rather than a long-range goal requiring several weeks or months.

Course Pre- and Post-tests

Some programed materials available today have a Course Pre- and Post-test. Before a student begins a course, he takes the Course Pre-test. Although there is a grade given for the Pre-test, it will not be recorded on the report cards. The Course Pre-test is only an index, or base line, from which the student can see the amount he has learned by comparing the Pre-test and the Post-test. The Post-test is the same test as the Pre-test, only it is given after the student has completed the course. The Post-test score minus the Pre-test score equals the gain score, and this gain score shows the amount the student has

learned from the course.

Unit Pre- and Post-tests

Some programed materials also have Unit Pre- and Post-tests. Programed instruction is usually divided into units, much like chapters in a regular textbook. The student should be given the Pre-test before beginning each unit and the Post-test upon completing the unit. If the student does not make at least 90 percent on the Post-test, he should not be allowed to advance to the next unit. Instead he should review the unit until he does reach the 90 percent criterion.

It should make no difference how many times a student has to go through the unit—once, twice, three times—the grade that counts is the student's final unit grade of 90 percent or more. As long as the student reaches this criterion he has learned the material, even if he has had to go through the material more than once. For his own purposes, however, the teacher may wish to record the grades on each try as an indication of the difficulty that that particular unit caused the student.

Unit Pre- and Post-test Answer Sheets are usually provided in each program. The teacher should collect these out of each book and control them himself.

Test Frames

Test frames are a printed-in part of the program itself. These are merely frames built into the program that do not have the answers given. 'They are short tests to indicate to the student whether or not he is learning the material, and at the same time they serve

as an attempt to control cheating, since answers to test frames are not checked until the unit is completed.

A chart can be made so that each student can have a personal record of his correct percentage of test frames in a given unit. This chart will go in the student's reference book.

Not all programs contain test frames. Included in the Modification section are instructions on how to prepare student control measures if a program is used which does not contain test frames.

Progress Checks

Experience has shown that progress checks are the most important part of the evaluation system in programed instructional material. It has been pointed out that progress checks are important to the student, because as its name suggests, they give the student a chance to show himself that he is learning—that he is progressing. Progress checks are necessary to the teacher, however, in evaluating the student's progress. They are the tool which the teacher uses in measuring this progress.

Very simply, progress checks are any tests given on the material in the program. Post-tests and test frames are progress checks. Also considered as progress checks are the tests which are given every 40 to 50 frames. The student checks these answers himself. A low percentage of correct answers will indicate to the student that he hasn't mastered that particular concept covered within the unit, and that he must review the material included since the last progress check. To guard against the student's continuing to study material for which he is not sufficiently prepared, the teacher himself

should grade every fourth or fifth progress check without announcing which checks the student will not be grading.

Progress checks are often available with programed materials, but in many cases the teacher will have to make them up himself. The Modification section of this Manual shows how to make up progress checks if they are not included in the program or if non-programed material is used.

Of all the evaluation material provided with programs, the progress checks given every 40 to 50 frames especially should always be used. It is conceivable that the Course or Unit Pre- and Post-tests and test frames would not be used, but we cannot over-emphasize that these other progress checks should always be used.

Administration of Progress Checks

The student is signaled by frame markers or by reference to a list when he must take a progress check. The progress checks can be passed out by the teacher, or they can be placed on a "self-service" shelf. In the latter system, the student finds his progress check on the same shelf as the programs. He may be allowed to get his progress check himself, or they may be administered by a teacher's aide. The student gets the progress check that tests the material he has just learned. If he has just finished Arithmetic, Unit 2, Section 3, he must get the progress check for Arithmetic, Unit 2, Section 3.

When the student has the correct progress check, he returns to his desk and answers the questions on a separate piece of paper. He does not write on the progress check sheet because it will be used again by other students. The student should be given instructions to check his work twice, then to give his progress check answers to the teacher or teacher aide.

At the option of the teacher, the test is graded by the student, a teacher aide, or the teacher himself. If the student has not completed the progress check satisfactorily, he must do that section again. If he has worked his progress check satisfactorily, he is allowed to engage in one of his preferred consequences.

Grading Progress Checks

As mentioned, there are two options in grading progress checks: the teacher check and the self-check. In the first system, the teacher grades every progress check. The administration of this system is quite simple. The student turns in every completed progress check, and the teacher grades each one. When using this system, it is important that the progress checks are graded immediately so that the student has immediate consequences for his responding.

The second, and most efficient system, is the self-check procedure. In this system, the teacher grades one out of five of the student's progress checks. The other four are graded by the student himself. The student may receive the grading key from the teacher for this purpose. The student will learn that nothing will be gained by cheating when he grades his own progress checks, since it will be pointed out that the student won't know the material when the teacher grades his one-out-of-five progress checks.

Satisfactory performance on the progress check also signals completion of the contingency contract so that the student may then execute his preferred consequences.

Grading

Progress reports are periodic evaluations of the student's present achievement level. In the past, educators have used a variety of ways to indicate achievement levels. These include:

1) letters from the Arabic alphabet:

A = excellent, B = good, C = fair, D = barely passing, and F = failing;

2) or the variation:

E = excellent, S = satisfactory, and U = unsatisfactory;

3) and numerical percentages:

90% - 100% = excellent, 80% - 90% = good, 70% - 80% = fair, and 70% and below = failing.

Although "grade cards" are often criticized, there are many good reasons why periodic evaluations should be made. Any individual likes to know how he is doing. He needs to know how he is doing, however, because the more information the student receives about his performance, the better he can evaluate his own abilities and change his subsequent performance. All students can benefit from finding out about their strengths and weaknesses if the information is coupled with positive suggestions for actions.

While grades are useful to the student to assess himself, they are necessary for others to assess the student. Often parents, friends, future employers, and other responsible members of the community are eager to know how students are doing in school. Parents are naturally pleased when their children have done well. Future employers or instructors of advanced vocational training programs are vitally concerned with an individual's abilities so they may place him in a job best suited to his capabilities.

The information is also necessary for evaluating the system. The teacher needs this feedback to aid him in determining what he should emphasize, what he need not emphasize, and what he has failed to teach.

The recommended form is a written progress report issued bi-weekly to each student. In each area, the students receive a grade of excellent, good, or fair, based on the average of their progress check scores.

Excellent = 90% - 100%

Good = 80% - 89%

Fair = 79% - and under

Using this system of progress report, no student receives a poor or failing grade. Students will respond better to reinforcement than to punishment.

MODIFICATION OF EXISTING MATERIALS

Altering Presentation of Programs Being Used

For various reasons, it is not always necessary for every student to go through every section of a program. Under certain circumstances students should omit sections of a program. The following are the major reasons for skipping or accelerating certain students.

Ability of Student

Often it will appear that a given course is too easy for a student. This can be seen by his excess rate of speed and by his doing near-perfect work on the progress checks. Under such conditions he should be allowed to proceed as rapidly as he can. To accomplish this, allow the able student to complete the unit with less work than other students. This can be done by letting the student omit certain sections of the unit.

Some programs have paths designed for the more able students. Often these accelerated paths only require the student to complete the last 30-40 percent of each unit. Other paths require the student to take only the most important sections of the program, which have been predetermined. Using the first requirement, if a unit of 200 frames had an accelerated path of frames 141-200, the student would skip frames 1-140 and go directly to frame 141. The second approach necessitates a list of the important frames to be taken, such as 1-6, 7, 41-44, 108-125, 140-160. Satisfactory performance on the progress checks assures competence for the entire unit. If performance on the progress check is not adequate, the student should redo the entire unit.

Most published programs do not have accelerated paths, but there are alternate methods of accelerating which may be used. One such method is to have the able student respond to only the even numbered frames and allow him, if he wishes, to only read the odd numbered frames. In most programs this will allow these students to gain all the information in the unit while avoiding much of the redundant practice. Of course adequate performance on the progress checks is necessary.

When the entering diagnostic tests show that a student has partial knowledge of an area but needs skills strengthened, the student should review the material, using the accelerated method as described above. This review allows the student to bring his knowledge and skills as indicated by performance on progress checks up to criterion level in as short a time as possible.

Prior Knowledge

Occasionally students already are familiar with some of the information offered in a program. When this happens, students can be accelerated in the units or can omit certain units.

Indication of the student's prior knowledge can be obtained from two main sources. These are the diagnostic test and the student interview. If the diagnostic pre-test shows that a student is strong in a given area, he may be allowed to skip the units or program that cover that area. If the student says he knows the material, he can verify this by taking the progress checks for the material. If he passes the progress checks, he can skip the material. If he does not, he must do the material.

Information Considered Unnecessary

Sometimes programs will contain units of material that cover information the teacher evaluates as unnecessary or superfluous. These units may be deleted. However, when the teacher finds unnecessary frames within a unit, it is not advisable to delete the frames because of the confusion that generally results.

Adding Progress Checks to Modify Existing Materials

Most currently available programed material is not constructed in such a way as to meet individual instructional requirements. It would not be worthwhile for each teacher to attempt to construct his own material, but it is feasible to modify existing programs. Since time and budget considerations, in most cases, will not permit any major modification of existing materials, let us consider the most economical and worthwhile modification of those materials on hand, that is, the addition of progress checks.

As explained in the Evaluation section of this Manual, progress checks are the most important part of the evaluation system. They are short tests designed to find out whether or not the student is absorbing and retaining the subject material he is studying in the program. Progress checks are all the checks used in determining the progress of the student in his learning process. These will vary in length from one frame, called a TEST FRAME, to a comprehensive Course Pre- and Post-test.

In the early days of programed instruction, students frequently did not realize that they had learned anything because the steps were so small and easy to take. This sometimes led to cheating (looking at the confirmation before making the response) or

skipping whole sections of material because "it looks dull." It became necessary to control the student's responding and to let the student <u>know</u> he was learning. As the name implies, progress checks are used to measure a student's progress--his learning is turned into performance that can be measured quickly and objectively. Progress checks not only measure the student's knowledge of content, they also give him a chance to use his ability to utilize the principles taught in that section. In addition to evaluating progress, progress checks are reinforcing to the student. Because they occur directly after the learning, they permit the student to IMMEDIATELY demonstrate his newly learned skill, not only to his teacher but to himself. Therefore, when the teacher is writing his own progress checks for material, he might remember that they can serve two purposes--to measure progress and to reinforce the student.

In a reading or language program, or at the end of graded reading material, progress checks are given. These progress checks are designed to test the student's <u>comprehension of what he has read</u>, his <u>knowledge of the specific content</u>, or his <u>ability to use the principles taught in the unit he has just finished</u>.

In content courses such as mathematics or science, the progress checks are placed at the end of a unit of discriminations and indicate the student's <u>specific abilities</u> and <u>knowledge</u>. If, for example, the material the student has completed covers the facts $5 \times 7 = 35$ and $35 \div 5 = 7$, the progress checks will test his ability to make the <u>appropriate responses under a variety of conditions</u>. The problems on these progress checks might be:

$$35 \div 7 = \underline{\hspace{2cm}}$$
$$7 \times 5 = \underline{\hspace{2cm}}$$
$$35 \div \underline{\hspace{2cm}} = 7$$
$$\underline{\hspace{2cm}} \times 7 = 35$$

Progress checks are most effective when they cover only a small amount of material; there should be a progress check after each important concept is developed. In a program, this means that progress checks should probably occur every 40 or 50 frames or less, certainly more often than the unit tests that may be available with commercially available materials.

If the student is learning from graded reading material (as opposed to going through a framed program), the progress checks should follow each segment, and the number of checks will be dictated by the length and complexity of the selection. If the selection is less than 400-600 words and the material is not complex, the progress checks follow the selection. When the selection is longer, it is divided into segments of approximately 400-600 words. Progress checks follow each segment and test the important concepts covered in the segments.

Special types of external progress checks.

1) Course Pre- and Post-test

2) Unit Pre- and Post-test

In many programs there is a Course Pre- and Post-test. The student is given the Pre-test before entering the program, and the Post-test upon completion of the program. This gives both the student and the teacher an idea of how much the student actually learned by going through the program. The teacher merely computes a gain score by subtracting the Pre-test score from Post-test score. For example, a score of 8 right out of 50 on the Pre-test and a score of 45 right out of 50 on the Post-test (same test) gives the student a gain of 37. By going through the program the student acquired enough information to answer 37 questions correctly.

The Unit Pre- and Post-test check is designed upon the same assumptions, but the questions only cover the material of one unit instead of the entire course.

How to Prepare Progress Checks

Try to obtain commercially available material that has adequate progress checks. However, do not ignore good programed material simply because it does not have progress checks. Budget and quality of material should dictate usage. Progress checks can be simply prepared for the material.

Writing Progress Checks for Programed Material

In programed material, progress checks should follow after a significant behavior has been developed. These should occur every 40 or 50 frames. There should be approximately three to five questions in the progress check, depending on the complexity of the material covered. If the behaviors developed consist of a large number of discriminations, either the number of frames between progress checks could be shortened or the number of questions in the progress check increased to six or seven, or both. It is not desirable to use more than seven items. When the material is comparatively simple, three to five questions may suffice.

If the progress checks are to be indicators of performance, they must have content validity. All the major discriminations covered in the frames should be represented. If a series of frames covering operations involved in reducing fractions is to be checked, questions asking the students to reduce fractions covering the range taught would be in the progress check. An example is on the following page.

Reduce these fractions.

$$\frac{2}{4} \qquad \frac{3}{9} \qquad \frac{4}{6} \qquad \frac{6}{18}$$

The rules for writing progress checks for programed material are as follows:

1) Progress checks should be given approximately every 40 to 50 frames, depending on the complexity of the material.

2) There should be three to five questions in each progress check, with a maximum of seven questions when the number of discriminations in the section is large.

3) The questions in the progress check should test the major discriminations and operations covered by the frames. The person writing the progress checks should go through the frames to ascertain what is most important. Then the questions can be constructed.

Writing Progress Checks for Nonprogramed Material

Some nonprogramed material can be used very effectively if progress checks are written for the material. This is especially true of graded reading material.

The rules for progress checks apply here too. Progress checks should occur after sufficient significant content is covered. The ratio of material to progress checks should be kept short, even if the selections must be broken into segments. The number of progress checks will, of course, then be dictated by the length of the reading selection. The complexity of the segments being checked affects the size of the progress check. At the lower levels, where the segments are fairly simple, three to five questions will probably be sufficient. For advanced, complex material, as many as 10 to 15 questions might be necessary.

To compose progress checks for unprogramed material, read the material and locate the major content points, then construct the questions from them. The progress check questions should check factual information to indicate reading comprehension.

To prepare progress checks for nonprogramed material:

1) If the selection is long, divide it into segments.

2) Construct progress checks to come at the end of each segment.

3) Determine the number of questions in the progress check by examining the length and complexity of the material. The range might be from three questions on very short, simple readings to 10 or 15 on long, complex readings.

4) Make sure the questions in the progress checks cover the content of the reading selection, and test for both factual information and reading comprehension.

Substitutes for Progress Checks

In the past there have been many techniques and devices to suppress cheating. These techniques, like progress checks, attempted to control the student's behavior, but generally without producing the desirable effects that progress checks do. In group situations, testing and spot-checking are two such techniques employed. Spot-checking, i.e., looking to see if each student is responding, is only minimally adequate in individualized instruction. An instructor can, by looking over a student's shoulder, check to see how the student is responding. But the presence of the teacher only serves as the signal to the student to avoid overt cheating and may also inhibit productive work as well. Checking each student by strolling around the room (as most teachers know) is inefficient and a waste of time.

Many programs have TEST frames. A TEST frame is a frame in which the student

is not given a confirmation, thus making it impossible to just copy the answer. Such
programs provide a test-frame answer sheet so that the student may, at the end of the
unit, check his test frames against the answer sheet to find out how many test frames he
missed. These test frames are crude attempts to control cheating and give objective evi-
dence of whether or not the student is learning the material.

The major objections to test frames are:

    1) Not all programs have them, and

    2) They are difficult to put into such programs.

Consequently, there is a lack of consistency in any group of purchased programs. The
progress checks, which are often available or can be prepared easily when not available,
offer a needed source of consistency. It is, therefore, recommended that progress checks
be used instead of test frames as "student control procedure."

It is possible to evaluate student performance with a frame-by-frame analysis. In
such an analysis, the instructor checks each and every response a student makes to the
program. This procedure takes a great deal of time and is not particularly fruitful. It is
possible for the teacher to find which behaviors were not successfully established, but this
same information can be more efficiently obtained from the progress checks.

In general, no substitute system to check responding is as efficient, universal, and
time-saving as the progress check system.

Using the Provided Unit Post-tests

Many programs have Pre- and Post-tests available for each unit. The purpose of
these tests is to check the student's gain on the unit by comparing his score before he goes

through the unit with his score when he finishes the unit.

When a course has a Pre- and Post-test for each unit, it is suggested that the Pre-test be dropped (unless it is useful for diagnostic purposes) and the Post-test be given to back up the progress checks. This procedure will cut down on grading considerably and will eliminate testing which serves little or no purpose. If the progress checks on the unit are good, the unit Post-test can also be dropped unless the teacher sees some benefit in testing the students twice on the same material.

REMEDIAL AND ALTERNATE METHODS FOR MAXIMUM GAIN

Contract Revision

It is important that the teacher note how each student reacts to his contract.

A student may exhibit some of the following examples of symptoms.

1) unfinished contract

2) complaining

3) dawdling

4) talking and wasting time

5) looking at the clock

6) inattention to instructions or detail

A student fails in the classroom because the system fails. To guarantee the success of programed instruction and the contract system in the classroom, there are three areas which should be under constant surveillance. These areas will require continued attention and probable revision.

1) Motivation. When a situation like one of the above arises, it is most likely due to the ratio of work to the amount of reinforcement. A rearrangement of the preferred consequences on the student's contract will then be in order.

2) Ability. If a change in the student's contract is indicated and motivation has been eliminated as the conflict, the student's Pre-test should be re-evaluated. If the test result indicates that the program in which he is having difficulty requires certain entering behavior he lacked at the beginning of the program, he should be re-routed to a program that will correct his deficiencies. It is possible, however, that the material is simply too difficult for that particular

student at that particular time. Re-routing to a remedial program will
be the measure to be taken in this case also.

3) Material. If the listed symptoms are exhibited by several students and the
teacher has discarded both motivation and individual ability as the cause,
the teacher's attention should be directed to the material being used. The
material could be inappropriate or generally inadequate to do the job. If
repeated use of the material in question establishes that it is of poor quality,
the material should be eliminated.

Additional Visual Stimuli

In the programed text the stimuli are all visual. The student reads to himself and
examines any figures or drawings to arrive at the correct answer. But the printed program
is not the only possible mode of program presentation. Other methods vary the presentation
of the visual stimulus and may add audio components. There are a number of commercially
available teaching machines with audio-visual capabilities. Almost all of these devices
have some response evaluation device ranging from a right-wrong buzzer to a computer which
selects remedial paths. In this Manual, however, we will limit ourselves to what can be
done by the average teacher with equipment that may be available.

All schools have slide and motion picture projectors available. Often, when the
quantity of programs is limited, the teacher places a program in an opaque projector.
This permits all students to examine and respond as a group. If necessary, the teacher can
also read the information from the frame. The students can write the answers on a sheet of
paper.

Audio Components

As mentioned before, there are elaborate systems of audio and visual components on the market. Slide projectors coupled to tape recorders require special preparation of materials, but if such material is available, it may be utilized. However, one audio component which can be added to change presentation mode is simply the teacher's reading aloud the verbal portions of each frame. This method is particularly valuable for students having reading difficulties. This procedure is naturally group-paced and not individual-paced, and the number in the group will have to be kept reasonably small in order for the teacher to ensure that each student understands what discriminations are called for in each frame.

A more sophisticated approach is to record the verbal matter for each frame on tape. The teacher controls the operation of the recorder and evaluates the response. The students follow along with their programs and examine the figures therein. In the school systems that have tape recorders, this method could be used to an advantage. The teacher's eyes would be free to watch facial expressions for incomprehension, or for inattentiveness.

Response Mode Variations

In visual-audio program presentation, it may be desirable to set up a method of responding other than writing in the programs. One effective procedure is to allow students to write constructed responses on a pad and to respond to multiple-choice items with a signal card. These cards may be marked or colored to indicate the response. For example, cards will be coded to the choices by color, figure, or number. Each student holds up in front of him a card which indicates to the teacher the choice that student has made. This

method allows the teacher to rapidly scan the room to evaluate student performance immediately.

Incorrect Way to Show Response Card   Correct Way to Show Response Card