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ABSTRACT

A study was designed to determine if multiple-image (four frames at a time) presentations of stimulus material would provide a superior learning mode for students when compared to the usual single image linear presentation of the material. Students who were learning to use audiovisual equipment in an automated laboratory situation were subjects: each was randomly assigned to either the standard (one frame at a time) carrel or to the experimental (four frames at a time) carrel. All subjects were given subsections of the Minnesota Rate of Manipulation Test, viewed the learning materials, and took a timed, practical operation criterion test. Results of analyses disclosed no significant differences between the experimental and control groups, although there were a number of factors which may have contributed to this: the inability to time learning or testing sequences to the second; the possibility of problems with older subjects; the simplicity of the task; the flexibility of the sequence required for task performance; and the possibility of using the four frame presentation in different alternative ways. (SH)

Final Report

A PILOT STUDY TO TEST THE EFFECT OF VISUAL STIMULUS PRESENTATION STRATEGIES ON LEARNING A MOTOR SKILL

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A PILOT STUDY TO TEST THE EFFECT OF VISUAL STIMULUS PRESENTATION STRATEGIES ON LEARNING A MOTOR SKILL

Paul Scholl

This study was an experimental application of basic research findings about learning strategies previously undertaken by the author. The earlier strategies study compared a single image strategy with multiple image strategies for presenting visual stimuli. The experiment presented a concept attainment task and used Junior and Senior college students as subjects. It indicated that learning was significantly faster and occurred with fewer errors when images representing the concept were presented four-at-a-time rather than sequentially one-at-a-time. The study reported here was an attempt to apply the multiple-image strategy of presenting visual stimuli to an operational learning environment.

Multiple-image learning has been the concern of practicing educators at the college level and within the military organizations. The U.S. Army Aviation School, Fort Rucker, Alabama printed and distributed a manual, Multiple Screen Instruction in February 1964. While the contents of this manual were not specific to the study, statements such as "Building block approach," "Increased student motivation," and "Progressive information presentation" were commonly used. These statements emphasize the ability of the student to "make sense" of actual objects and the ability for transition without difficulty from one idea to another during instruction.

An important concept of multiple image presentation, it seems, is the ability to compare exemplars of ideas and things to be learned. Instructional strategists draw heavily upon the finding from Bruner's work with concept attainment which states that learning can be made easier by reducing cognitive strain (memory requirement) needed for the solution of a problem. While Bruner used the descriptive technique to report his research data in A Study of Thinking, the basic data related to reducing cognitive strain should apply equally to those factors which can be controlled by the instructor. It seems reasonable to hypothesize that the application of multiple-image presentation strategies in instruction or training should provide the most efficient learning style for most students.

Problem and Design

The problem chosen for this study involved learning the psychomotor skill of operating audiovisual hardware; specifically a 16mm motion picture projector. Students in Audiovisual Media classes at the University of Connecticut are taught to operate AV equipment in an automated laboratory using principles of programmed instruction. Pictorial illustrations and written verbal directions are presented to students by 35mm slides in a linear sequence. This study was designed to try to determine if multiple-image (four-"frames"-at-a-time) presentation of existing stimulus material would provide a superior learning mode for students when compared to the usual single image linear presentation of the material. The specific hypotheses tested were:

(1) Four-at-a-time image presentations of the visual stimuli needed to learn a psychomotor task will decrease the time to criterion when compared with one-at-a-time image presentations of the same stimuli, and

(2) Four-at-a-time image presentations of the visual stimuli needed to learn a psychomotor task will decrease the number of errors made on the criterion test when compared with one-at-a-time image presentations of the same stimuli.

Procedure

Existing carrels in the University of Connecticut School of Education Automated Instruction Laboratory were used for this experiment. Two carrels are used to teach the operation of the 16mm motion picture projector. One carrel was modified for experimental purposes while the other carrel remained unchanged for the control group. The single carrel modification was less expensive and complicated than establishing a separate experimental facility. In addition the regular laboratory staff was able to monitor the instruction. This last factor however, as noted later, may have confounded the experimental results.

Existing carrel programs require the student to work through a learning sequence by pushing a button to cycle a 35mm slide projector whenever a new frame or bit of the pictorial and verbal information is needed for the next learning step. One learning carrel was modified to present sequentially and four-at-a-time exactly the same stimuli as presented in the existing program (see Figure 1, page 4). In the experimental carrel, instead of appearing one-at-a-time, the stimuli appeared four-at-a-time. A given stimulus appeared in the following positions: lower right corner, then lower left, then upper right, and finally in the upper left corner of the screen as the student pushed the advance button (see Figure 2, page 5). Size of the individual stimulus was held constant.

Subjects were given both the placing and the turning subsections of the Minnesota Rate of Manipulation Test hereafter referred to as MRMT. The test board and a subject taking the test are shown in Figure 3 (page 6). All testing was done by a graduate psychology student for consistency of application and scoring.

The MRMT score is expressed as the number of seconds required to complete the assigned task. The shortest time to completion (lowest score) indicates the greatest ability. Scores for the two sections were added to give a composite score for both subtests within the MRMT.

Student-subjects were randomly assigned to either the standard carrel or the experimental carrel to equate the experimental and control groups. Upon entering the automated carrel, each subject was given a record sheet, shown in Appendix A. The necessary information was filled out by the subject and checked by the laboratory assistant on duty. When the subject felt he had learned the task well enough

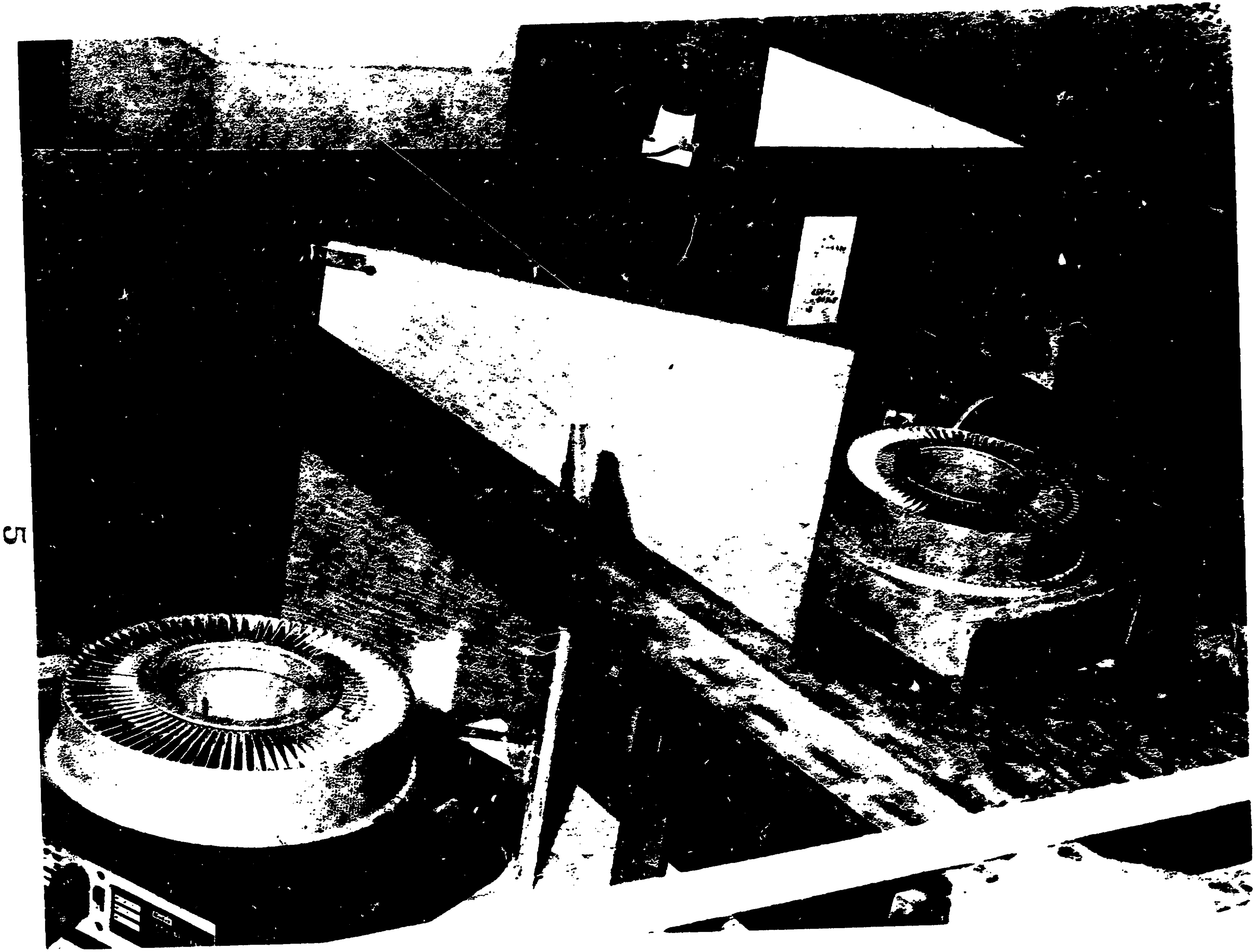

Figure 1. Carrel modification

Figure 2. Four-at-a-time Stimulus Material

Figure [illegible]. [illegible] Taking the [illegible] to pass a practical operation test, he told the assistant who then administered the criterion test.

Each subject was given a two-minute sound motion picture and was asked to project the film and then rewind it properly. This test was timed by the lab assistant and the time was recorded on the bottom of the lab information sheet, as well as whether the subject passed or failed the test and the number of minor errors (errors not serious enough to cause a system malfunction) which occurred during the final examination.

Data was also collected from the subject which indicated the number of hours of previous experience he had had on motion picture equipment or like items of equipment, number of times the laboratory visual program was viewed, and the amount of time needed for learning. This information was coded on data sheets for analysis.

T-tests were applied to the data to test the significance of the results.

Results

The raw data for this experiment is presented in Appendix B. A t-test was performed on the means of the MRMT scores of the experimental and control groups (see Table 1). The t= .6501 is not significant. This indicates the experimental

TABLE 1

T-Test for Rate of Manipulation Scores by Training Condition

Training Condition	N	Mean	S.D.	t
One-at-a-time	31	329.484	27.918	.6501*
Four-at-a-time	28	335.071	36.927	

*Not significant

and control groups had equal manual dexterity as measured by the MRMT.

A t-test was performed on the means of the criterion test completion times of the experimental and control groups (see Table 2). The t = .5140 is not

TABLE 2

T-Test for Timed Criterion Test by Training Condition

Training Condition	N	Mean	S.D.	t
One-at-a-time	31	4.581	1.391	.5140*
Four-at-a-time	28	4.804	1.877	

*Not significant

significant. This means the first hypothesis which stated that the four-at-a-time image presentations of the visual stimuli needed to learn a psychomotor task would decrease the time to criterion when compared with one-at-a-time image presentations of the same stimuli is untenable.

A t-test was performed on the mean number of errors made during criterion testing of the experimental and control groups (see Table 3). The t = .2553 is

TABLE 3

T-Test for Number of Errors Made During Criterion Testing by Training Condition

Training Condition	N	Mean	S.D.	t
One-at-a-time	31	.871	1.360	.2553*
Four-at-a-time	28	.786	1.197	

*Not significant

not significant. This means the second hypothesis which stated that the four-at-a-time image presentations of the visual stimuli needed to learn a psychomotor task would decrease the number of errors made on the criterion test when compared with one-at-a-time image presentations of the same stimuli is also untenable.

Discussion

A number of factors may have contributed to the lack of significant findings in this experiment. One factor was the inability to time both the learning and testing sequences to the second. Since this experiment was carried out under actual learning laboratory operating conditions, the assistant could not devote all his time to the test. Timing was reliably reported to the minute rather than to the second. Learning time was recorded by the subjects themselves and it seems reasonable to suppose that the measure of unit accuracy was about five minutes. Subjects were not told that their criterion test score would be the time taken nor were they under any pressure as a result of class directions to learn the assigned operation in the shortest time.

Second, while watching the subjects learn, it appeared that the task had emotional overtones for a number of subjects, particularly females over forty years of age. Some of the subjects who were extremely concerned went through the program three times and took as long as one hour and fifteen minutes to complete the learning task. They were extremely concerned about their performance on the test, and were quite frightened of possible failure.

Third, in scanning the data to get some idea of number of trials and time to criterion, the impression is that the learning task involved is rather simple for the population under consideration and not one that could be considered extremely difficult for an intelligent adult. This generally appears, except for the cases already noted, to be a one-time learning task with little subject variability.

Fourth, the fact was reaffirmed, again by observing student-subject behavior, that the sequence required for performing this particular task is not inflexible. It is quite possible to complete the task in different sequences. Admittedly the performance will not be as smooth as if strict adherence to the instructor sequenced pattern is followed, but the task can be completed to criterion.

Fifth, observation indicated that a number of subjects used the four-at-a-time slides in different ways. It seemed inappropriate in a pilot study to require that all subjects use the slides in the same way. Therefore, they were simply told that the slides would appear in sequence and that if they watched the image in the upper right quadrant they could anticipate the next images by looking in the lower left corner and lower right corner and review what they had previously been exposed to in the upper left corner. Some subjects would proceed to view the slides from upper left to lower right without advancing the projector. Upon completing the information in the lower right corner they would then cycle the equipment four times to get four new images on the screen, and again work through the sequence from upper left to lower right. Some students would constantly cycle the projector one visual at a time and attend to only the image in the upper left corner or the lower right corner.

More experimentation needs to be done on the question of whether or not learner determined strategies are indeed better for the individual who chooses them than one prescribed for all subjects either by the instructor or by common practice.

From the present experiment it must be noted that, given the task of learning how to operate the most complex piece of audiovisual equipment, the subjects as a group gained no significant advantage by viewing multiple-images as a communicator strategy were compared to single images presented serially. This does not mean that a strategy which is designed specifically to be used with multiple images would not be superior to a strategy designed for single image presentation only.

At this point it appears to be an unfruitful method of research to explore these matters further under actual learning laboratory operation. More complex tasks, tasks that have no particular emotional tone, and strategies that can be precisely controlled and accurately timed must be designed.

BIBLIOGRAPHY

Bruner, J.S.; Goodnow, J.J.; and A [illegible], G.A., A Study of Thinking, John Wiley and Sons, Inc., New York, 19[illegible], 330 pp.

Scholl, P.A., Visual Concept Attainment As Affected By Stimulus Complexity And Selected Communicator Strategies, Doctoral Dissertation, Bloomington, Indiana, 1966, 131 pp.

U.S. Army, Multiple Screen Instruction, U.S. Army Aviation School, Fort Rucker, Alabama, 1964, 16 pp.

Appendix A

SAMPLE RECORD SHEET

NOTE TO

STUDENTS USING THE AUTOMATED EQUIPMENT LABORATORY

In an attempt to increase the instructional efficiency of the automated equipment learning laboratory, the Audiovisual Center is presenting the material in the two motion picture projector stations in different formats. Therefore we request your cooperation in this learning experiment. The outcome will not affect your grade nor will you be penalized by either presentation. Directions for using the <u>MOTION PICTURE LEARNING CARRELS</u> are as follows:

1. Record the time you start using and the time you stop using the carrel. Use the space provided below. You may use the wall clock in the room.

2. When you feel you are ready to demonstrate that you can operate the projector without the help of the laboratory assistant or of the instructional diagrams, notify the assistant so he can check you performance. You may take this informal test without taking the instruction if you feel competent. You may take the test over again if necessary after you have spent some additional learning time in the carrel.

3. Return this form to the laboratory assistant each time you leave the laboratory. When you return to the laboratory always use the same motion picture station (carrel 1 or 7) which you used before so you will always receive the same presentation format.

PLEASE FILL OUT the following information each time you use one of the motion picture carrels.

Name__________________________date____________

How much experience, of any kind, have you had with motion picture projectors?

________hours

How many times have you worked through the motion picture learning slide sequence?

________times

Carrel use: Time stopped ____:____

Time started ____:____

LABORATORY ASSISTANTS

Name________________Date________Fail Pass________Time________#er____

Appendix B

RAW DATA

RAW DATA

Control Group

			Time to Criterion			Errors			Total MRMT			
STOO[illegible]E N	00	1	032	1	05	0	200	131	331	2	1	0
DRESSLER D	00	1	010	1	03	0	155	123	278	2	1	0
PRUE M	01	2	030	1	05	0	186	158	344	2	1	0
SCKA[illegible]KNER S	05	2	035	1	03	0	191	135	326	2	1	1
BERUBE C	00	2	045	1	05	0	184	134	318	2	1	1
MURTHA C	00	2	020	1	02	0	176	144	320	2	1	1
PLUM L	00	2	075	1	04	1	198	153	351	2	1	1
SULISH M	00	1	034	1	02	0	174	153	327	2	1	1
BELL J	00	1	060	1	05	0	169	147	316	2	1	1
ROSSITER M	00	2	060	1	04	1	205	162	367	2	1	1
THERIAULT C	00	1	040	1	04	0	188	143	331	2	1	1
METASKA T	00	1	030	1	05	1	185	134	319	2	1	0
THOMSON S	00	1	017	1	03	0	169	148	317	2	1	0
SAKHI G	00	1	025	1	05	3	236	164	370	1	1	2
MATTESEN W	03	1	037	1	03	0	172	132	304	1	1	[illegible]
FEARON P	00	2	035	1	04	1	158	140	298	1	1	2
DULLMAN J	00	2	045	1	04	0	165	139	304	1	1	2
PITEGOFF M	01	1	030	1	08	0	191	137	328	1	1	3
VADENAIS M	01	3	045	1	05	1	232	162	394	1	1	3
ALPERT J	03	2	015	1	02	1	200	174	374	1	1	3
GALLERAND L	06	0	023	1	05	6	183	138	321	1	1	3
REGAN B	00	1	045	1	05	0	177	138	315	2	1	0
HUDOCK D	00	1	030	1	07	2	199	146	345	2	1	0
SHANAZU E	00	1	030	1	05	3	167	156	323	2	1	0
DUDEK R	00	2	020	1	05	1	177	156	333	2	1	0
WEED P	00	1	035	1	06	1	157	123	280	2	1	0
GAFVEY B	00	0	23	1	05	2	197	138	335	2	1	0
MCCORMICK M	01	0	025	1	04	0	197	131	328	1	1	2
SPENCER H	00	2	030	1	04	0	174	135	309	1	1	2
SULLIVAN N	03	1	060	1	06	0	227	167	394	2	1	0
HARLOW M	00	3	060	1	06	3	185	129	314	1	1	0

RAW DATA

Experimental Group

			Time to Criterion			Errors			Total MRMT			
REFRE J	00	1	033	1	04	1	177	162	339	2	7	0
LEWIS A	00	3	300	1	06	2	209	207	416	1	7	2
RAPAPORT S	00	2	150	1	09	5	189	144	333	2	7	1
MCGINN P	04	2	075	1	03	0	197	139	336	1	7	3
CASARELLA A	01	1	035	1	05	1	173	135	308	2	7	0
GAISER B	00	1	035	1	08	2	189	160	349	2	7	0
MACKO B	00	1	030	1	03	0	165	135	300	2	7	0
GRADY F	03	1	055	1	5	2	194	121	315	2	7	1
PALAN F	00	2	040	1	05	0	200	164	364	2	7	1
VELRATH	00	1	040	1	04	0	186	143	329	2	7	1
VAN DER MEER	04	1	025	1	03	0	178	122	300	2	7	1
RADOMSKI B	00	1	030	1	02	0	198	145	343	2	7	1
LEWIS B	00	1	050	1	09	3	206	144	350	2	7	1
KEFT MARY LOU	00	1	050	1	04	0	168	128	296	2	7	0
MAZZUCCHI P	05	1	025	1	02	1	205	189	394	1	7	2
HESS S	03	1	020	1	04	1	187	138	325	1	7	2
ZIMMER R	04	1	055	1	03	0	208	139	347	1	7	3
RILEY D	03	2	030	1	05	0	167	126	393	1	7	3
JANKOWSKI J	00	1	025	1	05	0	176	145	321	2	7	0
SCHMID S	02	3	030	1	02	0	155	123	278	2	7	0
MATHEWS L	00	3	045	1	04	0	189	150	339	2	7	0
FERIN C	00	1	040	1	06	1	173	128	301	2	7	0
WILLIAMSON	00	2	150	1	07	1	203	183	386	1	7	0
RONCER D	01	1	020	1	05	0	189	121	310	2	7	0
ROBERT AELT	05	1	030	1	05	2	234	172	406	2	7	0
REGSEY H	04	1	045	1	06	0	179	130	309	1	7	0
KUHNLY P	00	3	020	1	04	0	158	127	285	1	7	0
NOYES B	00	2	030	1	06	0	180	130	310	1	7	0