R E P O R T   R E S U M E S

ED 016 390   24   EM 005 640

PROCEEDINGS OF HE CONFERENCE ON INSTRUCTIONAL METHODS AND TEACHER BEHAVIOR (BERKELEY, NOVEMBER 21-22, 1966).
FAR WEST LAB. FOR EDUCATIONAL RES. AND DEV.
REPORT NUMBER BR-6-2931
EDRS PRICE MF-$0.25 HC-$2.36 57P.

DESCRIPTORS- *CONFERENCE REPORTS, *EDUCATIONAL RESEARCHERS, COMPUTER ASSISTED INSTRUCTION, DISADVANTAGED YOUTH, MICROTEACHING, INDIVIDUAL INSTRUCTION, RETARDED CHILDREN, TEACHER BEHAVIOR, OSCAR

SUMMARIES ARE GIVEN OF CONFERENCE PRESENTATIONS MADE BY INSTRUCTIONAL RESEARCHERS INVOLVED IN CURRENT PROJECTS. TITLES INCLUDE (1) COMPUTER ASSISTED INSTRUCTION--A TOOL FOR TEACHING AND RESEARCH, (2) INSTRUCTION FOR EDUCATIONALLY AND CULTURALLY DEPRIVED ADOLESCENTS, (3) MICROTEACHING AS A TEACHING METHODOLOGY, (4) INDIVIDUALLY PRESCRIBED INSTRUCTION, (5) REINFORCEMENT MENUS IN THE INSTRUCTION OF MENTALLY RETARDED CHILDREN, (6) STRATEGIES FOR TEACHING STUDENTS TO ANALYZE PUBLIC CONTROVERSY, (7) STUDYING TEACHER BEHAVIOR WITH THE OSCAR TECHNIQUE, AND (8) BEYOND PROGRAMED INSTRUCTION. (MS)

FAR WEST LABORATORY
FOR EDUCATIONAL
RESEARCH AND DEVELOPMENT

Proceedings:

CONFERENCE ON INSTRUCTIONAL METHODS & TEACHER BEHAVIOR

Hotel Claremont
Berkeley, California
November 21-22, 1966

FAR WEST LABORATORY FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

PROCEEDINGS:

CONFERENCE ON INSTRUCTIONAL METHODS AND TEACHER BEHAVIOR

Hotel Claremont
Berkeley, California
November 21-22, 1966

TABLE OF CONTENTS

INTRODUCTION TO THE PROCEEDINGS

Interest in new instructional methods has been particularly strong and widespread throughout the region served by the Far West Laboratory for Educational Research and Development. The professional climate and the relatively high financial support for education within this region have attracted many educational innovators to the public schools and have placed many schools in the region at the forefront in field exploration and innovation.

The need for an instructional methods conference was based on the premise that interaction among educational leaders in the region would lead to an even higher rate of exploration and innovation as these leaders learned from each other. It was felt that the impact of such a conference could be even greater if leaders in the region had an opportunity to interact with a panel of researchers who were involved in interesting and promising explorations at different points along the current frontier of knowledge of instructional methods. Thus, two major criteria were employed in identifying prospective panel members. First, the person should be actively engaged in a promising research program related to the broad area of instructional methods. Second, the work of each panel member should be in a markedly different area from that of other panel members in order to provide the widest possible range of ideas and viewpoints. I believe that you will agree, upon reading the following summaries of the conference presentations that the Laboratory was extremely successful in assembling a panel that met these criteria.

Although all of the techniques discussed are still at an exploratory s age of development, they have produced results ranging from promising to some that can only be described as spectacular. Those of us at the Laboratory have concluded from the enthusiastic response of the school leaders who were present that the conference was successful. Although we realize that the following summary of the conference proceedings is a poor substitute for the process of interaction that was possible at the conference itself, we believe that even this rather brief report has something of value for any thoughtful and forward looking educator.

Walter R. Borg, Director
Instructional Methods Program

COMPUTER ASSISTED INSTRUCTION: A TOOL FOR TEACHING AND RESEARCH

H. A. Wilson

Senior Research Associate
Stanford-Brentwood CAI Project

Introduction

The title of this essay is misleading. What I am actually going to discuss is team teaching. The team I will describe is large and one of their tools is new and very powerful. The tool I refer to is a general purpose information processor and its peripheral equipment, more commonly known as a computer assisted instructional system.

The tool is so new and glamorous it tends to draw attention away from the people who are using it and the purpose for which it was developed. I want, therefore, to turn your attention to the people on the teaching team and to a brief statement of their goals and purposes before proceeding to a description of the system itself.

The Teaching Team

Two outstanding educator-scholars furnish joint direction for the team. Professor Patrick Suppes is one of the nation's leading philosopher-mathematicians and Professor Richard Atkinson is a mathematical psychologist of international reputation. They lead a group of fifty linguists, mathematicians, educators, psychologists, artists, writers, programmers, school administrators, and classroom teachers. We are known as the Stanford CAI Project.

The organization of teachers into instructional teams is an increasingly common pattern in today's schools. Detailed planning of the lesson material and of the mode of presentation is a cooperative effort of the entire team. Individual members of the team have different responsibilities in the preparation and presentation of the lessons. The evaluation of results, in terms of student performance and behavior, is made by the team as a whole, based on observations of each of the members.

There are many similarities between current team teaching practices and the operations of the Stanford CAI Project. The differences that exist are largely differences of degree rather than of substance. We too have worked as a group in the detailed planning of the lesson material. Two years have been spent in planning and preparation. Every word, picture, and audio message that the students will encounter on the system has been specified and prepared in advance. All conceivable responses that the student might make to every question or problem have been accounted for. Individual members of the project team have had different responsibilities in the preparation and presentation of the lessons according to their unique talents and areas of expertise. Evaluation and revisions will be undertaken by the group based on individual observations and the detailed performance record of each student.

The Stanford CAI project is working toward two major goals: 1) to truly individualize and optimize instruction in initial reading and mathematics, and 2) to investigate in a detailed fashion the processes through which young children acquire initial reading and mathematical skills and concepts. In order to progress toward these twin goals we have interacted extensively with industry in the development of a highly sophisticated instructional system.

The CAI System

The Stanford Project is not the first to investigate CAI applications to human learning. The PLATO system at the University of Illinois and the CLASS system at Systems Development Corporation are but two examples of pioneering work in the field. The Stanford Project is unique however, in that for the first time two major sections of the primary grades' curriculum are being taught for a full year under computer control in a public school setting.

A complete IBM 1500 CAI system is housed on the grounds of the Brentwood Elementary School in the Ravenswood School District in East Palo Alto. The facility is called the Stanford-Brentwood CAI Laboratory. The laboratory is equipped with sixteen student terminals. One half of a normal classroom can be accomodated on the system at a time. There are four first-grade classrooms at Brentwood. The students of two of the classrooms are involved in the reading programs and the students of the remaining two first-grade rooms are in the mathematics program. Each student receives thirty minutes of instruction on the system every day.

Each response terminal consists of a cathode-ray tube on which the computer can generate alpha-numeric characters and a limited set of graphics, a rear view projection device which is essentially a random access 16mm film strip projector under computer control, an audio unit which at the terminal end consists of a set of head phones and a microphone, a keyboard which can be used for student responses and for editing of text and programs, and a light pen which can be used to enter a response by touching it to the desired area on the face of the cathode-ray tube.

The system which drives the response terminals consists of an IBM 1800 central processing unit, six disc drives, two magnetic tape drives, a bank of sixteen random access audio tape units with both record and playback capabilities, a terminal control buffer, two proctor terminals, a card reader and a line printer.

CAI: A Tool for Teaching

Computer assisted instruction has a theoretical basis, as indeed does all programmed learning, in the notion that immediate reinforcement facilitates learning. For the human learner, reinforcement comes through both verbal praise acting as a reward and simple knowledge of the results of one's own actions. Correct responses are rewarded in the reading program through such verbal messages as "good," "you're doing fine," "right," etc. The standard reward in the math program consists of a visual reward of a smiling face appearing on the scope. Common sense and many learning studies all indicate that a constant stream of verbal or visual rewards for every correct response tend to lose their effectiveness. Accordingly, rewards in the reading program and in the math program are given on an intermittent basis. Immediate feedback is provided through reward messages or the presentation of the next problem and also through wrong answer messages.

Uninformed criticism of computer assisted instruction often carries a component of fear that the instructional process will somehow become dehumanized, that the students will in some sense become little automatons themselves. As it turns out, however, the elimination of the social intercourse aspect of learning through CAI is one of its great strengths.

The computer is an eternally patient teacher. The machine never becomes angry or threatening. Those of us who have spent some years teaching in the classroom are well aware of the fact that after repeated errors by a student it is difficult, if not impossible, to restrain certain voice or facial cues which indicate our displeasure. The messages coming from the machine, however, are completely free of any such threat or anger. The wrong answer messages recorded in the quiet of the recording studio can be continuously a neutral "No, this is the right word. Touch it."

The CAI system is also utterly impartial. It cannot be bribed by smiles and running errands. Neither does it differentiate amongst students by clean or messy desks.

We have found that the concentration of even very young students can be maintained at a rather high level by appropriate pacing of the presentation of the materials and of the time-out limits. Their concentration is also increased, particularly in the tutorial system, by the use of partitions between the response terminals. The individual student is not distracted by the actions of his classmates, nor is he carried along by their responses. Each individual is truly independently responsible for interacting with the learning materials.

The basic rationale, however, for the use of computer assisted instructional systems, resides in their potential for individualizing instruction in a very real way. If there is any one fact which has been thoroughly established in sixty years of intensive educational investigation, it is that a wide range of individual differences will be found in any classroom or dimension one wishes to investigate. CAI offers us a tool for tailoring our instructional procedures to these individual differences.

The current paper and pencil programs can account for individual differences in learning time. A bright student who responds rapidly can execute many more frames and cover a greater amount of material in a given time interval than the slow student who responds quite deliberately.

The nearly unlimited branching capability inherent in a CAI system allows the students to spread not only on the temporal dimension but also to take essentially different paths through the curriculum. Branching decisions for each student in a CAI system may be contingent upon a single response, his past history of responses, response latency, or some combination of these considerations weighted by previously acquired psychometric data.

CAI: A Tool for Research

The usefulness of CAI as a tool for research resides in two factors; 1) the control of independent variables and 2) the detailed response data which is recorded by the machine.

Educational research conducted outside the laboratory and in an existing school situation has long been plagued by the impossibility of controlling many variables inherent in the classroom and in the presentation of materials by the classroom teacher. CAI, in a sense, brings the laboratory into the school. The CAI laboratory at the Brentwood School has achieved a degree of control of environment and presentation that has been heretofore impossible in a classroom setting. The temperature of the terminal room is constant; the lighting in the terminal room is constant. The immediate environment of each student's response terminal is precisely the same as any other student's. The chairs and the machines are identical for all students. Every picture seen in the projection device, every bit of orthography or other display on the scope, and every audio message which the student hears, have been previously specified and can be as standardized or varied as the experimenter desires. This is not to say, of course, that all sources of variation are controlled. The students are not placed in Ball jars between each session in the terminal room. The CAI facility does achieve, however, a degree of control equivalent to that of campus learning laboratories. Many problems in learning theory, which have been investigated rigorously only in a laboratory setting, can now be looked at in an on-going school context.

The second capability of CAI which is extremely important for research is the collection of fine-grained response data. Allow me to give you an example of what I mean by fine-grained data; each response that every student makes to each problem he encounters in both the reading and mathematics curricula are permanently recorded on the data tapes. Each response record includes a complete description of the response by its coordinates on the face of the scope or the keys depressed on the typewriter. The response is defined as correct or incorrect, and if it is incorrect, it is categorized according to the type of error made. The response latency is recorded in tenths of a second. The contents of 30 registers and 29 switches associated with the student's past history of performance are recorded with each response on the data tape.

An individual student makes a response every fifteen seconds on the average. During the period of an entire school year a single student will enter approximately 216,000 responses. We are running one hundred students on the Brentwood system. Devising a sorting routine to handle this tremendous inflow of data is, in itself, no trivial task.

Another important use of CAI as a research tool is found in the area of mathematical psychology, particularly in the area of mathematical learning models. The quantity and nature of the response data which may be gathered in the CAI system allows the mathematical psychologist to test his various models in a situation which is a much closer approximation of actual classroom learning than existed in the past. Typically, such models have been tested through infra-organism behavior or through such contrived tasks as pairedassociate list learning or probability learning tasks. Professor Atkinson, who is co-director of the CAI project and principal investigator of the reading project, will use the kind of sequential response data which we will gather in the Brentwood facilities to develop optimization models for learning.

CAI: A Tool for Curriculum Evaluation

A final area of usefulness of CAI in the educational process is in curriculum evaluation. Our current methods of curriculum evaluation are extremely gross, relying on standardized tests or specially devised tests given on an intermittent schedule. The best that can be expected from such evaluation procedures is to be able to compare the general outcomes of one method or one curriculum approach to some other method or approach. Little or nothing can be said about the efficiency of any detailed section of the curriculum. It is exactly at this detailed level that CAI exhibits its greatest power for evaluation. The performance data gathered in the CAI system may be examined at all levels, from that of overall goals down through various strategies and approaches and then blocks of homogeneous problem types and, further, through individual problem types to the individual problems themselves. At each level we can actually examine the students' performance records to discover if this section or level of the material is functioning in the manner for which it was designed.

Implications

The implications of CAI for education are truly revolutionary. A serious discussion of the probable future impact of CAI on current school organization and practices is far beyond the scope of this paper. However, one point of obvious importance must be briefly discussed. That point concerns the implications of CAI on the already changing role of the classroom teacher.

It is clear that a large proportion of the teachers' current responsibility for imparting facts, basic skills and concepts and providing routine drill can be more efficiently and effectively handled by the machine. This does not imply that the computer will replace the teacher. Rather, by utilizing the computer to attend to those tasks for which it is uniquely effective, the teacher will have the time and energy and <u>information</u> with which to plan and to carry out the programs of socialization and intellectual enrichment which are the unique domain of the human teacher.

The extension of this view of the function of the classroom teacher into the field of teacher preparation will have far-reaching impact. Teachers must be trained to make the fullest use of data from a CAI system. They must also be given more than philosophical and moral precepts when they face the actual task of performing as humans and not as machines.

INSTRUCTION FOR EDUCATIONALLY AND CULTURALLY DEPRIVED ADOLESCENTS

John T. Dailey

Research Professor of Education
The George Washington University

Vocational and technical education today is facing two very serious problems. First, there is the growing competition with colleges for the upper ability high school graduates and even average ability high school graduates. Because of the considerable overlap in academic and vocational ability patterns, as a higher and higher proportion of our youth enter college, the supply of youth with well-developed academic skills who want vocational training becomes less and less. At the same time that this is happening there is a growing need for vocationally and technically trained youth at high skill levels to meet the expanding demands of both industry and the military services for technically trained personnel. Vocational and technical schools and the Armed Forces find that they must educate many marginally trainable youth - - that is, young people who are trainable in some useful occupational skills but are not readily trainable for the more highly skilled jobs with a good future. These marginally trainable youth lack basic educational skills as well as basic understanding of mechanical and technical concepts and principles and other knowledge needed to take full advantage of opportunities for vocational and technical education either in school or on the job. Anything that can be done to increase the proportion of our young people who are capable of being trained for more highly skilled jobs represents an important contribution towards reducing the number of unemployed and underemployed among our culturally deprived adolescents and young people.

If our culturally deprived adolescents are to have a full chance to emerge from poverty there must be a massive upgrading in the levels of their developed basic skills that we often call talents. Various studies of Project Talent* data have indicated that many of our youth from culturally deprived backgrounds leave school lacking the basic skills and aptitudes or talents necessary for training for many of our more highly skilled jobs. Of course, such tests as those in Project Talent do not identify latent talents that a student's environment has not permitted to develop. They measure the skills that he has developed but not the skills he might have developed in a more favorable environment. Nevertheless, the important tests in Project Talent do define the skills that must be developed in our culturally deprived adolescents if they are to be able to compete on equal terms in our society with those from more fortunate environments.

In order to help every individual reach his full potential, new and better ways of assessing and developing the potentials of individuals from minority or culturally deprived groups are needed. New materials and methods are needed to identify and develop these latent talents.

---

* Flanagan, J.C., et al., The American High School Student, Technical Report to the U.S. Office of Education, Cooperative Research Project No. 635. Pittsburgh: Project TALENT Office, University of Pittsburgh, 1964.

The Education Research Project of The George Washington University has attempted to meet this need by developing a curriculum and materials for teaching basic vocational talents to culturally deprived adolescents and young people. These materials are as follows:

1) A series of paper-and-pencil basic aptitude practice exercises designed to teach nonverbal abstract reasoning, basic mechanics, basic electricity, and both two- and three-dimension spatial reasoning. These materials are very similar to test items in format and are designed for use in training both adolescents and young adults.

2) A series of basic readers especially designed for students in grade 8 who read at the 6th grade level of difficulty or lower. They provide reading materials at a low-difficulty and high-maturity level, and cover various aspects of tools, machines, devices, and occupations. They are to be used in conjunction with the basic aptitude practice exercises. The titles of the readers are:

1. Transportation Long Ago
2. Transportation Today and Tomorrow
3. The Automobile
4. Occupations for You
5. Tools and Basic Machines

3) Laboratory equipment and simple demonstration devices designed to teach 9th-grade students those aspects of mechanical ability and basic mechanical and technical comprehension and understanding that are not suitable for teaching either by readers or paper-and-pencil exercises. This equipment is used in conjunction with the basic aptitude practice exercises. The laboratory equipment demonstrates such principles as: levers, gear trains, belts and pulleys, pendulums, inclined plane and screw threads, physical phenomena, and simple electrical circuits. Student and teacher manuals were also developed.

As the development of the new curriculum and materials for teaching basic vocational talents in the 8th and 9th grades progressed, a number of additional ways of using the materials have been indicated, among which are:

1) Use in adult basic education, literacy training or pre-vocational training.

2) Use by the Armed Forces for training marginal personnel.

3) Use in emerging nations to supply the basic technological skills necessary as a foundation for the training of engineers and technicians.

4) Use in short concentrated courses to assess how well students learn various technological skills and concepts and how well they like learning them. On the basis of this, they can be guided into appropriate long-range training courses.

5) Such concentrated programs are also appropriate for use in summer Talent Day Camps in Technology. These camps would be to assess students, sharpen their talents, and guide them into post-high school training programs in junior colleges and technical institutes.

The primary purpose of the Talent Camps would be to give students a chance to learn the basic talents underlying success in training for technological careers. On the basis of how well they learn the various basic technological skills and concepts and how well they enjoy learning them, they can be guided into existing high school, junior college, or other post-high school programs for technological careers. This could be a new approach to the problem of identifying and developing the latent talents of students from a wide variety of backgrounds, who may not have had an adequate chance to learn the skills and concepts sampled by existing occupational aptitude tests. In effect, the Talent Camp could serve as an aptitude test and also an interest test. The students could discover their real talents and interests, and the school could assess their patterns of potential for success in advanced technological training in vocational courses, junior college, or similar programs. The basic curriculum could be based on the materials developed by The George Washington University for teaching basic vocational talents.

Talent Camps could stress the following types of activities:

a. Swimming, sports, music, arts and crafts
b. Excursions to museums, hospitals, laboratories, factories, shops, junior colleges, and technological institutes
c. Contact with visiting specialists with outstanding skills and experience in various areas of technology
d. Reading stimulation and practice using The George Washington University occupational readers
e. Practice with aptitude exercises designed for learning basic technological skills and concepts
f. A laboratory course in basic mechanical, electrical, and electronics principles and phenomena
g. Occupational and vocational counseling

This procedure could enable schools to identify and strengthen the basic vocational talents of their students so that more of them can develop the basic skills essential for emergence from poverty.

The materials developed were tried out and evaluated in a representative sample of 2,538 students in eight of the nation's high school systems (San Antonio, Texas; Atlanta, Georgia; Wise County, Virginia; Washington, D.C.; New York City; Bayonne, New Jersey; Erie, Pennsylvania; and Detroit, Michigan).

Key Project Talent tests were used for pre-test and post-test. Results are shown in Tables 1 and 2. (See next page).

On the post-testing at the end of the school year it was found that substantial post-test increases were found in subject-matter areas that were taught, but only normal growth or less was found in the areas not taught. Abstract Reasoning and Two- and Three- Dimensional Spatial Reasoning were found to be especially trainable.

One very interesting finding was the apparent absence of any "general test-taking skill." Training in one skill does not affect test performance on a different skill. Little improvement was found in reading or arithmetic skills on the post-tests.

In grade 8 less improvement was found in mechanical reasoning and information. Additional gains in the technological skill areas were found in the 9th grade since the laboratory materials were used only at this level.

One result of the training was to increase the estimated reliability of some of the Project Talent tests. For some schools, some of the tests had exceedingly low reliability. This reflected the extremely low performance level of the students in some of the groups. Whenever a test is too difficult or too easy for a group, its reliability will be highly attenuated. Thus if a school group tends to do poorly on a test, raising its performance level should raise the reliability of the test.

The pre-tests and post-tests were separately subjected to factor analysis and these analyses were done separately by school systems. It was found that the factor structure of a test varies widely from school to school, and especially large differences in factor patterns were found for rural and urban groups. Apparently, what a test measures is heavily affected by the nature of the group and its environment. The same forces that cause over- and under-achievement on mechanical tests also seem to operate to change the factor content of tests.

Factor analyses of the post-tests reveal a general tendency toward finding a more powerful "general" factor accounting for a higher proportion of variance than was found in the pre-test analyses. There were also some important changes in the general factor structure. The groups that gained the most seem to have the greatest changes in the factor structure of the tests.

The data indicate that aptitude test batteries do not seem to function normally with very low-performance-level culturally deprived adolescents. They do not inter-correlate the way they did when standardized and validated and thus cannot be properly interpreted by counselors and teachers. It is suggested that training in the subject-matter areas measured by the tests might result in making the tests function more nearly like they do for the general population and thus make possible more meaningful interpretation and use. This suggestion should be explored in future research.

It has been demonstrated that it is possible to teach several basic vocational talents directly. The experimental materials developed for this purpose have been revised and will be tried out in a number of additional training programs for adolescents and young adults. These materials are being released for general use by schools and training programs.

It is planned also to carry out follow-up studies to relate the increases in performance on tests to increased trainability in vocational and technical training programs.

Schools should give serious consideration to more emphasis on teaching basic skills, and research should be initiated to develop talent training materials for the full spectrum of important tests such as those in Project Talent.

The work reported herein was carried out under Contract No. OE-5-85-023 with the United States Office of Education, HEW.

Table 1

Results of Tryout of Talent Training Materials *
(School Year 1965-66)

8th Grade -- Boys

Project Talent Ident. No.	Name of Test	N_1 Pre-Test	N_2 Post-Test	$Mean_1$ Pre-Test	$Mean_2$ Post-Test	$\frac{M_1-M_2}{SD_1}$	SD_1 Pre-Test	SD_2 Post-Test
R-290	Abstract Reasoning	483	458	6.352	8.055	.595	2.86	2.91
R-270	Mechanical Reasoning	483	458	7.174	8.900	.506	3.41	3.72
R-311	Arithmetic Reasoning	483	458	4.004	4.790	.342	2.30	2.58
R-281	Visualization--2 Dimensions	483	469	9.066	14.309	.935	5.61	6.12
R-282	Visualization--3 Dimensions	483	469	6.095	7.367	.482	2.64	3.13
R-250	Reading Comprehension	483	469	15.251	17.623	.324	7.33	9.17
R-102	Vocabulary Information	479	449	6.979	7.898	.246	3.73	3.89
R-106	Mathematics Information	479	449	4.351	5.200	.371	2.29	2.97
R-107	Physical Sciences Info.	479	449	5.447	6.094	.208	3.11	3.43
R-108	Biological Sciences Info.	479	449	3.795	4.178	.172	2.23	2.28
R-110	Aeronautics & Space Info.	479	449	2.871	3.203	.178	1.86	2.08
R-111	Elect'y & Electronics Infor.	479	449	4.962	5.786	.245	3.36	3.46
R-112	Mechanics Information	479	449	6.559	7.461	.265	3.41	3.49

9th Grade -- Boys

R-290	Abstract Reasoning	384	374	7.375	9.086	.547	3.13	3.12
R-270	Mechanical Reasoning	384	374	8.844	10.059	.318	3.82	4.36
R-311	Arithmetic Reasoning	384	374	5.362	6.214	.281	3.03	3.55
R-281	Visualization--2 Dimensions	387	379	10.395	15.501	.861	5.93	5.75
R-282	Visualization--3 Dimensions	387	379	6.972	8.475	.494	3.04	3.19
R-250	Reading Comprehension	387	379	20.380	22.815	.248	9.83	10.75
R-102	Vocabulary Information	384	377	8.698	9.844	.295	3.89	4.07
R-106	Mathematics Information	384	377	5.773	7.050	.403	3.17	3.85
R-107	Physical Sciences Info.	384	377	6.839	8.284	.382	3.78	3.80
R-108	Biological Sciences Info.	384	377	4.740	5.061	.137	2.34	2.28
R-110	Aeronautics & Space Info.	384	377	3.531	4.180	.286	2.27	2.31
R-111	Elect'y & Electronics Info.	384	377	5.721	7.329	.481	3.34	3.97
R-112	Mechanics Information	384	377	7.875	9.393	.441	3.44	3.80

*NOTE: For school systems in Washington, D.C.; Atlanta, Georgia; Erie, Pennsylvania; San Antonio, Texas; and Wise County, Virginia.

Table 2

Results of Tryout of Talent Training Materials *
(School Year 1965-66)

8th Grade -- Girls

Project Talent Ident. No.	Name of Test	N_1 Pre-Test	N_2 Post-Test	$Mean_1$ Pre-Test	$Mean_2$ Post-Test	$\frac{M_2-M_1}{SD_1}$	SD_1 Pre-Test	SD_2 Post-Test
R-290	Abstract Reasoning	120	113	4.517	6.487	.801	2.46	2.93
R-270	Mechanical Reasoning	120	113	4.408	5.407	.409	2.44	2.54
R-311	Arithmetic Reasoning	120	113	3.717	4.195	.187	2.55	2.82
R-281	Visualization--2 Dimensions	123	120	6.122	10.825	1.117	4.21	6.36
R-282	Visualization--3 Dimensions	123	120	4.740	5.883	.510	2.24	2.87
R-250	Reading Comprehension	123	120	13.220	15.558	.360	6.50	7.85
R-102	Vocabulary Information	122	112	5.049	5.955	.374	2.42	2.97
R-106	Mathematics Information	122	112	4.066	4.446	.182	2.08	2.55
R-107	Physical Sciences Info.	122	112	4.172	4.670	.234	2.13	3.01
R-108	Biological Sciences Info.	122	112	3.041	3.393	.191	1.84	2.39
R-110	Aeronautics & Space Info.	122	112	1.885	2.089	.156	1.55	1.58
R-111	Elect'y & Electronics Info.	122	112	3.344	4.455	.542	2.05	2.14
R-112	Mechanics Information	122	112	4.246	4.688	.193	2.29	2.42

9th Grade -- Girls

Project Talent Ident. No.	Name of Test	N_1 Pre-Test	N_2 Post-Test	$Mean_1$ Pre-Test	$Mean_2$ Post-Test	$\frac{M_2-M_1}{SD_1}$	SD_1 Pre-Test	SD_2 Post-Test
R-290	Abstract Reasoning	184	182	5.793	7.363	.565	2.78	3.07
R-270	Mechanical Reasoning	184	182	5.299	6.121	.345	2.38	3.03
R-311	Arithmetic Reasoning	184	182	4.359	4.758	.175	2.27	2.74
R-281	Visualization--2 Dimensions	185	181	7.059	12.475	1.221	4.43	6.19
R-282	Visualization003 Dimensions	185	181	5.492	6.878	.605	2.29	2.90
R-250	Reading Comprehension	185	181	18.281	19.862	.195	8.12	9.22
R-102	Vocabulary Information	181	179	6.840	7.911	.415	2.58	3.13
R-106	Mathematics Information	181	179	4.624	5.704	.417	2.59	2.53
R-107	Physical Sciences Info.	181	179	5.011	6.324	.503	2.60	2.75
R-108	Biological Sciences Info.	181	179	3.856	3.955	.051	1.96	1.80
R-110	Aeronautics & Space Info.	181	179	2.497	2.782	.198	1.44	1.55
R-111	Elect'y & Electronics Info.	181	179	3.983	4.693	.325	2.18	2.28
R-112	Mechanics Information	181	179	4.967	5.905	.392	2.39	2.60

*NOTE: For school systems in Washington, D.C.; Atlanta, Georgia; Erie, Pennsylvani- San Antonio, Texas; and Wise County, Virginia.

MICROTEACHING AS A TEACHING METHODOLOGY

Warren Kallenbach

Associate Professor of Education
San Jose State College

The Development of the video tape recorder has added a major new dimension to the methodology of teaching. Now, for the first time, we can see immediately how we have performed in teaching. We cannot only see results at once but can practice a given skill over and over in the microteaching studio until we are ready to try it in the classroom. We can view tapes or films of master teachers--or, at times, of teachers comparable and just a little better than ourselves and then practice this skill in both microteaching and actual classroom teaching sessions. (With training, we can use interaction analysis or the OScAR technique as we view. With appropriate evaluative instruments and training, we can analyze and evaluate our own teaching performance or that of others.)

The video tape recorder has been in commercial use only since 1956. Its portable versions came just a few years later. Prices for the portable versions have dropped from $20,000 plus to $14,000 to $10,000 to $3,500 and below. A home video tape recorder, not recommended for educational use, can be purchased for less than $2,000, complete with camera and playback equipment. Not only have prices dropped but quality and utility have increased. It is certain that scores even hundreds of portable video tape recorders will be purchased for school use in the next few years. How can they be put to their most effective uses in the schools? Or should the effectiveness criteria be put aside for a period of experimentation in each school so that perhaps totally unexpected instructional uses of the PVTR are discovered and tried? We could do both, of course, as some studies of classroom and instructional use of video tape recorders have provided data that should not be ignored by new users.

Perhaps I should describe what I mean by a video tape recorder. It is an electronic system whereby a television camera receives both visual and auditory images which are transmitted to the recording system, a system which retains images and sounds on tape much as an audio tape recorder retains sounds. Tapes vary from 1/2 inch to 2 inches in width and record from one half to two hours or more on each one. The video tapes can be erased as easily as audio tapes; an important safeguard to keep us from saving mediocre examples in our files forever. Electronic editing is possible with some systems which can mean a great deal in the preparation of demonstration and ETV tapes. The tape recorder can play back on its own usually small monitor, through any standard television set nearby or through television studio channels if the tape is compatible with the last or if it can be dubbed. It is possible to dub (i.e., tape from one tape to another) from a one-inch to a two-inch tape if the systems are at all compatible. Regular 16mm films can be made from most video tapes; a considerable advantage for dissemination purposes. Color and studio quality video tapes are on the educational-use horizons already. Portability of the tape recorder varies from difficult-to-move to backpack models which weigh 35 pounds and retail at $10,000. A model that can be moved easily by one man, through standard doorways, and up flights of stairs with no loss of recording or playback systems should be sought.

The history of use of video tape recorders in instruction is a brief one. References in the educational literature (Ed. Index) begin in 1959; appropriately enough an early reference appears in School Coach. Scattered research studies gradually appear.

One major study of secondary intern teacher preparation at Stanford University led to experimentation with audio taping and filming of the classroom teaching of the interns for playback at seminars on the campus. This system was far from perfect in feedback (problems in lighting and pickup of pupils' voices primarily) and the transition to video tape recorders--portable ones--was not long in coming. Having a large foundation grant and operating in the heart of the U.S. electronics industries, it was not long before several two-inch PVTR's were obtained for use with the secondary intern program at Stanford. The Stanford project staff, headed by Drs. Dwight Allen and Robert Bush, developed the procedure of presentation of short, videotaped lessons or lesson segments (from 5 to 10 minutes) to small groups of from four to six pupils. These lessons were evaluated by both the supervisor and the pupils and were discussed by the intern candidate and the supervisor during the playback and critiquing period immediately following. Recommendations for one change of behavior was made for reteaching, which again followed immediately with a comparable small group of pupils. Critiquing again followed this videotaping, using the same procedures. The name micro-teaching was given to this process, a process that is being further refined and studied at Stanford University's School of Education and elsewhere.[1] Micro-teaching offers the considerable advantages of immediate knowledge of results and opportunity to practice a given skill at once and until satisfactory performance is obtained and without disservice to classroom groups.

Most of the research findings from experimental use of microteaching have come from studies in Stanford's Secondary Teacher Education Program and at the Stanford Center for Research and Development in Teaching. A few other studies are now underway on other campuses. It is probable that scores of studies will emerge in the next year or two.

A first major finding in the Stanford Program was that there were no significant differences in judged teacher competence between randomly-selected secondary intern teaching candidates (n=30) who had had summer student teaching and those who had participated in the micro-teaching program on campus.[2] Pre- and post-tests, on video tape, were judged, double-blind,

---

1. Secondary Teacher Education Program. Micro-Teaching: A Description. Stanford: School of Education, Stanford University, Summer 1966.

2. Dwight W. Allen and James C. Fortune. An Analysis of Micro-Teaching: A New Procedure in Teacher Education. Stanford: School of Education, Stanford University, c. 1964.

by highly-trained evaluators. The tests consisted of short lessons presented by each intern in the study. These findings from the summer program carried over into the regular teaching year; success levels being judged with the same evaluation instrument, the Stanford Teacher Competence Appraisal Guide, which had been demonstrated to be a highly reliable instrument when used by trained observers.[3]

Validity of the instrument was judged on the basis of the adequacy of its sampling of the major teaching skill areas utilized by the Stanford STEP Staff.

An immediate consequence of the Stanford Intern Program findings was to drop the logistically-difficult summer student teaching and school aide programs in favor of an on-campus micro-teaching program for all such interns. The design of this particular study is being utilized in a two-year study at San Jose State College as applied to elementary intern teachers. Findings in the first year of the San Jose study are similar to the Stanford findings, viz., no significant differences between the control and experimental groups as judged from observations of their pre- and post-test videotapes by highly-trained observers.[4] A similar study is underway for 1966-1967 and includes a field follow-up using both STCAG and IOTA,[5] - a more comprehensive teacher competence evaluation instrument.

One advantage of microteaching is that it provides "An opportunity for those who are preparing to teach to obtain a liberal amount of practice immediately upon their entrance into training, under optimum conditions for the trainees and without endangering the learning of pupils."[6]

It "Aims to break down teaching into simpler components so that the learning task will be more manageable for the beginner."[7]

The trainee focuses upon a certain aspect of teaching until he has developed a satisfactory minimum of skill before he proceeds to another skill. In each session, he views his performance on video tape, receives a critique of it and of pupil evaluations, immediately reteaches the same lesson to another small group of students with one recommended change and can repeat until successful.

Several teaching skills have derived from the project and while these do not represent even a major part of a theory of teaching they at least bring some order to a rather nebulous area.

---

3. Ibid.
4. Warren Kallenbach and Robert Tamonda. "The Effectiveness of Microteaching in the Preparation of Elementary Intern Teachers." Unpublished mimeographed paper, San Jose State College, 1966.
5. Instrument for the Observation of Teaching Activities (IOTA). Copyright 1960, 1964 by Bradley, Kallenbach, Kinney, Owen, and Washington.
6. Robert N. Bush and Dwight W. Allen. Micro-Teaching: Controlled Practice in the Training of Teachers. Stanford: School of Education, Stanford University, 1964.
7. Ibid.

Some of the skills stressed for teaching in the Stanford Program are:

1. Establishing Set - The establishment of cognitive rapport between pupils and teacher to obtain immediate involvement in the lesson.

2. Establishing Appropriate Frames of Reference - Organizing and teaching from several appropriate points of view.

3. Achieving Closure - Attained when the major purposes, principles, and constructs of a lesson, or portion of a lesson, are judged to have been learned so that a pupil can relate new knowledge to past knowledge.

Five or six other skills have also been isolated.

Recently three important studies have been conducted using microteaching as a basis.

One study[8], tested the effects of self-feedback and reinforcement on the acquisition of a teaching skill, viz., the teacher's use of positive reinforcement for pupil responses in classroom discussion. It was demonstrated that self-viewing (self feedback) by the intern was relatively ineffective (no significant changes in frequency of pupils' responses during discussions) as measured in this study. The most effective training method existed when cue discrimination (pointing out of salient cues in teaching to which reinforcement should be attached) was added to the positive reinforcement given by the intern teacher's supervisor during the viewing of the video tape playbacks.

Another study[9] tested the effects of feedback and practice conditions on the acquisition of a teaching strategy, viz., asking questions of pupils designed to elicit more information or more meaning for the pupil, this process being called <u>probing</u>. (Probing being broken down into clarification, critical awareness, redirection, prompting, and refocusing.) The effects of immediate feedback--massed practice; immediate feedback--distributed practice were tested. Outcomes favored mass practice--immediate feedback over distributed practice--reinstated feedback.

---

8. Frederick J. McDonald, et al. The Effects of Self-Feedback and Reinforcement on the Acquisition of a Teaching Skill. Unpublished manuscript, Stanford University School of Education, Stanford, 1966.

9. Dwight W. Allen, et al. Effects of Feedback and Practice Conditions on the Acquisition of a Teaching Strategy. Unpublished manuscript, Stanford University of Education, 1966.

The final study in this series[10] tested the effects of modeling and feedback variables on the acquisition by secondary intern candidates of a complex teaching skill - probing (used where questioning goes beyond first-answer pupil responses).

In general, the experiment sought to determine which would be more efficient: telling the person what to do (called symbolic modeling) or showing him what to do (called perceptual modeling) or some combination of these that includes reinforcement and further discrimination training on the relevant cues.

Six groups were randomly selected and different treatments were applied to each.

Combinations of minimal and maximal symbolic and perceptual modeling were applied. Group six represented a combination of combined symbolic and maximal perceptual modeling and was determined to be the optimal training condition in achieving a favorable balance in use of probing techniques. It was clearly demonstrated that perceptual modeling excels over symbolic modeling.

Even though self-viewing by intern teachers has not proved effective or as successful as some other modes in teaching, this may not be the case with experienced teachers. It may be quite worthwhile to test the use of the PVTR in the classrooms of experienced teachers in which they alone view the tapes and they alone decide what changes they wish to make in their teaching.

This last approach was the basis of a study at San Jose State College: one called "Strategies in College Teaching", so as not to offend the sensitivities or alarm the professors involved. Pre and post tapes of beginning psychology classes were made of five instructors all of whom who presented the same concepts for the taping. No significant differences were found between the tapes as judged by the same professors viewing each of the other four professor's pre and post tapes on a better or less effective basis. This finding may be explained in that a total 50-minute class session was taped and, in some cases, the repeat taping brought out such attempts to improve everything at once or such anxieties that quality actually went down upon the second performance. In the San Jose State College intern studies we find that three or more microteaching sessions are necessary to overcome the first-time-on-television effect, --which we call the "cosmetic effect." Also in our microteaching projects we have learned to keep teaching sessions very short at first and to concentrate on one teaching skill at a time, although this latter is very difficult for any supervisor of student or intern teachers at whom we formerly threw whole barrages of "goods" and "let's improve's."

---

10. Michael E. J. Orme. The Effects of Modeling and Feedback Variables on the Acquisition of a Complex Teaching Strategy. Unpublished manuscript, Stanford University School of Education, 1966.

The uses of the PVTR seem limited only by our imaginations and finances. We could tape school board meetings for civics classes: tape kindergarten class performances to be played back to the PTA Meeting: tape You-Name-It for whatever.

I prefer to concentrate on the improvement of teacher competence through microteaching even if I have to practice via microteaching myself.

INDIVIDUALLY PRESCRIBED INSTRUCTION[1]

Richard C. Cox

Learning Research and Development Center
University of Pittsburgh

Educators have long been aware of the need to develop a systematic approach to the educational process which is sensitive to individual differences among pupils. Plans and proposals that have been instituted for accomplishing this goal have been numerous during the past sixty years of American education. Many of these models remain today only as noteworthly examples which either no longer exist in practice or which have been so prostituted by the pressures of the present mass educational system that they are virtually unrecognizable. After-the-fact hypotheses about the apparent rejection, in practice, of these individualized systems include criticisms concerning the lack of proper dissemination and evaluation activities, the lack of sufficient curricular materials and technology, and the lack of adequate support from various educational institutions.

Educators, however, are not prone to abandon worthwhile goals. Evidence to substantiate this premise is apparent in the resurgence of discussion about, and proposals for, the individualization of instruction. Part I of the Sixty-first Yearbook of the National Society for the Study of Education points out the importance and interest in the individualization of instruction. A recent conference at the Educational Testing Service was entitled "New Approaches to Individualizing Instruction." Much of this renewed interest seems to be a result of construction of instructional materials, in measurement and evaluation procedures, in learning technology, and in technological devices which hold promise for the design of an individualized instructional system.

The Individually Prescribed Instruction Project

The Learning Research and Development Center at the University of Pittsburgh has identified as one of its major developmental activities a feasibility study of individualized instruction. In cooperation with the Baldwin Township School District in suburban Pittsburgh the Center has instituted the Individually Prescribed Instruction (IPI) system in the Oakleaf school for about one-half of each school day. At present, the individualized program is used with the three content areas of mathematics, reading and science. School district procedures are followed in the instruction of subjects taught during the remainder of the school day.

The long-range goals of the IPI project are: 1) to restate certain elementary school curricula in terms of a continuum of specific behavioral objectives which provides for the monitoring and assessing of the progressive

1. The research and development reported herein was performed pursuant to a contract with the United State Office of Education, Department of Health, Education, and Welfare under the provision of the Cooperative Research Program.

development of each pupil's competence in subject-matter areas; 2) to provide a variety of instructional materials and techniques to meet the individual needs of pupils; 3) to establish teacher functions and procedures to facilitate individually prescribed instruction; 4) to develop a school structure and organization that permits the flexibility required for individualized learning; and 5) to provide operating procedures which are within the financial means of most innovative schools.

As the IPI system was conceived certain assumptions were made to guide the staff in the development of the program. These include the following:

1. One obvious way in which pupils differ is in the amount of time and practice that it takes to master given instructional objectives.

2. One important aspect of providing for individual differences is to arrange conditions so that each student can work through the sequence of instructional units at his own pace and with the amount of practice that he needs.

3. If a school has the proper types of study materials, elementary school pupils, working in a tutorial environment which emphasizes self-learning, can learn with a minimum amount of direct teacher instruction.

4. In working through a sequence of instructional units, no pupil should be permitted to start work on a new unit until he has acquired a specified minimum degree of mastery of the material in the units identified as prerequisite to it.

5. If pupils are to be permitted and encouraged to proceed at individual rates it is important for both the individual pupil and for the teacher that the program provide for frequent evaluations of pupil progress which can provide a basis for the development of individual instructional prescriptions.

6. Professionally trained teachers are employing themselves most productively when they are performing such tasks as instructing individual pupils or small groups, diagnosing pupil needs, and planning instructional programs rather than carrying out such clerical duties as keeping records, scoring tests, etc. The efficiency and economy of a school program can be increased by employing clerical help to relieve teachers of many non-teaching duties.

7. Each pupil can assume more responsibility for planning and carrying out his own program of study than is permitted in most classrooms.

8. Learning can be enhanced, both for the tutor and for the one being tutored, if pupils are permitted to help one another in certain ways.[2]

The actual IPI program is best described by a discussion of the essential elements of the system which include curriculum, materials and test development, and instructional procedures which include prescription writing and classroom management.

Curriculum Development

In developing the curricula in the IPI program, staff members, including teacher, psychologists, and subject-matter specialists, studied various curricula presently available in an attempt to develop a sequence of learning experiences which would permit the flexibility necessary for individualizing instruction. The curricula needed to be expressed by carefully defined objectives with each succeeding objective built upon the preceding where feasible.

To facilitate the development of a sequence of objectives for grades 1 through 6, each of the curricula was divided into levels, units and skills. A level includes behavioral objectives from many separate categories representing a level of achievement of a certain sequence of work. Each category within a level is called a unit, and within each unit the objectives to be mastered are called skills. After general agreement between the Learning Research and Development Center staff and the classroom teachers concerning the content areas to be included, specific skill objectives were written for each of the three areas of mathematics, reading and science. Care was taken to identify the units of work in each of the content areas and to write precise statements of the behavioral objective desired. The sequencing of objectives from the least to the most difficult was of primary concern to curriculum writers. Easier objectives were placed in units at lower levels; more difficult objectives were placed at higher levels.

Materials

Once the objectives for each subject area had been established, materials were developed or adapted to help carry out each objective. The teaching materials were primarily oriented toward self study since most of the pupil's work is done independently. Lesson materials which best met these requirements were programmed textbooks and workbooks. No attempt was made to select any commercial series of textbooks or workbooks emphasizing a particular curriculum approach; rather, pages from textbooks and workbooks were matched according to the behavioral objectives.

In material selection and adaptation, the writers were careful to take advantage of skills taught at lower levels. Consideration was also given to the possible ranges of age, interest, and vocabulary of the pupils since pupils in the second and fifth grades could be working with the same objective.

---

2. Lindvall, C. M. & Bolvin, J. O., Individually prescribed instruction: The Oakleaf Project. Working Paper 8, University of Pittsburgh, Learning Research and Development Center, 1966.

The materials on which pupils work and from which teachers write prescriptions are arranged in two ways: by objective, and by individual page. The materials for each objective are placed in a folder; the accumulation of all folders making up a master file. From this file the teachers obtain information and sources for prescription writing. The loose-leaf pages for student use are stored on six library carts. In order to provide for cross-indexing, a list of pages with the source and behavioral objective of each page was made. This master file of the original materials which identifies the behavioral objective of each page assists the teacher in prescription writing.

Diagnostic Instruments

The evaluation of pupil progress is a crucial element of the IPI system. Information about pupil achievement provides the basis for continual planning of programs for pupils and for evaluating the effectiveness of instructional procedures. Four types of diagnostic instruments were developed to assess the strengths and weaknesses of each individual pupil on each behavioral objective.

A. Placement Tests. Placement tests are administered at the beginning of each academic year to determine individual placement within each content area. These tests may extend over several levels of work; their purpose being to determine the level for each unit of work for which the pupil has demonstrated mastery or lack of mastery. A pupil is placed at the lowest level in which he has not demonstrated mastery. The placement test may not test all objectives in each unit but are intended only to yield a general profile of pupil achievement.

B. Pretests. Because each unit and level of work includes several objectives, the pre-unit test was developed to identify which specific objectives within each unit a student knows or need to learn. The pretest is designed to measure all of the specific objectives within a unit. These tests are administered before a prescription is written and indicate to the teacher what materials for which skills should be assigned to the pupil. If a pupil demonstrates mastery on each skill within the unit, he is not assigned any work in that unit. A pupil is assigned materials only for those skills for which he has indicated lack of mastery on the pretest. After a child has worked on these unmastered skills and his study indicates mastery, he is given the third type of diagnostic test, a curriculum embedded test.

C. Curriculum Embedded Tests. The curriculum embedded test is a test of one specific objective within a unit of work. It measures attainment of that objective and serves as a short pretest of the next objective within the unit. The results of the curriculum embedded test aid the teacher in prescribing additional work on the objective or in assigning a new objective.

D. Posttests. Mastery of all the skills within an assigned unit enables the pupil to take a posttest covering all of the skills within that unit. If a posttest, which is an alternate form of the pretest, indicates mastery, he is assigned the next unit. If lack of mastery is indicated on certain objectives, the student is assigned additional prescriptions of work pages or supplemental help of some type before he is allowed to take a second posttest.

Instructional Procedures

Once the placement testing is completed, the teacher determines where each pupil should begin instruction. On the basis of this diagnosis of a pupil's weakness, a prescription is developed for each child. This prescription lists the materials for the skill in which the child should begin studying. For this initial prescription the teacher will generally consider the following factors: 1) the ability level of the child in each subject being prescribed, 2) the general maturity of the child, 3) the type of learner that the child seems to be, and 4) the pupil's general reaction to IPI.

At the present time there are nine teachers and six clerks or teacher aides assigned to the project. Seven teachers are assigned to homerooms and are responsible for the teaching of non-IPI subjects. These seven teachers also serve as a nucleus for the program in IPI. They are supplemented by a math-science teacher who is responsible for all of the IPI science as well as selected assignments in the mathematics program, and a librarian who functions as a reading teacher or consultant for each of the three groupings of students. Math and reading are scheduled one hour a day, each day for each group. In order to share the additional teachers and the clerks, these subjects are never scheduled in competition with each other, even for different groups.

The pupil generally begins work independently on the prescribed materials. This is done in a large room which provides space for all the students from a particular group, e.g. Primary I, Primary II or Intermediate. In this room there are, generally, the two teachers assigned to these students for most of their learning experience, augmented by the additional teacher depending upon whether the subject is math or reading, and two to four teacher assistants. Most of the pupils can proceed through the prescribed materials with a minimum of teacher direction and instruction. When assistance requiring extended explanations or instruction is required the team of teachers will decide cooperatively who should give this instruction. The teachers responsible for the instruction of a particular group also decide on the sharing of other responsibilities such as administration of pre and posttests, large group instruction, and prescription writing that may be necessary during any class period.

In order to free the teacher for instructional decision-making tutoring and evaluation of student progress, the scoring of worksheets and tests, is done by the teacher aides, or in some cases, by the children themselves. The teacher aides also assist the children in locating materials and performing other noninstructional tasks.

Another important aspect of organization necessary for individualized instruction is the provision for joint planning and evaluation for those teachers assigned to a given group of students. During these planning sessions each pupil's progress is analyzed and evaluated for each of the IPI subjects and suggestions are made as to type of prescription needs and for charting his program for the next week. It is also at this time that the assignments for teacher responsibilities are discussed and decided upon. A third factor decided or discussed during the planning session is the program to be followed during the "seminar" period in math and reading. One of the scheduled periods each week in each of the areas is set aside for group interaction and participation. The planning for this activity is varied and complex and as an integral part of the overall program must be carefully planned and executed.

Implications for the Public Schools

Any implications cited here must be tempered by the realization that the Individually Prescribed Instruction project is basically a developmental study at the present time. Much of the data collected from the study has served the purpose of making decisions among alternative refinements of the individualization procedure rather than providing evidence concerning implications for future educational systems. However, there appear to be several factors in the IPI project which suggest some fundamental requirements for the individualization of instruction.

School Organization

Within any given grade level there is a wide range of pupil ability. Conventional grade level classifications do not facilitate varied rates of pupil progress. The idea of a first grade, a second grade etc. must be replaced with a system designed to permit each pupil to work at his own level of achievement. Provision must also be made so that each pupil can proceed in each subject as soon as he achieves some given mastery criteria. A pupil, therefore, may spend anywhere from four months to several years acquiring mastery of skills typically identified as one year of schooling.

School organization must also provide for a rapid and exact system to report information regarding each pupil's progress so that, at any given time, the teacher can make a reasonable estimate about each pupil's abilities and achievement in order to prescribe a teaching program congruent with his individual requirements. Schools should take advantage of the benefits of automated teaching devices and automated data collection techniques in order to achieve this goal.

Curriculum Development

A curriculum for an individualized program must be based on a carefully sequenced listing of behaviorally stated instructional objectives. The achievement of each pupil should be defined by his position along this continuum.

Curriculum materials must be geared to the instructional objectives and should allow pupils to proceed independently and with a minimum of teacher direction. The materials should also be such that the pupil will acquire competence in self-directed learning.

Diagnostic instruments should be an integral part of the curriculum and must provide for the continuous evaluation of pupil progress. These instruments must be content referenced in that they refer directly to the objectives stated in the curriculum and should provide information concerning what the pupil does not know.

Teacher Preparation

Professional training must be provided so that teachers become increasingly competent in the theory and practices of individualizing instruction. Teachers must be concerned with educational diagnosis and evaluation in order to guide the learning experiences of individuals. Teachers need to have a wide range of information available for assisting pupils working at varying levels. Subject-matter competence to teach one particular grade level will be insufficient preparation for the teacher in an individualized system. Emphasis in professional training must be given to the interpretation of test scores and other data so that the teacher can make appropriate diagnoses of pupil strengths and weaknesses. Each pupil must be considered as an individual on a continuum of growth and it is the responsibility of the teacher to guide learning.

In summary then, it seems possible to devise educational systems which are more sensitive to individual differences than past procedures have indicated. These systems will probably take a variety of form. However, there will be certain requirements for school organization, for curriculum development and for teacher preparation. Such individualized procedures have many implications for educational systems of the future.

REINFORCEMENT MENUS IN THE INSTRUCTION OF MENTALLY RETARDED CHILDREN

Marvin F. Daley

Director, Psychological Laboratory
Utah State University

My presentation has been called "Reinforcement Menus in the Instruction of Retarded Children." In other settings the talk might have been titled, "Human Motivation and the Environment," or "Another Prosthetic Environment," or possibly "A Technique of Contingency Management."

Psychology Laboratories have long been developing techniques and principles applicable to the behavioral analysis of organisms throughout the Phylogenetic scale. The behavioral technology and concepts that have been worked out in animal laboratories are often applicable in the area of human behavior with little or no modification.

These investigators required their human subjects to pull a lever, push a button, or engage in some other comparable motor activity to receive either an edible or a token. These direct applications have lead to such developments as modifying infant verbal behavior (Rinegold, et. al., 1959) or modifying cooperative behavior of young children (Azrin and Lindsley, 1956.) Such pioneer studies have promoted extensions of reinforcement principles developed in the animal laboratory to psychotherapy, human psychophysics, programmed instruction and virtually every other area of psychological research with humans.

In recent years, our laboratories have been producing a rapidly growing body of research concerned with the motivational control of behavior. A concept of reinforcement has been developed by Premack, which states, "... for any pair of responses, the more probable one will reinforce the less probable one (Premack, 1965)." A major supporting principle is the "indifference principle," i.e., the reinforcement value of an event is independent of the factors producing the specific response probabilities. Taking Premack literally, any behavior can be used as a reinforcer of any other lower probability behavior at the instant that the behavior is a higher probability one. In one of his early experiments (Premack, 1959) a Cebus monkey was placed in a chamber that had three response mechanisms attached to one wall. One or more of the mechanisms could be rendered inoperative. The monkey was given a period of time in the chamber during which response frequencies were determined with only one mechanism functioning at a time. It was found that the animal manipulated each response mechanism with different frequencies. The experimenter altered the environment so that the monkey had to operate the mechanism initially used least frequently in order to have access to the mechanism initially used most frequently. As a consequence of his contingency management, the response mechanism which the animal initially operated at a low frequency was now operated at a much higher frequency approximating that of the high frequency operandum. Since the original study, numerous others have been reported involving other organisms and responses such as turning wheels and pressing bars.

The significance of these findings when systematically applied to human behavior is overwhelming. First, it is not necessary when attempting to modify behavior to depend wholly on candy or trinkets as reinforcers as did the early investigators. It is necessary only that the Contingency Manager be able to identify what students are doing most frequently in a given environment. Homme, et. al., (1963) observed children in a pre-school nursery. The children would run around the room, scream, push a chair across the floor and play games. All these behaviors were occurring most of the time. As one would expect, the instruction, "come and sit down" would go relatively unnoticed. The investigators concluded that most of the high probability behaviors for these children were aversive to adults. Applying the Premack principle, Contingency Manager allowed the children to engage in "undesirable" behaviors contingent or dependent upon the subjects doing a very small amount of what the experimenters instructed them to do. A typical early contingency required the children to briefly sit quietly in chairs and look at the blackboard. The behavior was followed quickly by the command, "everybody run and scream now." Immediate control over the situation was obtained. Time sitting in chairs was progressively increased and training in school skills was begun. The experimenters reported that they were able to teach the entire first grade repertoire to these students in about one month of training.

In another experiment, Homme (1966) was able to demonstrate that preschool Indian children could make substantial improvements in learning English when taught by contingency management system.

Still another twist for gaining better control over the contingency management has been to develop a kind of menu of activities that represent high probability responses (Addison and Homme, 1966). The menu has been put in a book form with systematic line drawings or stick figure sketches of the activities. The subject is presented with the menu before executing the task to be learned and is allowed to select from it an event which for him at that moment is a high probability event. Upon completion of the task, he is allowed to go to the reinforcement area and his selection is immediately made available. Homme has suggested that certain reinforcing events could be "daily specials" to be made available on a restricted basis. It should be noted that the implications and possibilities of such practical applications are innumberable if emphasis is placed upon careful management of contingencies. With contingency management and the Premack principles, the teacher is in a position to deliberately, systematically, and efficiently modify behavior.

At Utah State University we have initiated a series of experiments which will enable us to delineate areas of fruitful investigation directed at modifying behavior by careful contingency management. The experiments presented here used mentally retarded individuals as subjects.

Experiment 1

One of our first experiments was designed to parallel the regular classroom situation. Five mentally retarded children from the Cache Valley Day Care and Training Center served as subjects.

Allen had a chronological age of 10 years, 1 month, a mental age of 5 years 3 months, and Utah verbal language development age of 2 years 10 months. Case studies indicated he was easily distracted, tired easily, had a short attention span, and often displayed aggressive behavior toward other children.

Lorna, 8 years 1 month old, had a mental age of 3 years 4 months and a Utah language age of 2 years 6 months. She tired easily and preferred passive activities.

Patty had a chronological age of 9 years 0 months, a mental age of 4 years 1 month, and a language age of 2 years 2 months. Her teachers reported that she was an aggressive, restless, child with a short attention span.

Ruth was 10 years 1 month old, had a mental age of 4 years 0 months, and a language age of 2 years 3 months. She was considered moody and difficult to discipline.

Tex is 11 years 2 months old, had a mental age of 4 years 0 months, and a language of 2 years 9 months. His teacher had referred to him as "...unreliable in any situation as well as a distraction. He is a burden to any group and his actions are dangerous to other children."

The general concensus of opinion held was that these individuals were very difficult to motivate and they often emitted non-acceptable behavior in the school atmosphere.

Armed as we were with our predecessors' successes, the first step was made. Extensive observations were carried out producing 22 items which, because of their high frequency of occurrence, were considered to be high probability behaviors:

a. Talking
b. Writing
c. Coloring
d. Drawing
e. Reading
f. Swinging feet
g. Record
h. Hugging
i. Dancing
j. Walking
k. Drawing on Board
l. Telephoning
m. Puzzle
n. Blocks
o. Jumping
p. Drinking
q. Using Colored Pencils
r. Singing
s. Swinging on Door
t. Moving chair
u. Erasing Blackboard
v. Looking out Window
w. R E Book

A menu depicting these activities in color was prepared by an artist and enclosed in a single book with one activity per page. This book indicating the reinforcing events is called an RE menu for short.

The menu (Figure 1) was introduced to the class by encouraging them to name the activity involved while the RE menu was held before them and the pages turned. The children were then told, "You are going to be able to have times to do what ever you want to do that is in this book. Every time you finish your work, you will get to look at our book and pick what you want to do for 4 minutes. I will tell you when your time is over to do what you want to do."

REINFORCEMENT MENU

Figure 1

The lesson activity was presented and upon completion of the exercise the children were told, "Here is the book. Now you can pick what you want to do for 4 minutes. Our things are here and only for this time when we use this book. No one else can use them." The children were shown the RE materials and after 4 minutes were instructed to replace the materials and were given the next exercise. From here on the children took turns being first to use the menu upon completion of the task.

Lessons were taken directly from the Peabody language development kit (Dunn and Smith, 1965). The stated purpose of the kit is: a) "to stimulate the over-all oral language facility of the disadvantaged and retarded," b) "to develop their verbal intelligence through training," and c) "to enhance their school progress." Each lesson contained an average of 3 exercises, e.g., following directions, identification, classification, etc. In one case, a card is held up and the instruction given to the group to "pick out food eaten for breakfast," "pick out food eaten for snacks," etc. Experimental sessions were 60 minutes long and comparable to a regular class period.

Initially an RE activity was made available after every 5 minutes of work. By the 11th hour session, each task was now 30 minutes long. The experimenter-instructor was able to gradually shape larger and larger amounts of work to be accomplished before making available the RE menu. Thus, attention span and work output had been increased greatly. After 15 sessions, the children were re-evaluated with the Utah Verbal Language Development Scale. The range of improvement was 2 years 0 months to 2 years 6 months. (Figure 2).

Another experiment was designed to explore the possibility of using a restricted menu as a device for making low probability task behavior into high probability reinforcing behavior.

Girl subjects were selected from the Cache Valley Day Care and Training Scbool. Each had a measure IQ of approximately 40 and a mental age of 6 years on the Stanford-Binet.

Two rooms were used: one for performing the task and the other about 25 yards away for housing the reinforcement area.

Reading aloud two pages of textual material and writing two pages of programmed math problems were selected as the low probability tasks. In order to have access to the RE area, a 90% correct criterion was employed for each task. After a mathematics assignment was completed, correct answers were indicated; and if less than 90% correct, the subject re-worked the entire set until the 90% criterion was met. In the case of reading aloud, immediately after an error the subject was corrected and then re-required to repeat the sentence. Upon successfully completing the task, the subject had 4 minutes access to the RE area.

A restricted menu of high probability responses was employed for each subject in order that new menus might be more easily developed. Coloring, using cut-outs, playing with a Barbie doll and handling a cat were found to

LANGUAGE AGE SCORES

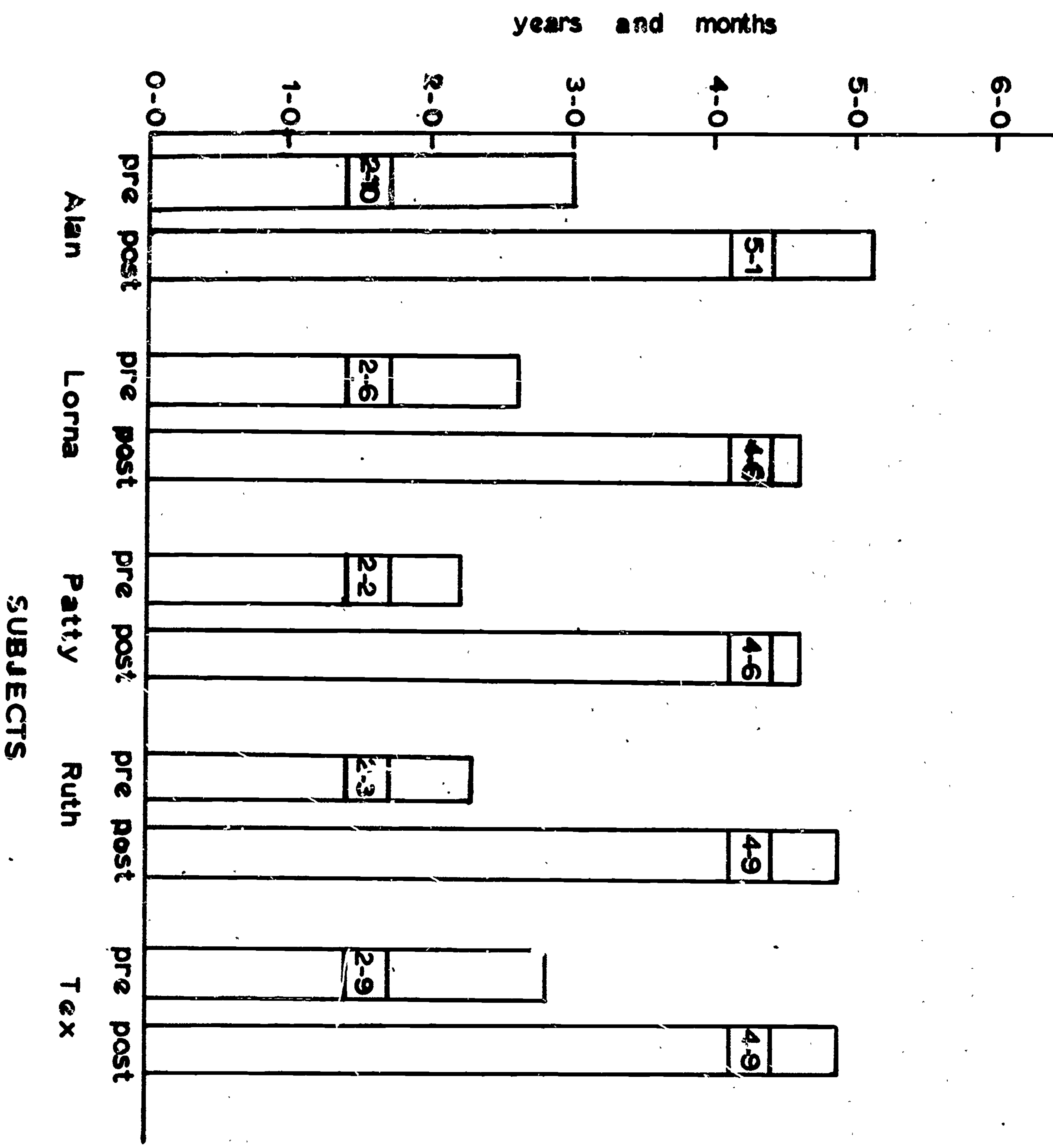


Figure 2

be high probability behaviors for the representative subject reported here. (Figure 3). Light color sketches were made of these activities on 8 x 5 cards and a menu prepared for each subject. Arithmetic and writing were selected as the low probability responses which could gradually come to replace the original items on the menu. Five separate menus were prepared for each subject (Figure 4).

With each new menu (2 through 5) the components of the activities indicated on the card were gradually changed in the direction of mathematics for color and cut-out menu items and writing for doll playing items. The subject was not presented an earlier menu once it had been superseded with a new menu. The procedure of a unit of work, a unit of reinforcing activity was employed. At the completion of the experiment, 60 sessions, the subjects were doing units of work involving reading and mathematics in order to have the opportunity to do some reinforcing arithmetic.

Rapid learning curves were produced by each subject. Their performance was worked by little variability on the response measures once asymptotic performance had been developed. Further, introduction of the new menus did not disrupt their behavior on any of the Response measures.

Another striking feature of this data was the difference between the time it took to go to the RE area and the time it took to return to the task area. The latter was much faster. It was suggested that this result indicated the task itself may have acquired reinforcing properties (Figure 5).

There were changes in behavior other than the measurable ones reported in the above experiments. Without exception every child began to demonstrate a higher frequency of socially desirable behavior; e.g., temper tantrums no longer occurred and teachers remarked on the improvement in social interactions.

One of the subjects was placed in junior high school and is still doing well in a special program. Further, none of the subjects have thus far shown a tendency for their enthusiasm to wane as the experiments progressed.

Learning Centers of the Future

It is not difficult to envision drastic changes in our educational system over the next decade. We have heard here at this conference a number of new, exciting, and provocative ideas about the classroom of tomorrow, or indeed the lack of it as we know it today.

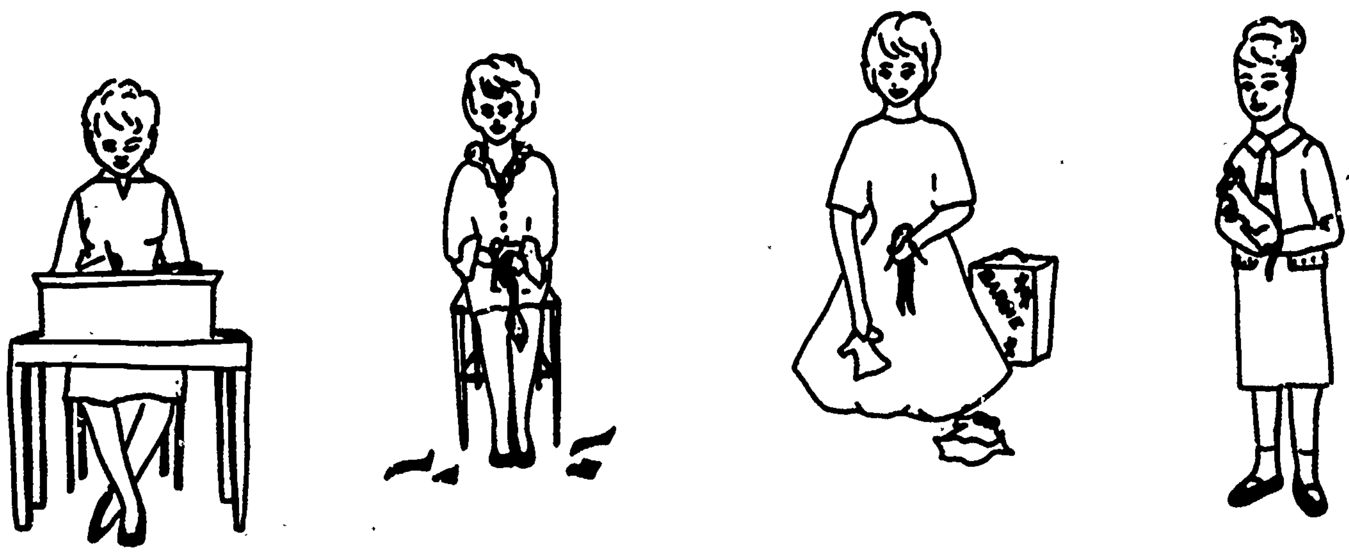
One approach to modifying behavior that seems to be well suited to the motivational system which I have just presented is the computerized educational system. It seems to us that computers with their vast storage capacities while capable of handling numerous instruction consoles, at one time are uniquely compatible with a contingency management system. There is little question that any subject that can be taught by lecture can be more efficiently presented through a computer system. The day when carefully programmed computers enter into a dialogue with the student is very close. Computerized instruction which integrates programmed instruction and contingency management into its general operation will be a most formidable system of behavior modification.

Figure 3

REINFORCEMENT MENU

DOROTHY

M1

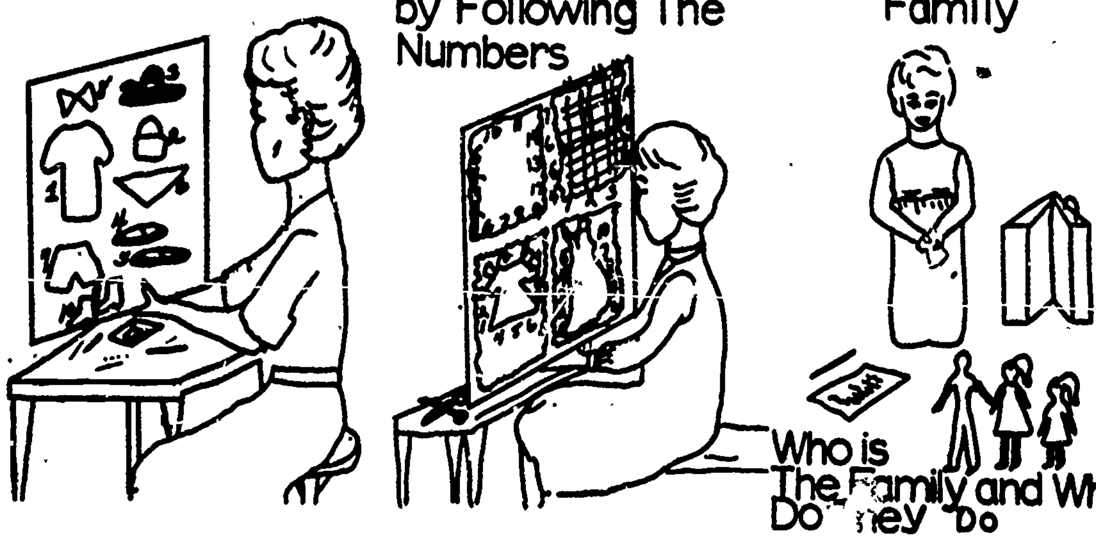


M2

Color Games
Color Numberd
Pictures in Order

Games with Cut
Outs
Cut Out Patterns
by Following The
Numbers

The
Barbe Doll
Family



Who is
The Family and What
Do They Do

COLOR CUTOUT DOLL CAT

REINFORCEMENT MENU

DOROTHY

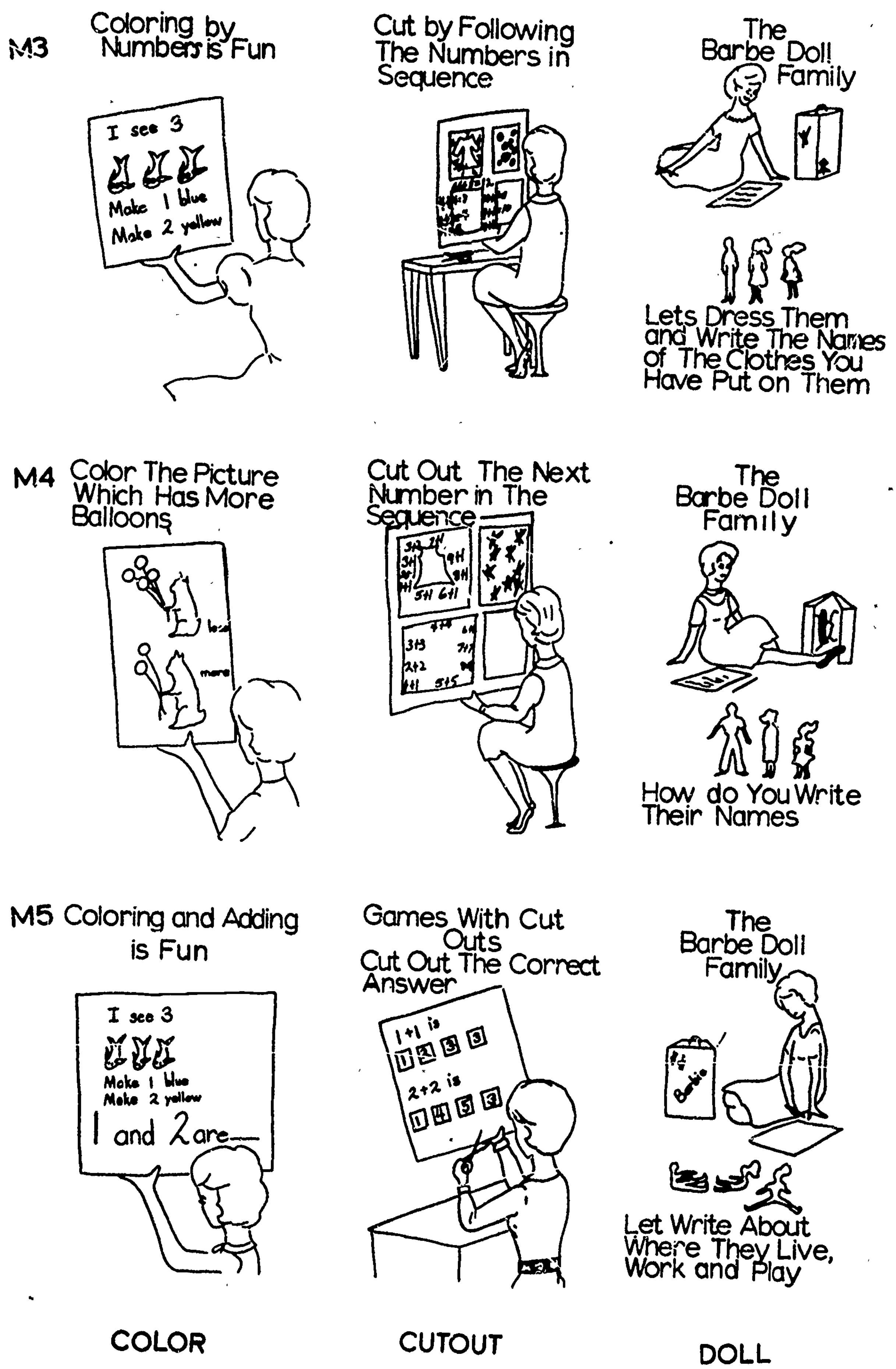


Figure 4

Dorothy

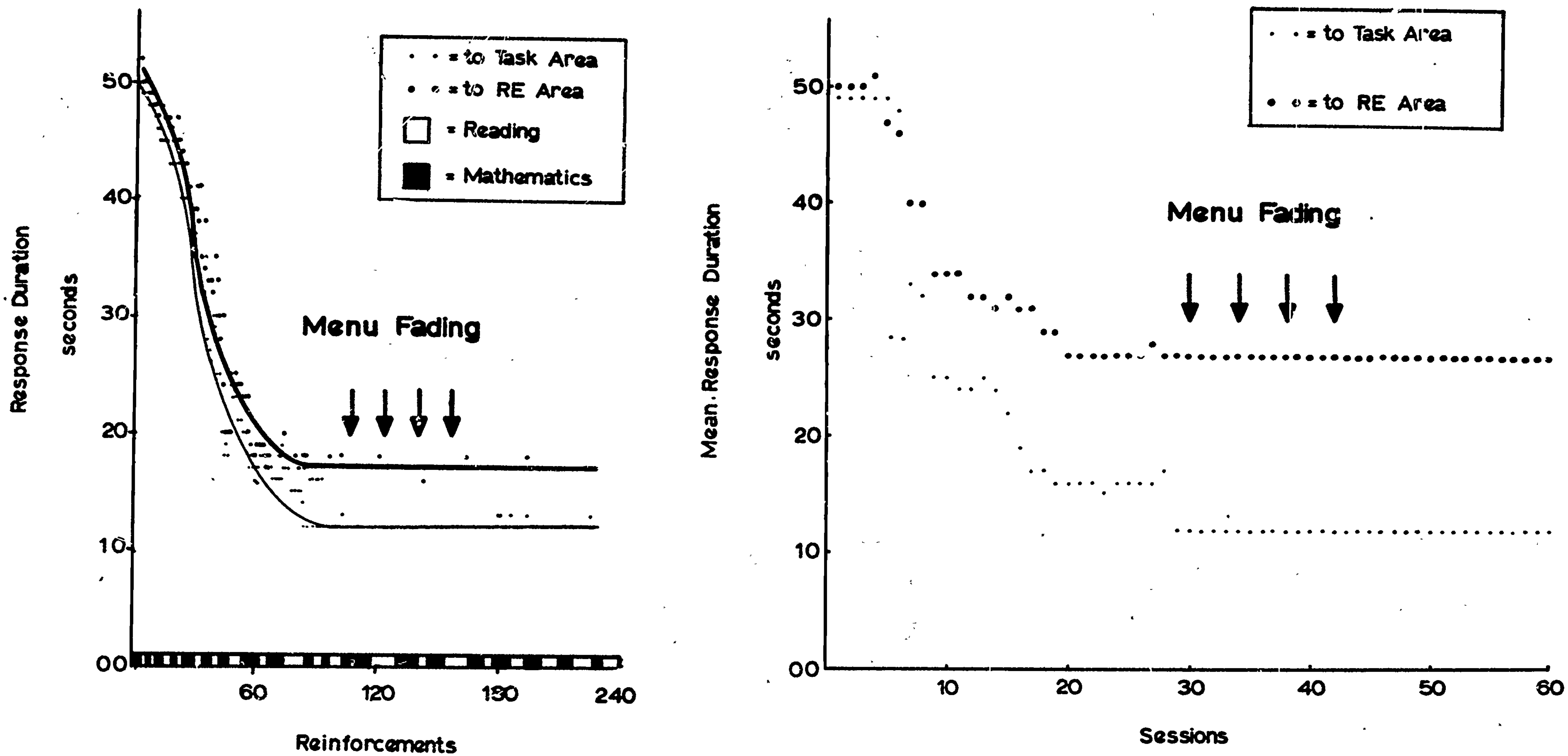


Figure 5

It appears that we have reached one solution to the problem of the "unmotivated" individual--careful management of contingencies between low and high probability responses. In this sense the underlying theme from this paper has been behavioral engineering.

It is in this context of behavioral engineering and education that we will go so far as to suggest that in most cases programmed environments are of necessity prosthetic environments. Further, it has been and still remains, our contention that modern science has finally acquired the ability to design suitable environments for the behavior of a given individual as well as design the environments necessary for maximizing the individual's behavioral efficiency.

References

Addison, R. M., and Homme, L. E., The Reinforcing Event (RE) Menu. NSPI Journal, 1966, 5 (1), 8-9.

Azrin, N. H., and Lindsley, D. R., The Reinforcement of Cooperation between Children, J. Abnorm. Soc. Psychol., 1956, 52, 100-102

Dunn, Lloyd, and Smith, James, authors and ed., Peabody Language Development Kit Manual for Level #1. American Guidance Service, Inc.: Minneapolis Minn., 1965.

Green, E. J., Concept Formation: A Problem in Human Operant Conditioning. J. Exp. Psychol., 1955, 49, 175-180.

Homme, L. A., System for Teaching English Literacy to Preschool Indian Children. Westinghouse Research Laboratories Contract 14-20-065001506. Bureau of Indian Affairs, Final Report, October 11, 1965, 1-15.

Homme, L., De Baca, P., Devine, J., Steinhorst, R., and Rickert, E., Use of the Premack Principle in Controlling the Behavior of Nursery School Children. J. Exp. Anal. Behav., 1963, 6, 544.

Premack, D., Toward Empirical Behavioral Laws: I. Positive Reinforcement. Psychol. Rev., 1959, 66, 219-233 (a).

Premack, D., "Reinforcement Theory." In David Levine (Ed.) Nebraska Symposium on Motivation. Lincoln, Nebraska: University of Nebraska Press, 1965, 123-188 (b)

Rheingold, H. L., Dewirtz, J. L., and Ross, H. W., Social Conditioning of Vocalizations in the Infant. J. Comp. Psychiol. Psychol., 1959, 52, 68-73.

STRATEGIES FOR TEACHING STUDENTS TO ANALYZE PUBLIC CONTROVERSY*

James P. Shaver

Professor of Educational Research
Utah State University

Educational research is a young field, probably still in its adolescence, if not in the later stages of infancy. School people are not yet able to find in research reports adequate answers to most of their pressing questions about educational practices. Questions about teaching students to think critically or reflectively, or put in the more specific terms of the title of this paper, teaching students to analyze public controversy, are no exception. There are few definite conclusions to be drawn from the available research. But we are not totally ignorant in this area.

A few years ago, I reviewed the research done on the teaching of critical thinking in the social studies. My reading of the research since the review was published in 1962 and has not turned up studies which would change my conclusions at that time.

> Probably the most conclusive suggestion [for teachers] supported by the research reviewed here is that we should not expect that our students will learn to think critically as a by-product of the usual social studies content. Instead, each teacher should determine what concepts are essential--e.g., that of relevance--if his students are to perform the intellectual operations deemed necessary to critical thinking--such as, for example, the formulation and evaluation of hypotheses. Each of these should then be taught explicitly to the students. Utilizing what is known about transfer of learning, a further step can be suggested: Situations as similar as possible to those in which the students are to use their competencies should also be set up in the classroom, and students guided in application of the concepts in this context.
>
> It is when we begin to consider specific procedures and methods for carrying out this course of action that many questions arise. It has been the primary purpose of this review to emphasize that for the moment social studies teachers will not find the answers in reports of educational research. We can only hope that the future will be more fruitful. (Educational Research and Instruction for Critical Thinking. Social Education, 1962, 26, 16.)

---

*The work reported here was supported in part by the Cooperative Research Program of the U.S. Office of Education.

Process Analysis. Cambridge, Mass.: Addison-Wesley, 1951.) and expanded them to fit our theoretical descriptions of the behavior that should occur when the two instructional techniques were used.

For each of our four experimental teachers, twelve discussions--six for each style--were selected for analysis from a larger number recorded over a period of several weeks. Two-way analysis of variance was used to determine if different patterns of behavior did occur when the different techniques were to be in use. The differences were consistently large--so large as to make the statistical tests of significance almost unnecessary. There also were significant differences among the teachers when they were to be using the same technique. This apparently was a manifestation of the differing personality traits brought to the classroom by the teachers. In general, however, despite the differences within each technique, behavior similarities did not overlap between the two teaching styles.

Having established the differences in teacher behavior for the two methods, we moved to the analysis of learning. First, the control students were compared with students in two control schools in similar communities. On tests of social studies knowledge and general reasoning ability, there were no significant differences; on tests developed to measure the use of concepts that the project intended to teach, the experimental students scored significantly higher. (Some of these tests involved scoring student participation in an interview or in a student discussion in order to have a testing context more "natural" than a paper-and-pencil test setting.)

The next step was to compare the learning of students who were involved in the discussion of public issues through the socratic technique with that of students whose exposure to the same issues was through the recitation technique. No significant differences in learning emerged. This finding did not surprise us in the light of the numerous studies of teaching methods that have ended up with no significant differences or with contradictory results from one study to the next. There was, however, reason to suspect that proper analysis would reveal that students had reacted differently to the different teaching methods, even though when averaged together for the previous analysis, these differences in learning had been obscured. (See, e.g., W. J. McKeachie, Motivation, Teaching Methods, and College Learning. In Marshall Jones (editor), Nebraska Symposium on Motivation. Lincoln: University of Nebraska Press, 1961.) Consequently, we administered a number of personality tests to our students in order to investigate the interaction of student personality with teaching method.

We found that none of our personality measures showed consistently high correlations with our measures of learning. This, too, was in line with past research findings. Next, we classified each student according to the teaching method to which he had been exposed (socratic or recitation) and according to whether he fell into the bottom, middle, or top one-third of the distribution of scores on each of the personality tests administered. Having made these classifications, we used analysis of covariance (adjusting the posttest means for any differences on the pretest and on an IQ test) to test whether there was any interaction of method and personality in affecting posttest performance.

This summary of research provides the context for the curriculum development-research project out of which my paper comes. The Harvard Social Studies Project, under the direction of Donald W. Oliver, was given responsibility for the social studies program of five groups of students (approximately 125 students) as they moved through the seventh and eighth grades of a suburban Boston school. Our intent was to teach these students concepts that would help them to analyze public controversy more adequately. The instruction was carried out within the overall framework of a course in U.S. history which provided the usual content for the two-year social studies program in the experimental school. In fact, however, by the time we had administered our testing program and carried out our experimental teaching, only about one-third the usual amount of time was left over for the regular history coverage. (A complete description of the project and its findings is available in Donald W. Oliver and James P. Shaver, Teaching Public Issues in the High School. Boston: Houghton, Mifflin, 1966.)

Our teaching centered on the analytic concepts that would help students to analyze public controversy, although we were also concerned with the constitutional principles and the governmental structure that provide the context for public debate. The analytic concepts were directed as three types of problems people should confront in dealing with public issues: 1) the clarification of communication and language meanings, 2) determining matters of fact, and 3) political-ethical choices. These concepts were taught separately as part of an instructional unit, using civil rights cases (free speech, etc.) to illustrate their application. Then the students were exposed to a number of substantive units (e.g., one on the problems of school desegregation) that presented public issues to which the analytic concepts could be applied.

Students were assigned to two different instructional methods, labeled the socratic and the recitation, for the discussion of cases presenting public issues to be analyzed. With the socratic technique, the student was first encouraged to take a personal position on a policy to handle the issue presented in the case, and then forced to defend it. In particular, inconsistencies between his values and between his factual beliefs and his values were emphasized, and he was encouraged to take these into account in applying the analytic concepts and arriving at a defensible position. When using the recitation technique, the teacher began by reading the same case with his students. He then used a series of questions to get at matters such as possible policy positions, the data that might be relevant to making a decision, the language that might need to be clarified, and the value conflicts that might need to be confronted in arriving at a defensible position. The student was not, however, forced to take a personal position and defend it.

A set of observational categories was developed to determine whether or not the experimental teachers would be able to use both teaching techniques. The basic scoring unit was the simple sentence. These were scored in categories such as : Asks for Descriptive Statement, Suggests Evaluative Inconsistency, Gives an Evaluation, Disagrees with a Description, Shows Positive Affect, Shows Antagonism, and Tension Release. (See Table 1.) We began with a set of categories developed by Robert Bales (Interaction.

Out of a total of ninety-one analyses, twelve were significant at the .05 level. At this level, only about five significant findings would be expected to emerge purely by chance. The results do not, therefore, seem to be a chance happening. At the same time, it is difficult to have confidence in any one interaction pattern until it has been reproduced in further research.

What did the interactions look like? Figure One presents the interaction effects of teaching method (or style, as we called it during the project) and Factor F (Friendliness) of the Guilford-Zimmerman Temperament Survey in affecting performance on the Unit Test. The Unit Test score was a composite score obtained by adding up the students' scores on a number of "teacher-made" tests utilizing a variety of typical classroom testing items and administered after each instructional unit. Note that students low on the "friendliness" factor (which is supposed to measure tolerance for hostile action and tendency not to dominate or be hostile) did better on the Unit Test when taught by the socratic method. And, while the recitation method produced better Unit Test scores as the "friendliness" scores increased, the opposite trend is observable for the socratic style with a slight recovery for the highest "friendliness" group.

Speculating about the causes of such patterns of interaction is at best a tenuous process. But it could be that students low on Factor F concentrated their efforts on the more specific and manageable aspects measured by the Unit Tests in order to compensate for the frustration and the difficult to manage feelings generated by the adversarial stance of the teacher using the socratic method. The performance of the "high friendliness" socratic group, while not up to that of the counterpart recitation group, might indicate that as tolerance for seemingly hostile action increases, the socratic becomes stimulating enough to provoke learning. The lower mean score as compared with the "high friendliness" recitation students may be accounted for by the fact that socratic teaching entails more argumentation and less attention to case details than does recitation teaching. The poor performance of "low friendliness" students with the recitation method is hard to account for, unless it indicates that the student's hostility stood in the way of the classroom participation that can be helpful in learning specific outcomes.

Examination of this one interaction must suffice to indicate the general nature of the interactions we found. The patterns of interaction varied with the tests involved, and each pattern was difficult to interpret. Nevertheless, the results indicate why many researchers are coming to see this type of investigation as among the most provocative and promising in research on teaching.

Despite the lack of clear and accumulated research findings that would provide a basis for educational decisions, the evidence of teaching method-student personality interactions has tremendous implications for teaching. It seems clear that the effects of different teaching methods (including programed instruction, for which there is a pittance of studies investigating the effects of student personality on learning) will vary depending upon the traits of the student being taught. In the past, educators have been cognizant that differing levels of student intellectual ability might be an important variable for understanding the effectiveness of differing teaching methods (although "ability grouping" has not produced clearcut results). Perhaps it is time for teachers to seriously consider grouping students by personality types and adapting teaching methods to the different groupings. (For an interesting report of such an attempt on the college level, see George A. Stern, Environments for Learning. In Nevitt Sanford (editor), The American College. New York: Wiley & Sons, 1962.) Research cannot yet say what methods will be appropriate for what students. But if educational practice always waited on definite educational research, change would rarely occur.

If the school's aims include teaching for the analysis of public controversy, the necessary strategy for optimum learning seems clear: The teacher must identify those concepts that the students are to learn and teach these explicitly. (This does not mean that "inductive" methods can not be used. It does mean that the "induction" of the concepts will not be left to chance or expected from the usual classroom materials.) The students should also be guided in the application of the concepts in situations as similar as possible to those in which it is hoped the concepts will be used, and helped to develop general rules for their use. However, when it comes to the teaching methods that will be most effective for teaching the student to apply the concepts to public issues, research provides few clearcut answers. One thing seems evident, however. We cannot expect our teaching methods to have the same impact on all students. Allowance must be made for temperament as well as for intellect.

Table 1: Brief Definitions of the Categories in the Observational System for the Description of Teacher Style

<u>Affective, or Socio-emotional, Categories</u>

SOLIDARITY--Status raising language or tone of voice; strong approval or acceptance of another person. Often indicated by enthusiastic acceptance of another's ideas.

LOW POSITIVE AFFECT--Signs of mild approval or acceptance of another person, or of his ideas.

TENSION RELEASE--Action interpreted as tension reducing or attempting tension reduction, e.g., laughing or telling a joke.

TENSION--Behavior indicative of a state of tension, such as stuttering or becoming tongue-tied.

LOW NEGATIVE AFFECT--Statements or acts indicating mild disapproval or rejection of another person, e.g., disbelief or, skepticism about, a statement by the other person.

ANTAGONISM--Deflating, derogatory, or highly negative statements or actions.

NEUTRAL--Acts or statements with no affective message discriminable by the observer.

<u>Cognitive Categories</u>

SUGGESTS INCONSISTENCY--An attempt to lead another person to see inconsistencies in his values, claims, or definitions.

EVALUATIVE--Statements which evaluate events, i.e., statements of like or dislike, right or wrong, good or bad.

DESCRIPTIVE--Statements which describe events, i.e., make claims about what reality is like, was like, or will be like.

REPEATS, SUMMARIZES, FOCUSES--Statements that restate what has happened during the discussion, or bring attention to what is happening or going to happen.

CLARIFICATION--Statements that attempt to clarify the content of the discussion, i.e., clear up the meanings of statements or specific words.

ANALOGY--Statements setting up for consideration a situation similar to the one under discussion. The situation set up may be hypothetical or one which it is claimed existed, exists, or will exist.

NON-COGNITIVE--Acts with no cognitive--including procedural--message discriminable by the observer.

Table 1 Continued

Procedural Categories

DIRECTS TASK ORIENTED BEHAVIOR--Statements directed at controlling behavior which is in line with the task of the group, or at delineating what that behavior will be.

CONTROLS DEVIANT BEHAVIOR--Statements directed at controlling behavior which detracts from the accomplishment of the group task.

STUDYING TEACHER BEHAVIOR WITH THE OScAR TECHNIQUE

Donald M. Medley

Educational Testing Service

In the last 20 years or so there has been a growing interest on the part of educational research workers in the study of the teaching process as distinguished from the learning process. Research in teaching has one important advantage over research in learning; you can't do it with rats. In fact, it is so difficult to do research in teaching anywhere but in the classroom, that practically all of it has been done with real teachers and real pupils. I call this an advantage because it means that anything the researchers happen to find out is much more likely to be useful than something they discover about rats in a maze--or at least its usefulness is more obvious. Research in teaching has another valuable by-product; many of the instruments used by researchers to study teacher behavior can also be used by supervisors, teachers, and others more interested in changing than in studying teacher behavior.

Today I want to discuss the work of our own group. Since we have been rather closely concerned with instrumentation, instrumentation will be the main focus of my remarks. And I will pay particular attention to the possibility that our approach to the study of teaching may prove useful in projects less concerned with research than with direct intervention in the educational process.

Our approach differs from that used by most other groups interested in the teaching process in that it has been basically a measurement approach. Our goal has been to develop procedures for obtaining objective quantitative descriptions of teacher behavior, in terms of a minimum number of dimensions, on the basis of direct observation. Behavior profiles so obtained could be used to study differences in behaviors of effective and ineffective teachers, to measure changes in teachers during training, to measure the effects of training on teacher behavior, and for a host of other purposes.

The name OScAR, which is an acronym for "Observation Schedule and Record," refers to a card or sheet of paper which contains a list or taxonomy of behaviors the observer is to look for during a classroom visit, and also provides space for recording the frequency of occurrence of each item. An effort is made to specify the items to be observed in such a way that the cues on which they are discriminated will be as simple and as easily recognized as possible, so that the observer will need a minimum amount of sophistication and special training. His task is to record what he sees without judging or evaluating.

Scoring is a separate step from observing, and is essentially a clerical task of combining items into sets or "keys" each of which describes an interesting aspect of behavior. Factor analytical methods are then used to derive dimensional scores from the keys.

Our first study using the technique was made in New York City elementary schools with first-year teachers who had been trained in the municipal college system. In addition to the observational data we also obtained each teacher's scores on several criteria of effectiveness.

To illustrate one of the uses of objective behavior measurements, we may examine the data of this study to see what we can learn from them about the meaning of various measures of teacher effectiveness often used as criteria in research studies, as well as for selection, promotion, merit pay, and the like.

Ratings of teacher competence by principals' and pupils' reactions to the teacher were found to favor teachers whose classrooms were pleasant and orderly. Pupils also tend to prefer teachers who emphasize verbal activities rather than non-verbal ones, but principals' ratings are unrelated to this dimension. Neither the pupils' nor the principals' opinions about a teacher's competence had any detectable relationship to how much the pupils learned from the teacher.

Since much research in teacher effectiveness has used ratings of competence as a criterion, these findings have definite bearing on the interpretation of the results of such studies. And since ratings are also widely used in promoting teacher determining who is to get merit pay, etc., they suggest that we may be rewarding teachers more for keeping pupils quiet and happy than for helping them learn.

Teacher self ratings, on the other hand, did indicate how effective the teachers were in helping pupils learn, but not how well either pupils or principals like the teacher. Teachers who rated themselves as highly effective tended to permit less small group work than those who rated themselves as less effective. However, when mean pupil gain was correlated with teacher behavior it did not show any relationship either to social organization or to verbal emphasis; and its relationship to emotional climate, though positive, was too small to justify any confidence.

The second study I want to mention involved student teachers in a campus school; two observations were made of each student teacher at the beginning and at the end of the semester with the principal purpose of studying changes in their behavior. So far as we were able to ascertain, no such study had ever been done before--no attempt to make objective comparisons between the behavior of the same teacher at different periods in his career had ever been made.

The OScAR used in this study was a rather elaborate one; it was scored on 35 keys and yielded 8-dimensional behavior profiles. To get some idea of the magnitude of changes which took place, we noted that 12% of all variations in behavior observed represented changes, and that 46% represented stable differences between different teachers--a ratio of about one to four.

Of the observed changes, about half were idiosyncratic--that is, represented instances in which students teaching under virtually identical conditions--same supervisor, cooperating teacher, and pupils--changed in opposite directions. About a fourth represented changes uniform for all student teachers; these may be interpreted as representing the effects of the experience itself.

What was the nature of these changes? Behaviors related to affective climate were the most stable of all. Teachers' use of approval and disapproval showed almost no change, nor was there any appreciable gain in the teacher's awareness of pupils' feelings.

The pattern of pupil behavior changed significantly; pupil activity increased but the amount of initiative or freedom the teacher permitted did not. The teacher's own role also changed significantly. He increased in presence (appearance of control both of his own and his pupils' behavior). His teaching style became less imaginative and original, but more informative --dealt with more content.

I think these two examples illustrate that information about areas where both our ignorance and our need for knowledge are great can be obtained by studies using the OScAR technique. Both of these studies used OSCARs which were hastily constructed for those studies alone.

Currently we are at work on a carefully constructed instrument which may prove useful in a number of projects--some of which may be done by others.

OScAR 4V is the first part of this omnibus instrument, a part dealing only with teachers' verbal behaviors. It provides for the coding of each teacher utterance into one of 50 different categories. The cues used in the coding are extremely simple; classifying any verbal behavior requires a series of no more than six elementary yes-no decisions. An example of a teacher statement needing the maximum number of discriminations is the following:

"A funny thing happened to me on the way to school." The discriminations needed to code this are as follows:

1. Did teacher say it? (Yes)
2. Did it solicit a pupil response? (No)
3. Did it deal with feelings, values, desires? (No)
4. Did it deal with content the pupils are supposed to learn? (No)
5. Did it constrain or limit pupil behaviors? (No)
6. Does it belong in the same category as the last teacher statement? (no)

The types of behaviors discriminated in the system look in general like things one should know about a teacher. Statements are classified according to whether they relate to motivation, management, or subject matter; questions are classified according to whether they call for a prescribed answer, offer the pupil a chance to originate his own answer, or ask him to discuss a previous pupil comment. Information is obtained about how complex the content of a lesson is, how intense the hostility or supportiveness of the teacher, the extent to which the teacher dominates the pupils, what kind of pupil behavior he encourages, how he uses criticism and objectives feedback, and so on.

If we had used this OScAR in the two studies I have described, it seems likely that we would have learned much more both about criteria of effectiveness and about how teachers' behavior changes with experience. One of my main reasons for being here is to encourage others to use OScAR in studies of these and other problems.

My other purpose is to suggest that this kind of instrument might also be very useful in projects whose purpose is not do research but to implement educational change. If the project is dependent upon producing changes in teacher behavior--whether by better training or supervision, by introducing new curricula or materials, or by reorganizing the administrative structure to free teachers to teach better, systematic measurements of teacher behavior can make an important contribution to its success. Such measurements can tell you whether or not teachers do in fact teach differently after the change; they may tell you why some teachers improve and others get worse after the innovation; if they are used for feedback they can be instrumental in expediting the changes teachers need to make in their behavior if the new program is to achieve its goal.

BEYOND PROGRAMED INSTRUCTION....

Lincoln F. Hanson

Professor of Education
Rockland Community College
Suffern, New York

For ten years now the field of programed instruction has been plagued with the bandying about of borrowed terms that may or may not turn out to have proven utility in the advancement of knowledge about learning.

In common with most teachers we have neglected one part of the process in a fashion almost as incredible as it is dangerous. This neglected but crucial aspect of learning is, very simply, the process of listening to the student. Most of us acknowledge the importance of student responses in developmental testing, a not new (but regularly not employed) technique available to the publisher and useful to the teacher. Only a small handful of programs we encounter shows any serious evidence of developmental testing as it could and should be practiced. A small amount of additional developmental data may turn up in the few teachers' manuals worthy of the name. And a few more publishers are known to have data which, for one reason or another, has not reached the light of day.

What we have in mind, however, goes well beyond all extant techniques and, we propose, stands to benefit the student, the teacher, the administrator, the publisher, and especially the author. Furthermore, this modest technique will (not should, not may) provide a greater and more continous source of error signals than any educational feedback technique now known to exist.

The technique is herewith dubbed "the carbon paper ear" and its advantages will either be self-evident or it will properly die.

One of the few advantages of programed over conventional educational materials is the opportunity for the student to demonstrate an interaction with the printed word. Yet, of what does this activity usually consist? Saccadic eye movements and sub-vocal muscular activity in the tongue and throat have all been reported--and can be operationally demonstrated if they do occur. A written response may be made. But what is really going on?

We usually wait for something we call a test to reveal the nature and extent of the brain activity which lies beyond ready measure. What a travesty on the human learning process! So we invent the open-ended and essay tests, which, with considerably less stimulation on our part, elicit a greater proportion of student activity.

And now we lose objectivity and enter the mystical realms of the subjective. Not only because the student writes what he is "thinking" (God forbid!) but even more dangerously, because we must now face the belated reconciliation of student activity with teacher intent. All too often a graduate assistant injects yet another "mind" into the process! (All conscientious professors and teachers in less economically favored school systems automatically exempted.)

If our goal was student activity--of the highly individualized sort that students demonstrate so well in non-class aspects of their behavior--why do we delay this crude measuring process by even a day, say nothing of the weekly quiz, the monthly test, the mid and semester or even final exam?

"But how can the student respond immediately and individually if he doesn't even know what I want?"

Try him!--and listen.

"But I have 30 students! I can't listen to them all."

All right--listen on paper--!

"What? How?"

Let him react to every point you wish to make. Assume you have a programed text. Do you presently let the student fill in the blanks--or otherwise write in the text?

"No--we cannot--the books are too expensive and must be used by other students."

Fair enough. Do you have inexpensive lined paper? Yes--and can you provide a modest supply of carbon paper? (We trust)

Each sheet (complete with carbon paper under) is divided thus:

NO.	RESPONSE	COMMENT	SUGGESTIONS

In the first column go numbers of enough response items to enable you and the student to keep track. Three or four key items numbered per page appears adequate.

In the second column the student responds to the program. If he covers the answers and makes any errors, he draws a single line through his initial response and adds the correct response--"copied", if you will, from the answer section of the frame.

So far--a fairly standard procedure, but...

In the third column the student writes any comment he may have, and we would suggest that raw emotion be encouraged here insofar as you may be able to persuade the student to express it in writing.

A modest number of teachers and a larger number of program editors have already employed this additional comment. A few have even succeeded in capturing what is now proposed as mandatory for every user of every program.

In the last column we simply shift the burden of communication (further toward a shared position only,) by asking for "constructive suggestions which might better draw out the response you think the author wants".

"What do I do with all this student-produced written matter."

1. The students keep one copy. (Just a simple record of performance!)

2. In a conventional lock-step class the teacher collects the carbon copies of the day's "assigned" frames and by simply fanning them on the desk, sees a rather unusual profile which indicates--

a. whether anyone had any reactions
b. who had what reactions
c. who had problems and
d. who made suggestions, many of which will be related to (c).

3. If the nature of program use has achieved its logical goal of individual student progress rate, the carbons are dropped into each student's file to be held against the day of apparent problems. (Some file folders may never need to be touched--any may be passed on intact, as hurdles such as conventional tests are passed.) The availability of such cumulative diagnostic and resource materials for the teacher represents a novelty deemed well worth the extra file drawer.

Stated another way, in contrast with most homework assignments or daily quizzes--the teacher now has a more detailed chance of learning

-whether there was understanding and, if not, how much, as well as
-exactly where the misunderstandings were.
-whether any class discussion is desirable or necessary.
-who really has problems--and which student can now no longer monopolize the time of the whole class with a unilateral engagement of the teacher's time and energy.

We can only conjecture as to the frequency with which teachers have ever met their classes thus diagnostically armed! Has anyone ever claimed to have "heard" from every student, on each point (however inadequately) before he started speaking. Maybe now a teacher could even move with confidence to completely new areas! Quite possibly he can foster intelligent discussions with knowingly pinpointed participation. After brief discussions, student A's suggestion is called for as a possible answer to student X's problem or comment on item #531.

But this sketch is only a suggestive start.

4. A department or sectional head may now see specific reactions of students to the text, positive quite as readily as problem.

5. Periodically the teacher might bundle up his carbons and ship them off to the publisher--who, for perhaps the first time in history, would have a flow of pertinent information, unlike any normally available, on which to base his decisions to revise and reprint.

6. Last in the chain, the author now may have not only the reactions of a polite class of his own who have been "exposed to" his text in developing form, but a continuous monitor of student by student constantly (and probably repetitously) reacting to each point in the text. While such a barrage might become formadible, there is a possible advantage as and if his audience widens beyond or changes from the original target population. Further, he is also getting a continuous flow of suggestions, of which even a small fraction could shape both book and author perceptibly!

Some of our visitors have asked if the carbon paper ear is copyrighted or patented. Nonsense! Good teachers have been sensitive listeners for years. A few program writers and editors have similarly found how much they could learn from their developmental test students, even as you and I recall how much we learned from our first days at the front of a classroom.

No, one reason for taking the liberty of projecting a local "technique" into this space is to ensure the widest possible dissemination of an obviously promising and almost incredibly simple method of "listening" to our learners.

A couple of perspicacious teachers have already noted that this technique, definitely derived from programed instruction, and superficially advantageous to "linear" materials, is, in fact, amenable to any text material whatsoever.

It has been tried with math exercises.

It has been tried with grammar exercises.

It has even been tried successfully with paragraphs of extant conventional texts.

And at any moment we expect to hear that someone has tried it with a novel or a poem--.

Why not--where can we not listen with profit?

The day we stop learning is the day we should stop teaching.

Figure 1

SAMPLE STUDENT RESPONSE TAKEN FROM A GENERAL PSYCHOLOGY COURSE

Page	Fact in Book	My Opinion	Alteration
80	"Maturation" practice when imposed before readiness, may inhibit the individuals potentential carry discouragement which influenced future performance.	I agree with this statement. I think too many times parents force their children in to doing things when they are not ready for it, not realizing the body functions develop different times.	I don't know if there is a set pattern for biological maturation but if there is, I think the author should state some give some examples including ages.
92	Heredity and environment are interdependent and complementry	I agree, I think too many times a persons actions are blamed on his heredity.	The author should stress this point a little more in the book.
93	"Homeostasis" mentally emotionally the organism may be thought of as	This is true, but the author should say what this pattern is. I think it is the	Again the author doesn't stress enough points, of importance.

GPO 974-588