DOCUMENT RESUME

ED 114 549 CE 005 399

AUTHOR Fishburne, R. P., Jr.; Mims, Diane M.
TITLE Formative Evaluation of an Experimental BE/E [Basic Electricity and Electronics] Program. Report No. 9-75.
INSTITUTION Naval Technical Training Command, Millington, Tenn. Research Branch.
REPORT NO RBR-9-75
PUB DATE Mar 75
NOTE 94p.

EDRS PRICE MF-$0.76 HC-$4.43 Plus Postage
DESCRIPTORS *Comparative Analysis; Educational Experiments; Electricity; Electronics; Enlisted Men; Experimental Programs; *Formative Evaluation; *Low Ability Students; Matched Groups; Program Effectiveness; *Program Evaluation; Statistical Data; *Teaching Methods
IDENTIFIERS Navy

ABSTRACT

An experimental Basic Electricity and Electronics course (BE/E) utilizing a lock-step, instructor presentation methodology was developed and evaluated at the Service School Command, Great Lakes. The study, directed toward the training of lower mental group, school nonqualified personnel, investigated comparative data on test performance, attitude, and attrition of 50 students in an experimental group matched to a control group within the ongoing individualized BE/E training system. The results revealed significantly reduced attrition within the experimental group, control group, and overall Great Lakes BE/E School with no significant differences in quality of the graduates of the two treatment groups. Attitudinal data was generally positive for both groups and not significantly different. Two factors were concluded to be responsible for the program's success: the focus of management attention to problems of training lower ability individuals in both groups, and the introduction of prestudy sessions into the experimental group. Appendixes (55 pages) include: statistical tables comparing test performance of the two groups, statistical analyses of test and attitudinal questionnaires items, instructor comments on the course, instructional materials readability and student reading ability, the prestudy concept, and cost breakdown for conducting the research. (Author/MS)

Research Branch Report 9-75

March 1975

FORMATIVE EVALUATION OF AN EXPERIMENTAL BE/E PROGRAM

by

LT R. P. FISHBURNE, JR., MSC, USNR

DIANE M. MIMS

Approved for Public Release; Distribution Unlimited

Chief of Naval Technical Training
Naval Air Station Memphis (75)
Millington, Tennessee 38054

Submitted by

N. J. Kerr, Ed.D., Head, Reasearch Branch

Approved by

T. F. MULLANE, Captain, USN
Assistant for Training Methods, Research, and Evaluation

SUMMARY

An experimental Basic Electricity and Electronics Course utilizing a lock-step, instructor presentation methodology was developed and evaluated at the Service School Command, Great Lakes. The study which was primarily directed toward the training of lower mental group, school non-qualified personnel investigated comparative data on test performance, attitude, and attrition of fifty students in an experimental group matched to a control group within the ongoing individualized BE/E training system. The results of this investigation revealed significantly reduced attrition within the experimental group, control group and overall Great Lakes BE/E School with no significant differences in quality of the graduates of the two treatment groups. Attitudinal data was in general positive for both groups and not significantly different. Two factors were concluded to be responsible for the success of the experimental program: (1) the focus of management attention to the problems of training the lower mental group, school non-qualified individual in the BE/E curriculum of both groups, and (2) the introduction of "pre-study" advance organizer lectures/instructor involved programmed instruction into the experimental group. Due to the greater than fifty percent increase in cost (including increased staff personnel and increased training time) for the operation of a lock-step instructional system designed to train lower mental group, school non-qualified individuals in the BE/E curriculum, it appears that a more cost-effective approach would involve the modification of the ongoing modular individualized system through the inclusion of the lock-step proven "pre-study" concept and specialized management attention.

In addition to the findings, conclusions, and management considerations generated from this program, a formal instructor guide was developed, and studies were conducted on the readability of BE/E instructional modules and the content validity and item difficulty of BE/E test items.

TABLE OF CONTENTS

Promoting the efficient utilization of available resources has long been the concern of the Naval Technical Training Command. This efficiency can be measured through numerous criteria among which the rate of attrition achieves considerable prominence. Accordingly, it was this criterion which directed the CNTECHTRA Research Branch into an investigation of an instructional methodology designed to facilitate the training of lower mental group, school non-qualified personnel in the Basic Electricity and Electronics (BE/E) Curriculum. The primary impetus for this investigation conducted at the GM and BE/E Schools of Service School Command, Great Lakes, was an earlier statistical breakdown of attrition by ratings within the three BE/E Schools at San Diego, Memphis, and Great Lakes. This earlier study had been brought about by the disparity among the attrition rates at the three schools. Tables I and II present the results of the previous study which indicated excessive

Table I

BE/E SCHOOL ATTRITION
(Jan-Jul 1974)

	Great Lakes	Memphis	San Diego	COMMAND TOTAL
Student Flow	2989	3210	2579	8778
OVERALL ATTRITION	17.9	6.8	11.3	11.9
School Academic Attrition	9.6	2.2	9.8	7.2
School Non-Academic Attrition	8.3	4.6	1.5	4.7
% School MG I and II Attrition	5.7	3.5	3.8	4.3
% School MG III Attrition	9.9	2.4	7.2	6.5
% School MG IV Attrition	1.2	.4	.3	.6
% School MG Unknown Attrition	1.1	.5		.5

attrition within the lower mental group and "A" school non-qualified input to the Great Lakes, BE/E School. The analysis further revealed that the problem was in particular affecting the GM rating.

Table II

SERVSCOLCOM GREAT LAKES - BE/E SCHOOL
Attrition by Rates - January to July

	CTM	EM	ET	GM	TMS	TM	FT
RATING ATTRITION	3.0	21.5	6.4	44.1	34.4	43.2	9.4
% Rating Academic Attrition		13.4	2.6	24.3	12.5	28.4	3.7
% Rating Non-Academic Attrition	3.0	8.1	3.8	19.2	21.9	14.8	5.7
% Rating MG I and II Attrition	2.2	4.0	3.9	8.6	20.3	23.4	5.6
% Rating MG III Attrition	.8	13.6	2.2	30.4	10.9	16.0	2.8
% Rating MG IV Attrition		2.5		1.7	1.6	2.5	.6
% Rating MG Unknown			.3				

Because the Class "A" schools fed by BE/E had indicated that the material taught in the BE/E curriculum was required for successful completion of the follow-on school and because a great number of students designated for particular ratings failed in the BE/E phase, the currently employed BE/E instructional methodology became suspect.

In light of the above, a formative evaluation was undertaken which involved the on-site development and appraisal of trainlng system techniques which appeared to have a high probability of payoff in reducing attrition without a concurrent loss in student performance. Thus, the present study has been oriented around the development of a meaningful alternative to the

self-paced modular instructional strategy of the BE/E School. This alternative is based upon classroom instructor presentation methods augmented with intensive counseling, pre-study lecture/programmed instruction, and remediation techniques.

The conduct of this investigation from September to November 1974 required the selection of fifty matched pairs of subjects divided into an experimental group to receive lock-step, instructor taught classes at the GM School, Great Lakes, and a control group to receive the standard self-paced individualized instruction at the BE/E School, Great Lakes. Tables III and IV present a breakdown of the number of experimental and control

Table III

CLASS "A" SCHOOL QUALIFIED AND NON-QUALIFIED

Entrance Requirement	CLASS "A" SCHOOL	QUALIFIED		NON-QUALIFIED	
		Experimental	Control	Experimental	Control
ARI + 2 ETST = 171	ET	6	9	2	3
	FT	7	6	3	2
	CT	1		1	
GCT + MECH + SHOP = 154-156	EM	6	7	9	10
	GM	4	2	6	6
GCT + ARI = 110	TM			1	1
	TMS	1	1	3	3
	TOTAL	25	25	25	25

group subjects selected according to rating categories (grouped by "A" School entrance requirements), school qualified versus non-qualified entrance scores, and mental group classifications.

Table IV

MENTAL GROUP CLASSIFICATION *

	MG I		MG II		MG III		MG IV	
	EXP	CON	EXP	CON	EXP	CON	EXP	CON
Class "A" School Qualified	4	4	9	9	11	11	1	1
Class "A" School Non-Qualified			4	4	19	19	2	2
TOTAL	4	4	13	13	30	30	3	3

* Mental Group I GCT + ARI + MECH = 194 and above

Mental Group II GCT + ARI + MECH = 163 - 193

Mental Group III GCT + ARI + MECH = 135 - 162

Mental Group IV GCT + ARI + MECH = 104 - 134

This study included certain highly complex developmental features. The reason is that it was concerned with the operation and evaluation of an evolving system. Thus it is necessary that the features of the study be shown in comparative format. These are summarized in Table V. Likewise, Table VI presents a listing of the comparative and supplementary data collected to support a comprehensive analysis of these factors.

Table V

COURSE DESIGN

	EXPERIMENTAL GROUP	CONTROL GROUP
Selection	Representation of rating, "A" School qualification and mental group attrition problem areas (50 Ss).	Matched to experimental group (50 Ss).
Curriculum	Standard BE/E narratives and summaries, labs and performance tests.	Standard BE/E material--14 Modules (programmed instruction and/or narratives and summaries) labs and performance tests.
Teaching Methodology	Lock-step, instructor taught.	Self-paced, individual study.
Supplementary Aids	Programmed instruction, instructor prepared diagrams and transparencies.	Sound/slides (optional).
Testing	BE/E developed, objective type - group administered.	BE/E developed-objective type - individually (self-administered).
Remediation	Supervised, programmed instruction and/or lectures.	Individualized study of modules (programmed instruction and/or narratives and summaries.)
Night Study	Pre-study, (consisting of advance organizer lectures and programmed instruction) required of midterm failees for remainder of course and subsequent test failees till passing two consecutive modular tests. (See Appendix G)	As required based on PCT (Projected Completion Time) and test failures. Individualized study of modules (programmed instruction and/or narratives and summaries).
Administration	Grouping by classroom (Class A, fast group (GCT + ARI $\geq$ 105) and Class B, slow group (GCT + ARI $\leq$ 104)). Separate BEQ. Watch bill scheduled on non-interfering basis.	Non-grouping. Self-paced.
Counseling	Conducted by instructors and staff after each test failure.	Conducted by instructors and staff as required.

Table V - Continued

	EXPERIMENTAL GROUP	CONTROL GROUP
Academic Review Board	Consisted of administrative staff and student's instructor. Convened subsequent to midterm and final exam for those failing.	Conducted by administrative staff as required.
Course Length	$\overline{X}$ = 35.78 days	$\overline{X}$ = 27.27 days
Staff/Student	1/10	1/22
Estimated Cost Per Student	$2,374.00	$1,443.95

Table VI

COLLECTION OF DATA

STUDENT DATA	CONTROL GROUP	EXPERIMENTAL GROUP
Pre-Comprehensive Exam	X	X
California Achievement Test (Reading Portion)	X	X
Module Tests	X	X
Remediation Tests	X	X
Midterm Exam		X
Post-Comprehensive Exam	X	X
Attitudinal Questionnaire	X	X
Working days required to complete course	X	X
UAs/Attrites	X	X
MATERIAL DATA		
Readability of instructional materials		
1. Narratives and Summaries		
2. Programmed Instructions		
Content analysis of module test questions		
Percentage of students missing each question		

Results

The primary statistical analysis of the effects of the experimental versus control group training systems has centered upon analysis of variance techniques on the individual modular test scores and t-tests of significance on the comprehensive examination. These statistical procedures have been applied to overall experimental versus control group performance and to the subgroups of individuals, categorized according to school qualified versus non-qualified status, mental group classification, rating, and instructional class.

Tables VII and VIII present the mean modular test scores (% correct) for the instructional class and pre-study categories of the experimental group only.

Table VII

MEAN MODULAR TEST SCORES (% CORRECT) FOR INSTRUCTIONAL CLASSES IN EXPERIMENTAL GROUP ONLY

	CLASS A	CLASS B
MOD 1	91.36	87.04
MOD 2	82.27	78.53
MOD 3	86.10	78.74
MOD 4	91.60	86.80
M/M	89.37	84.32
MOD 5-1	91.76	75.29
MOD 5-2	80.86	84.29
MOD 6	78.26	74.18
MOD 7-1	69.75	60.75
MOD 7-2	92.00	85.31
MOD 8	78.00	73.60
MOD 9	79.54	80.29
MOD 10	85.93	82.06
MOD 11-1	84.98	86.36
MOD 11-2	82.61	80.71
MOD 12-1	82.61	80.67
MOD 12-2	75.00	88.75
MOD 12-3	81.37	82.50
MOD 13	82.61	83.00
MOD 14-1	86.96	83.42
MOD 14-2	67.70	71.67

Table VIII

MEAN MODULAR TEST SCORES FOR EXPERIMENTAL GROUP Ss UNDER THREE LEVELS OF PRE-STUDY

MODULE	NO PRE-STUDY	SOME PRE-STUDY	ALL * PRE-STUDY
1	96.00	89.33	80.00
2	91.67	80.69	65.24
3	92.11	83.55	68.42
4	95.00	91.25	74.29
M/M	94.30	87.06	79.32
5-1	93.63	89.70	52.11
5-2	89.88	81.84	79.59
6	88.88	76.52	60.39
7-1	78.13	65.05	53.57
7-2	96.67	87.78	80.00
8	83.00	76.00	60.00
9	91.67	76.71	72.28
10	89.71	84.24	73.94
11-1	93.94	79.39	85.71
11-2	95.24	76.57	79.59
12-1	92.36	79.73	72.38
12-2	87.50	76.35	91.67
12-3	89.29	77.12	73.86
13	87.50	80.40	84.29
14-1	89.91	83.17	86.49
14-2	75.78	66.20	72.79

* Subjects in this group were assigned to mandatory nightly "pre-study" sessions for entire second half of course.

Appendix A presents the analyses of variance (two factor design with repeated measures on factor B) for those mean scores indicating the following:

I. Instructional Class (In the case of significance for the primary factor (Class A - Fast Group versus Class B - Slow Group) the direction of the effect appeared to be in favor of the "Class A" group).

A. Significant difference ($p < .05$) between the experimental Class A and the experimental Class B for Modules 1-8 (including multimeter), but not for Modules 9-14. ($\overline{X}_A$ 1-8 = 84.67, $\overline{X}_B$ 1-8 = 78.99)

B. Significant difference ($p < .01$) across modules within the experimental Class A and experimental Class B for Modules 1-8 (including multimeter), and Modules 9-14.

C. Significant interaction ($p < .01$) in experimental Class A and experimental Class B Modules 1-8 (including multimeter), but not Modules 9-14.

II. Pre-study Categories (In all cases of significance for the primary factor - amount of pre-study - the effect appeared to be in favor of those requiring less pre-study.)

A. Significant differences ($p < .01$) between the "no pre-study" and "some pre-study" groups as well as the "some pre-study" and "all pre-study" groups for Modules 1-8 but only between the "no pre-study" and "some pre-study" groups in Modules 9-14. ($\overline{X}$ "no pre-study" 1-8 = 90.84, $\overline{X}$ "some pre-study" 1-8 = 82.62, $\overline{X}$ "all pre-study" 1-8 = 68.45, $\overline{X}$ "no pre-study" 9-14 = 89.29, $\overline{X}$ "some pre-study" 9-14 = 77.99)

B. Significant differences ($p < .01$) across modules when subgrouped according to "no pre-study" versus "some pre-study" and "some pre-study" versus "all pre-study" for Modules 1-8 and "no pre-study" versus "some pre-study" only for Modules 9-14.

C. Significant interactions ($p < .01$) in "some pre-study" versus "all pre-study" Modules 1-8 only.

Tables IX, X, XI, and XII present the mean modular test scores for the experimental versus control groups when subgrouped according to "Mental Group," "School Qualification," "A" School scores," and "Pre-study." Analysis of variance (two factor design with repeated measures on factor B) for those mean scores indicated the following:

I. Primary Factor Significance

A. Significant differences between the experimental and control groups for Modules 1-8 (including multimeter) when subgrouped according to:

1. MG IV ($p < .05$) $\overline{X}_{Exp} = 60.48$, $\overline{X}_{Con} = 82.12$
2. GCT + MECH + SP "A" School Qualification Scores ($p < .05$)
   $\overline{X}_{Exp} = 80.06$, $\overline{X}_{Con} = 83.42$
3. Pre-study students (prior to pre-study) ($p < .01$)
   $\overline{X}_{Exp} = 67.26$, $\overline{X}_{Con} = 81.49$

B. Significant differences between the experimental and control groups for Modules 9-14 when subgrouped according to:

1. MG III ($p < .01$) $\overline{X}_{Exp} = 81.22$, $\overline{X}_{Con} = 73.99$
2. "A" School Qualified ($p < .01$) $\overline{X}_{Exp} = 83.87$, $\overline{X}_{Con} = 78.66$
3. GCT + MECH + SP "A" School Qualification Scores ($p < .01$)
   $\overline{X}_{Exp} = 80.69$, $\overline{X}_{Con} = 74.02$

Table 1X

MEAN MODULAR TEST SCORES (% CORRECT)
FOR EXPERIMENTAL AND CONTROL GROUPS
CLASSIFIED ACCORDING TO MENTAL GROUPS

	MENTAL GROUP					
	MG I & II		MG III		MG IV	
	EXP	CON	EXP	CON	EXP	CON
MOD 1	94.35	96.50	89.47	91.31	64.00	94.00
MOD 2	86.67	88.54	78.67	82.18	58.89	81.67
MOD 3	88.53	93.42	80.34	86.03	68.42	84.21
MOD 4	92.35	93.12	91.00	89.62	66.67	90.00
M/M	91.64	88.16	85.96	84.11	68.42	86.84
MOD 5-1	93.77	93.73	81.76	90.41	43.14	91.18
MOD 5-2	87.81	77.68	80.48	74.72	73.81	63.69
MOD 6	87.42	79.52	71.83	66.67	56.65	69.22
MOD 7-1	72.06	78.52	62.71	70.43	52.08	90.62
MOD 7-2	95.29	85.68	87.78	82.40	59.83	76.92
MOD 8	83.53	82.19	73.67	78.46	53.33	75.00
MOD 9	85.66	89.02	76.70	75.19	73.52	76.47
MOD 10	88.61	87.06	81.88	75.30	76.47	82.35
MOD 11-1	88.07	84.80	85.79	83.26	63.64	86.04
MOD 11-2	80.35	86.66	84.62	73.63	71.42	57.14
MOD 12-1	87.60	84.89	79.73	74.60	63.34	86.66
MOD 12-2	79.46	77.00	81.67	63.04	91.66	83.34
MOD 12-3	84.46	68.93	83.14	62.42	50.00	57.14
MOD 13	84.67	82.00	82.00	83.04	85.00	80.00
MOD 14-1	85.17	77.54	84.63	83.23	89.48	50.00
MOD 14-2	68.03	60.39	72.00	66.20	68.80	50.00

Table X

MEAN MODULAR TEST SCORES (% CORRECT)
FOR SCHOOL QUALIFIED VERSUS NON-QUALIFIED
EXPERIMENTAL AND CONTROL GROUPS

	SCHOOL QUALIFICATION			
	QUALIFIED		NON-QUALIFIED	
	EXP	CON	EXP	CON
MOD 1	90.72	93.92	93.58	87.68
MOD 2	83.33	85.33	83.34	77.47
MOD 3	86.32	88.84	88.36	78.52
MOD 4	90.80	91.20	90.53	87.60
M/M	88.84	86.52	84.62	84.84
MOD 5-1	88.00	92.69	90.29	79.05
MOD 5-2	86.28	76.81	73.31	78.86
MOD 6	80.78	74.77	67.09	71.66
MOD 7-1	72.25	76.50	71.38	58.25
MOD 7-2	90.40	87.06	80.04	86.91
MOD 8	77.00	83.40	74.74	74.60
MOD 9	83.12	83.58	76.18	77.20
MOD 10	86.95	80.25	80.88	79.78
MOD 11-1	88.53	83.28	82.26	85.02
MOD 11-2	86.15	78.57	77.14	72.32
MOD 12-1	85.22	81.35	77.67	76.25
MOD 12-2	81.88	74.26	80.83	61.84
MOD 12-3	83.52	61.43	80.00	69.35
MOD 13	83.91	83.75	81.50	80.62
MOD 14-1	89.47	81.55	80.53	78.62
MOD 14-2	69.98	64.09	69.04	61.83

Table XI

MEAN MODULAR TEST SCORES (% CORRECT)
FOR EXPERIMENTAL AND CONTROL GROUPS
CLASSIFIED BY "A" SCHOOL ENTRANCE CRITERIA

	"A" SCHOOL BTB SCORES					
	ARI + 2 ETST (ET, FT, CT)		GCT + MECH + SP (GM & EM)		GCT + ARI (TM & TMS)	
	EXP	CON	EXP	CON	EXP	CON
MOD 1	92.20	89.79	85.76	93.71	94.00	90.52
MOD 2	84.50	88.24	96.80	81.59	80.00	81.67
MOD 3	87.90	89.78	78.10	87.47	77.63	86.84
MOD 4	91.00	90.78	87.20	92.38	90.00	85.00
M/M	88.57	86.98	85.47	84.46	84.21	85.52
MOD 5-1	90.59	91.86	78.11	93.17	80.88	82.35
MOD 5-2	87.14	81.66	80.00	75.51	71.77	57.14
MOD 6	83.97	73.04	70.38	72.22	71.30	57.26
MOD 7-1	73.44	77.52	61.00	70.24	56.25	76.56
MOD 7-2	91.33	83.08	85.31	85.70	95.00	78.08
MOD 8	79.00	78.51	72.60	81.19	80.00	75.00
MOD 9	80.59	85.61	79.28	77.59	79.41	61.26
MOD 10	84.41	81.08	83.89	78.99	73.53	65.94
MOD 11-1	87.24	87.01	84.19	82.53		
MOD 11-2	81.43	83.25	81.98	69.38		
MOD 12-1	84.00	82.37	79.71	76.14		
MOD 12-2	76.67	77.38	85.51	64.47		
MOD 12-3	80.71	71.54	82.92	61.22		
MOD 13	84.58	80.84	81.30	82.38		
MOD 14-1	89.74	79.29	81.46	78.63		
MOD 14-2	72.76	58.62	66.67	68.93		

Table XII

MEAN MODULAR TEST SCORES (% CORRECT)
FOR MANDATORY PRE-STUDY
EXPERIMENTAL Ss AND MATCHING CONTROLS

	EXP	CON
MOD 1	76.89	92.00
MOD 2	63.70	80.37
MOD 3	66.66	80.70
MOD 4	74.44	90.00
M/M	77.49	84.50
MOD 5-1	48.69	92.12
MOD 5-2	77.76	72.09
MOD 6	59.53	75.36
MOD 7-1	55.56	71.53
MOD 7-2	76.98	81.06
MOD 8	62.22	76.67
MOD 9	72.27	83.19
MOD 10	73.95	80.67
MOD 11-1	85.72	85.52
MOD 11-2	79.59	75.51
MOD 12-1	72.38	83.81
MOD 12-2	91.67	66.68
MOD 12-3	85.71	63.26
MOD 13	84.29	92.86
MOD 14-1	86.47	82.82
MOD 14-2	72.79	75.51

II. Secondary Factor Significance

A. Significant differences across modules within the experimental and control groups for Modules 1-8 (including multimeter) when subgrouped according to:

1. MG I & II ($p < .01$)
2. MG III ($p < .01$)
3. School Qualified ($p < .01$)
4. School Non-qualified ($p < .01$)
5. ARI + 2 ETST "A" School Qualifications Scores ($p < .01$)
6. GCT + MECH + SP "A" School Qualification Scores ($p < .01$)
7. Pre-study students ($p < .01$)

B. Significant differences across modules within the experimental and control groups for Modules 9-14 when subgrouped according to:

1. MG I & II ($p < .01$)
2. MG III ($p < .01$)
3. School Qualified ($p < .01$)
4. School Non-qualified ($p < .01$)
5. ARI + 2 ETST "A" School Qualification Scores ($p < .01$)
6. GCT + MECH + SP "A" School Qualification Scores ($p < .01$)

III. Significant Interactions

A. Significant interactions in the experimental and control groups for Modules 1-8 (including multimeter) when subgrouped according to:

1. MG I & II ($p < .01$)
2. MG III ($p < .01$)
3. School Qualified ($p < .01$)
4. School Non-qualified ($p < .01$)

5. ARI + 2 ETST "A" School Qualification Scores ($p < .05$)

6. GCT + MECH + SP "A" School Qualification Scores ($p < .01$)

7. Pre-study students ($p < .01$)

B. Significant interactions in the experimental and control groups for Modules 9-14 when subgrouped according to:

1. MG III ($p < .01$)

2. School Qualified ($p < .01$)

3. GCT + MECH + SP "A" School Qualification Scores ($p < .01$)

4. Pre-study students ($p < .01$)

IV. TM and TMS Rating Significance

A significant difference ($p < .01$) across modules, only, within the experimental and control groups for Modules 1-11 when subgrouped according to GCT + ARI "A" School Qualification Scores. (This applies to TM and TMS ratings only.)

Table XIII presents the means and standard deviations for the experimental and control groups by student categories on the pre-comprehensive, post-comprehensive, and post-comprehensive gain scores (% correct). T-tests of significance for the scores represented by these categories indicated the following:

I. Comprehensive Exams

A. No significant differences between the experimental and control groups were found for the pre-comprehensive, post-comprehensive, and post-comprehensive gain scores grouped according to the following subcategories.

1. MG I & II
2. MG III
3. MG IV
4. School Qualified
5. School Non-qualified
6. ARI + 2 ETST "A" School Qualification Scores
7. GCT + ARI "A" School Qualification Scores

B. A significant difference between the experimental and control groups ($p < .05$) was found for the GCT + MECH + SP "A" School Qualification Scores subgroup on gain scores, only. The direction of this effect appeared to be in favor of the control group.

Table XIII

MEANS AND STANDARD DEVIATIONS FOR EXPERIMENTAL AND CONTROL GROUPS BY STUDENT CATEGORIES ON PRE-COMPREHENSIVE, POST-COMPREHENSIVE, AND POST-COMPREHENSIVE GAIN SCORES (% CORRECT)

	EXPERIMENTAL		CONTROL	
	$\bar{X}$	SD	$\bar{X}$	SD
Total Group				
Pre-Comp	28.43	10.82	26.45	13.22
Post-Comp	73.92	14.36	76.45	10.11
Gain	45.12	15.13	50.28	12.99
School Qualified				
Pre-Comp	30.08	13.28	25.69	14.10
Post-Comp	79.30	12.41	77.69	10.32
Gain	48.91	13.62	52.00	14.61
School Non-Qualified				
Pre-Comp	27.62	6.92	26.43	13.76
Post-Comp	66.87	14.32	74.25	9.95
Gain	39.69	16.38	47.38	9.94
MG I & II				
Pre-Comp	31.00	15.30	28.57	13.09
Post-Comp	79.28	12.73	82.64	8.85
Gain	48.28	14.97	54.07	13.04
MG III				
Pre-Comp	28.17	8.32	23.60	14.38
Post-Comp	70182	15.24	72.47	9.44
Gain	42.65	15.62	48.86	13.04
MG IV				
Pre-Comp	26.00	-----	35.50	6.36
Post-Comp	77.50	7.77	75.50	7.77
Gain	51.50	7.77	40.00	1.41
FT/ET/CT				
Pre-Comp	30.06	15.61	26.31	13.19
Post-Comp	80.56	14.11	77.31	9.53
Gain	50.50	16.58	51.00	14.94
EM/GM				
Pre-Comp	28.38	6.96	25.80	15.17
Post-Comp	69.66	11.98	76.42	10.26
Gain	41.28	12.15	50.61	11.59
TM/TMS				
Pre-Comp	28.50	2.12	25.50	2.12
Post-Comp	71.00	31.11	66.50	16.26
Gain	42.50	28.99	41.00	14.14

In addition to the analyses of modular and comprehensive exam scores, two other performance measures were examined. Descriptive statistics were compiled on a comparative basis to reveal any significant differences in attrition between the experimental and control groups and categories within these groups. Both descriptive and inferential statistics were computed on responses to the questions on an attitudinal questionnaire to determine any significant differences between the experimental and control groups.

Attrition

Table XIV presents a breakdown of the attrition for students in the experimental and control groups in terms of academic and non-academic categories as well as by mental group. As seen here, the control group had a 12 percent overall attrition as compared to the experimental which had only 8 percent. Both of these percentages of attrition were substantially below previous attrition rates for Great Lakes.

Table XIV

ATTRITION

	Experimental (GM School)			Control (BE/E School)		
	Drops	% Attrition		Drops	% Attrition	
Overall	4/50	8		6/50	12	
Academic	3/50	6		5/50	10	
Non-Academic	1/50	2		1/50	2	
	Drops	% Total Attrition	% MG Attrition	Drops	% Total Attrition	% MG Attrition
MG I & II	0/17			1/17	2	5.9
MG III	2/30	4	6.5	4/30	8	13.3
MG IV	2/3	4	66.7	1/3	2	33.3

Table XV examines attrition by ratings. Included on this Table are the rating attrition rates prior to the beginning of the study (Jan-Jul), during the experiment (Sep-Oct), and the overall rates through October. Particularly noteworthy is the lower experimental group attrition in the GM rating.

Table XV

RATING ATTRITION

	EXPERIMENTAL	JAN-JUL	JAN-OCT	SEP-OCT	CONTROL
ET	12.50	6.40	5.08	2.27	8.30
FT	10.00	9.40	9.23	8.64	0
CT	0	3.00	2.29	1.57	0
GM	10.00	44.10	36.77	37.55	25.00
EM	6.70	21.50	21.22	21.42	11.70
TM	0	43.20	33.33	17.24	25.00
TMS	0	34.40	22.70	10.74	0

Attitudinal Questionnaire

At the conclusion of the course both the experimental and control groups completed a questionnaire which focused upon individual impressions and attitudes about the course, instructional material and instructional methodology. Table XVI summarizes the results. T-tests indicated no significant difference between the groups on the overall questionnaire, the instructors/learning center supervisors aspects, or the tests. The control group was found to be more in favor of existing classroom facilities ($p < .05$) and BEQ arrangements ($p < .01$) than the experimental. The

experimental group was more in favor of the training materials ($p < .05$) and the general operating procedures ($p < .05$) of their course.

Table XVI

STUDENT ATTITUDE QUESTIONNAIRE*

COURSE ASPECT	EXPERIMENTAL GROUP	CONTROL GROUP
Instructors/Learning Center Supervisors	$\bar{X}$ = 2.00	$\bar{X}$ = 2.21
	SD = .42	SD = .50
Training Materials	$\bar{X}$ = 2.52	$\bar{X}$ = 2.81
	SD = .36	SD = .63
Classrooms	$\bar{X}$ = 3.81	$\bar{X}$ = 2.89
	SD = 1.64	SD = .63
Tests	$\bar{X}$ = 2.52	$\bar{X}$ = 2.44
	SD = .70	SD = .62
BEQ	$\bar{X}$ = 4.47	$\bar{X}$ = 3.23
	SD = 1.46	SD = .85
In General	$\bar{X}$ = 2.99	$\bar{X}$ = 3.41
	SD = .54	SD = .81

* Responses were scored on a scale of 1-7. Lower scores indicate more positive responses.

DISCUSSION

The results of the statistical analyses on the modular test scores indicate that the present BE/E system of individualized instruction is as effective for school qualified, school non-qualified, Mental Group I, II, and III and TM, FT, ET, and CT rating categories as traditional classroom instruction for the first eight modules of the BE/E curriculum. Furthermore, Mental Group IV and EM and GM category students in the individualized instruction group appear to respond significantly better than their counterparts in the classroom situation in Modules 1-8. This trend is reversed, however, during Modules 9-14, where the Mental Group IV category individuals do equally well in the classroom situation as in the individualized system, and the school qualified, Mental Group III and EM/GM category individuals significantly outperform their counterparts in the individualized system. The most probable cause for this reversal effect appears to be in either an increasing instructional effectiveness with the increasing difficulty of the modules, or the introduction of pre-study lectures/programmed instruction for the second half of the course. Analysis of the pre-study group only reveals significant differences in favor of the matching control for the first half of the course, but not for the second half when mandatory nightly pre-study sessions were in effect. This finding, coupled with the analysis of modular test scores classified according to amount of pre-study received, lends strong support to the contention that the pre-study advance organizer lectures/programmed instruction were responsible for the effect. The rationale behind this contention lies in the significant differences favoring the lesser pre-study groups during the first 8 modules (when pre-study was not in effect), but not in Modules 9-14.

OBSERVATIONS AND CONCLUSIONS

A. Statements based on results of study:

1. Coincident with the conduct of the formative evaluation of an experimental lock step BE/E program, attrition was significantly reduced not only in the experimental group but in the control group and overall Great Lakes BE/E School as well.
2. The quality of the graduates of the experimental BE/E program, as measured by modular and comprehensive test performance, was not significantly different from that of the control group.
3. The cost (including increased staff personnel and increased training time) for the operation of a lock step instructional system designed to train lower mental group, school non-qualified individuals in the BE/E curriculum appears to involve greater than a fifty percent increase in financial resources.
4. The focus of management attention to the prcblems of training the lower mental group, school non-qualified individual in the BE/E curriculum appears to be a significant factor in reducing attrition.
5. The pre-study concept (advance organizer lectures/programmed instruction) significantly improves test performance for the lock step instructor taught BE/E.
6. Indications are that the most cost-effective approach to the training of lower mental group school non-qualified individuals in the BE/E curriculum would involve the modification of the on-going modular individualized system through the inclusion of the lock step proven "pre-study" concept and specialized management attention.

7. In general, student attitudes toward both the experimental lock step system and the ongoing individualized system for BE/E were equivalent and positive.

B. By-products of study:

1. Formal instructor guide
2. Readability study of module programmed instruction and narratives/ summaries (See Appendix F)
3. Pre-study concept (See Appendix G)
4. Content validity and item difficulty check on test items (See Appendix C)
5. Data on conditions contributing toward attitude development and the learning environment (See Appendix D)

C. Continuing analysis of data:

Longitudinal study continuation. NAVPERSRANDCEN San Diego to track through "A" school and fleet.

MANAGEMENT CONSIDERATIONS

The potential impact of the findings from the foregoing study appears to have value for the Navy if applied in the following manner. First, the development and successful implementation of the "pre-study" concept, as previously described, offers the training system a supplementary strategy designed for and validated upon low performers. Its value is clearly defined in terms of reduced attrition and increased performance scores. Thus, it is recommended that the "pre-study" concept already demonstrated within the experimental, lock step BE/E instructional system be adapted for and evaluated within the on-going modular, individualized BE/E system as a supplementary aid for low performers. Note that the success experienced with this concept has been with "pre-study" preceding rather than following modular tests.

More importantly from a management point of view is the cost perspective which emerges from this effort. As the purpose of the study was to find a way to train the lower mental group, school non-qualified individual in the BE/E curriculum, every effort was made to achieve this criterion by providing whatever resources were required. One of these resources was time. The experimental training cycle average 35.78 days as opposed to 27.27 days for the training of a matched group within the on-going modular system. This time would have been considerably greater if the classroom lectures had not been supplemented by hours of afternoon remediation and evening "pre-study." The addition of these components to the training system further increased the requirement for staff personnel resources from a 1/22 ratio to a 1/10 ratio. Undoubtedly, the increased costs (estimated to be more than 50 percent) for the training

of the fifty experimental group students would diminish if operationalized on a large scale, but probably not more than a few percentage points. Thus, the fifty percent increase in required resources appears to be a reasonable approximation of the cost of training lower mental-group, school non-qualified individuals in an instructor taught, lock step BE/E curriculum. While the cost of operating the necessary adaptation of the on-going modular individualized system is presently unknown, the requirement for incorporating components of the experimental lock-step system virtually assures a substantial increase in resource demands.

Finally, there are several management considerations emerging from this study which are directed toward the optimization of conditions within the on-going modular, individualized BE/E training system. One of these factors is readability. It is apparent that there is a mismatch between the reading grade level of large numbers of individuals and the readability of the self-study modules --- particularly the programmed instruction. This mismatch is probably even more serious than indicated by the California Reading Test which was not specifically designed for the population tested. Clearly, management needs to take action to insure the earliest possible re-write of these materials to approximate the ninth grade level as measured by the recently derived Navy Readability Indices. Such action can be expected to increase the comprehension of technical training materials thereby increasing learning and reducing attrition. This approach, however, can only reflect positive changes in learning when the content validity and item difficulty of the BE/E tests have been optimized. Analysis of a sample of these tests has revealed that they fall short in these areas. In light of the above, it is recommended that management

take immediate corrective action toward the rewrite of the test items in consonance with the objectives.

Clearly, the training community is capable of handling the lower mental group, school non-qualified individuals, but only when the necessary resources (instructors, support personnel, time, and money) are provided and directed toward the adaptation of the system to their needs.

In summary, it appears that the pre-study, advance organizer lectures/ programmed instruction were responsible for the success of the lecture-oriented classroom instructional system. Although such factors as limited time and other resources may have tended to obscure the potential effectiveness of such teaching methods for certain categories of students, it appears that the pre-study was a factor of even greater importance. Generalizing to the present modular individualized BE/E system, it is reasonable to expect a similar contribution from the incorporation of the pre-study concept.

APPENDIX A

ANALYSIS OF VARIANCE SUMMARY TABLES FOR MODULAR TEST COMPARISONS

Table A-1

EXPERIMENTAL INSTRUCTIONAL CLASS COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (Class A vs Class B)	4436.023	1	4436.023	4.221* ($p < .05$)
Subjects within groups	50437.489	48	1050.781	
Within subjects				
B (MODULAR TESTS)	26444.663	10	2644.466	24.060* ($p < .01$)
AB	2815.364	10	281.536	2.561* ($p < .01$)
B x subjects within groups	52756.792	480	109.909	

Table A-2

EXPERIMENTAL INSTRUCTIONAL CLASS COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (Class A vs Class B)	109.584	1	109.584	.177
Subjects within groups	25323.069	41	617.635	
Within subjects				
B (MODULAR TESTS)	7761.746	9	862.416	4.946* ($p < .01$)
AB	2496.226	9	277.358	1.590
B x subjects within groups	64338.560	369	174.359	

Table A-3

NO PRE-STUDY VERSUS SOME PRE-STUDY EXPERIMENTAL GROUP COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (No pre-study vs some pre-study)	6017.748	1	6017.748	13.695* ($p < .01$)
Subjects within groups	14838.487	34	439.396	
Within subjects				
B (MODULAR TESTS)	14056.798	10	1405.679	15.190* ($p < .01$)
AB	729.164	10	72.916	.787
B x subjects within groups	31462.884	340	92.537	

Table A-4

NO PRE-STUDY VERSUS SOME PRE-STUDY EXPERIMENTAL GROUP COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (No pre-study vs some pre-study)	10355.271	1	10355.271	24.335* ($p < .01$)
Subjects within groups	14892.980	35	425.513	
Within subjects				
B (MODULAR TESTS)	6585.808	9	731.756	4.068* ($p < .05$)
AB	1265.277	9	140.586	.781
B x subjects within groups	56659.937	315	179.872	

Table A-5

SOME PRE-STUDY VERSUS ALL PRE-STUDY EXPERIMENTAL GROUP COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (Some pre-study vs all pre-study)	11904.880	1	11904.880	23.321* ($p < .01$)
Subjects within groups	14803.333	29	510.459	
Within subjects				
B (MODULAR TESTS)	14532.335	10	1453.233	12.629* ($p < .01$)
AB	4483.927	10	448.392	3.896* ($p < .01$)
B x subjects within groups	33368.943	290	115.065	

Table A-6

SOME PRE-STUDY VERSUS ALL PRE-STUDY EXPERIMENTAL GROUP COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (Some pre-study vs all pre-study)	141.182	1	141.182	.313
Subjects within groups	13066.284	29	450.561	
Within subjects				
B (MODULAR TESTS)	5266.618	9	585.179	2.482
AB	2524.030	9	280.447	1.189
B x subjects within groups	61527.649	261	235.738	

Table A-7

MENTAL GROUP I & II MODULAR TEST COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	201.220	1	201.220	.575
Subjects within groups	10844.912	31	349.835	
Within subjects				
B (MODULAR TESTS)	12032.853	10	1203.285	13.520* ($p < .01$)
AB	2650.027	10	265.002	2.977* ($p < .01$)
B x subjects within groups	27589.676	310	88.998	

Table A-8

MENTAL GROUP I & II MODULAR TEST COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	883.706	1	883.706	1.285
Subjects within groups	19938.193	29	687.523	
Within subjects				
B (MODULAR TESTS)	14283.268	9	1587.029	9.549* ($p < .01$)
AB	2541.498	9	282.388	1.699
B x subjects within groups	43375.506	261	166.189	

Table A-9

MENTAL GROUP III MODULAR TEST COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	203.825	1	203.825	.331
Subjects within groups	33217.056	54	615.130	
Within subjects				
B (MODULAR TESTS)	34592.477	10	3459.247	25.311* ($p < .01$)
AB	3969.933	10	396.993	2.904* ($p < .01$)
B x subjects within groups	73799.553	540	136.665	

Table A-10

MENTAL GROUP III MODULAR TEST COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	6253.516	1	6253.516	10.627* ($p < .01$)
Subjects within groups	27066.415	46	588.400	
Within subjects				
B (MODULAR TESTS)	11568.223	9	1285.358	6.635* ($p < .01$)
AB	5870.803	9	652.311	3.367* ($p < .01$)
B x subjects within groups	80201.396	414	193.723	

Table A-11

MENTAL GROUP IV MODULAR TEST COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	6185.578	1	6185.578	15.998* ($p < .05$)
Subjects within groups	1159.894	3	386.631	
Within subjects				
B (MODULAR TESTS)	1575.024	10	157.502	.833
AB	2655.789	10	265.578	1.406
B x subjects within groups	5666.621	30	188.887	

Table A-12

MENTAL GROUP IV MODULAR TEST COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	63.352	1	63.352	.743
Subjects within groups	170.482	2	85.241	
Within subjects				
B (MODULAR TESTS)	5721.494	9	635.721	1.682
AB	2010.754	9	223.417	.591
B x subjects within groups	6800.725	18	377.818	

Table A-13

"SCHOOL QUALIFIED" CATEGORY MODULAR TEST COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	6.124	1	6.124	.008
Subjects within groups	34473.462	48	718.197	
Within subjects				
B (MODULAR TESTS)	17316.078	10	1731.607	15.598* ($p < .01$)
AB	3047.234	10	304.723	2.745* ($p < .01$)
B x subjects within groups	53284.777	480	111.009	

Table A-14

"SCHOOL QUALIFIED" CATEGORY MODULAR TEST COMPARISONS 99-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	5214.560	1	5214.560	8.080* ($p < .01$)
Subjects within groups	29039.565	45	645.323	
Within subjects				
B (MODULAR TESTS)	16256.575	9	1806.286	10.082* ($p < .01$)
AB	4047.491	9	449.721	2.510* ($p < .01$)
B x subjects within groups	72552.606	405	179.142	

Table A-15

"SCHOOL NON-QUALIFIED" CATEGORY MODULAR TEST COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	994.830	1	994.830	1.304
Subjects within groups	32036.557	42	762.775	
Within subjects				
B (MODULAR TESTS)	28090.448	10	2809.044	21.021* ($p < .01$)
AB	5182.079	10	518.207	3.878* ($p < .01$)
B x subjects within groups	56123.108	420	133.626	

Table A-16

"SCHOOL NON-QUALIFIED" CATEGORY MODULAR TEST COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	1656.643	1	1656.643	2.578
Subjects within groups	21840.494	34	642.367	
Within subjects				
B (MODULAR TESTS)	8946.833	9	994.092	4.406* ($p < .01$)
AB	3369.580	9	374.397	1.659
B x subjects within groups	69039.396	306	225.618	

Table A-17

"ARI + 2 ETST" RATING CATEGORY MODULAR TEST COMPARISONS (J-6)

SUMMARY OF ANOVA (Unweighted-means Solution

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	285.868	1	285.868	.464
Subjects within groups	22768.375	37	615.361	
Within subjects				
B (MODULAR TESTS)	11892.667	10	1189.266	10.106* ($p < .01$)
AB	2267.677	10	226.767	1.927* ($p < .05$)
B x subjects within groups	43540.710	370	117.677	

Table A-18

"ARI + 2 ETST" RATING CATEGORY MODULAR TEST COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	1197.333	1	1197.333	1.623
Subjects within groups	27286.678	37	737.477	
Within subjects				
B (MODULAR TESTS)	13160.518	9	1462.279	7.603* ($p < .01$)
AB	3181.305	9	353.478	1.837
B x subjects within groups	64043.330	333	192.322	

Table A-19

"G + M + SP" RATING CATEGORY MODULAR TEST COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	3359.713	1	3359.713	4.450* ($p < .05$)
Subjects within groups	33215.703	44	754.902	
Within subjects				
B (MODULAR TESTS)	26271.373	10	2627.137	19.861* ($p < .01$)
AB	3617.961	10	361.796	2.735* ($p < .01$)
B x subjects within groups	58200.340	440	132.273	

Table A-20

"G + M + SP" RATING CATEGORY MODULAR TEST COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	4874.679	1	4874.679	8.085* ($p < .01$)
Subjects within groups	25321.066	42	602.882	
Within subjects				
B (MODULAR TESTS)	9188.355	9	1020.928	5.008* ($p < .01$)
AB	7513.328	9	834.814	4.095* ($p < .01$)
B x subjects within groups	77047.474	378	203.829	

Table A-21

"GCT + ARI" RATING CATEGORY MODULAR TEST COMPARISONS (1-10)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	500.942	1	500.942	.331
Subjects within groups	9080.184	6	1513.364	
Within subjects				
B (MODULAR TESTS)	9180.135	12	765.011	4.926* ($p < .01$)
AB	3051.605	12	254.300	1.637
B x subjects within	11179.946	72	155.277	

Table A-22

PRE-STUDY CATEGORY MODULAR TESTS COMPARISONS (1-8)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	10013.155	1	10013.155	25.547* ($p < .01$)
Subjects within groups	6271.096	16	391.943	
Within subjects				
B (MODULAR TESTS)	7920.624	10	792.062	4.794* ($p < .01$)
AB	6381.733	10	638.173	3.863* ($p < .01$)
B x subjects within groups	26430.422	160	165.190	

Table A-23

PRE-STUDY CATEGORY MODULAR TESTS COMPARISONS (9-14)

SUMMARY OF ANOVA (Unweighted-means Solution)

Source of Variation	SS	df	MS	F
Between subjects				
A (EXP. vs CON.)	78.810	1	78.810	.150
Subjects within groups	6292.837	12	524.403	
Within subjects				
B (MODULAR TESTS)	2984.766	9	331.640	1.762
AB	5293.594	9	588.177	3.125* ($p < .01$)
B x subjects within groups	20324.431	108	188.189	

APPENDIX B

ITEM ANALYSIS OF MODULAR AND COMPREHENSIVE EXAM QUESTIONS

Table B-1

ITEM ANALYSIS OF SERIES D MODULAR TEST QUESTIONS

CLASS &	QUESTION NUMBERS (Number and percentage of subjects (in experimental) group missed each question)															
MOD-TEST#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A-1	1 4%	4 16%	5 20%	1 4%	0 -	0 -	4 16%	2 8%	1 4%	0 -	0 -	0 -	2 8%	5 20%	1 4%	5 20%
B-1	0 -	2 8%	3 12%	2 8%	6 24%	6 20%	0 -	13 52%	0 -	2 8%	1 4%	2 8%	9 36%	3 12%	2 8%	5 20%
A-2	1 3.33	4 13.33	3 10%	3 10%	8 26.66	24 80%	1 3.33	4 13.33	2 6.66	2 6.66	1 3.33	1 3.33	0 -	1 3.33	1 3.33	0 -
B-2	5 16.66	1 3.33	2 6.66	4 13.33	4 13.33	6 20%	4 13.33	7 23.33	7 23.33	7 23.33	8 26.66	4 13.33	2 6.66	3 10%	7 23.33	5 16.66
A-3	1 5.26%	1 5.26%	0 -	5 26.32	10 52.63	17 89.47	0 -	1 6.26%	5 26.32	0 -	0 -	0 -	1 6.26%	0 -	4 21.05	3 16.79
B-3	4 21.05	7 36.84	1 5.26	3 15.79	3 15.79	6 31.58	5 26.32	3 15.79	4 21.05	1 5.26	7 36.84	3 16.79	0 -	5 26.32	9 47.37	14 73.68
A-4	0 -	4 40%	6 60%	2 20%	0 -	0 -	1 10%	2 20%	4 40%	1 10%						
B-4	1 10%	6 60%	2 20%	3 30%	4 40%	1 10%	0 -	1 10%	7 70%	8 80%						
A-MM	1 4.55	10 45.45	2 9.10	10 45.45	5 22.73	3 13.64	2 9.10	0 -	0 -	2 9.10	2 9.10	6 27.27	3 13.64	2 9.10	3 13.64	3 13.64
B-MM	3 13.64	21 95.45	9 40.91	13 59.10	3 13.64	3 13.64	4 18.18	0 -	4 18.18	1 4.55	2 9.10	5 22.73	3 13.64	6 27.27	4 18.18	11 60%
A-5.1	0 -	1 3.22	1 3.22	1 3.22	1 3.22	2 6.45	0 -	1 3.22	1 3.22	2 6.45	0 -	3 9.68	9 29.03	4 12.90	5 16.13	1 3.22
B-5.1	2 6.45	4 12.90	2 6.45	3 9.68	6 19.35	6 19.35	7 22.58	7 22.58	8 25.81	9 29.03	3 9.68	10 32.26	11 35.48	4 12.90	7 22.58	8 25.81
A-5.2																
B-5.2																
A-6	2 8.70%	14 60.87	0 -	5 21.74	6 26.09	5 21.74	9 39.13	4 17.39	8 34.78	1 4.35%	0 -	4 17.39	3 13.04	4 17.39	1 4.35%	8 34.78
B-6	0 -	7 30.43	5 21.74	5 21.74	3 13.04	14 60.87	5 21.74	2 8.70	9 39.13	1 4.35%	3 13.04	1 4.35%	4 13.79	5 21.74	2 8.70	1 4.35
A-7.1	2 6.45%	7 22.58	7 22.58	4 12.90	11 35.48	9 29.03	1 3.22	0 -	2 6.45%	5 16.13	11 35.48	14 45.16	15 48.39	14 45.16	12 38.71	7 22.58
B-7.1	2 6.45%	8 25.81	4 12.90	4 12.90	4 12.90	11 35.48	9 29.03	13 41.94	16 51.61	8 25.81	16 51.61	17 51.29	11 35.48	17 51.29	3 9.68	12 38.71
A-7.2																
B-7.2																

Table B-1 Continued

CLASS & MOD TEST #	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
A-1	0 -	1 4%	14 56%	1 4%	1 4%	5 20%	0 -	0 -	1 4%							
B-1	2 8%	2 8%	0 -	6 24%	3 12%	3 12%	0 -	0 -	5 20%							
A-2	6 20%	7 23.33	5 16.66	4 13.33	0 -	9 30%	3 10%	2 6.66	4 13.33	8 26.66	1 3.33	1 3.33	2 6.66	15 50%		
B-2	6 20%	7 23.33	2 6.66	9 30%	3 10%	11 36.66	7 23.33	7 23.33	9 30%	5 16.66	1 3.33	4 13.33	4 13.33	9 30%		
A-3	1 5.26	8 42.11	9 47.37													
B-3	10 52.63	8 42.11	1 5.26													
A-4																
B-4																
A-MM	6 27.27	1 4.55	18 81.82	0 -	7 31.82	1 4.55										
B-MM	6 27.27	3 13.64	20 90.91	1 4.55	7 31.82	4 18.18										
A-5.1	2 6.45															
B-5.1	6 19.35															
A-5.2		19 61.29	7 22.58	12 38.71	1 3.22	1 3.22	3 9.68	2 6.45	1 3.22	2 6.45	7 22.58	2 6.45	2 6.45	0 -	5 16.13	
B-5.2		0 -	3 9.68%	12 38.71	0 -	4 12.90	8 25.81	3 9.68	2 6.45	4 12.90	2 6.45	6 19.35	5 16.13	0 -	1 3.22	
A-6	4 13.79	5 21.74	7 30.43	17 73.91	11 47.83	0 -	2 8.70									
B-6	13 56.52	13 56.52	8 34.78	17 73.91	12 52.17	2 8.70	5 21.74									
A-7.1																
B-7.1																
A-7.2	6 19.35	6 19.35	4 12.90	1 3.22	3 9.68	1 3.22	0 -	0 -	2 6.45	2 6.45	2 6.45	2 6.45	2 6.45	1 3.22	1 3.22	
B-7.2	6 19.35	6 19.35	5 16.13	2 6.45	1 3.22	3 9.68	1 3.22	1 3.22	8 25.81	1 3.22	2 6.45	4 12.90	4 12.90	1 3.22	2 6.45	

Table B-1 Continued

Class & Test #	1	2	3	4	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19
A-8	6 30%	3 15%	15 75%	12 60%	5 25%	1 5%	2 10%	6 30%	6 25%	18 90%	1 5%	7 35%	12 60%	1 5%	1 5%	1 5%	2 10%	2 10%	0 -
B-8	4 20%	5 25%	14 70%	8 40%	2 10%	7 35%	1 5%	1 5%	4 20%	4 20%	4 20%	13 65%	12 60%	4 20%	4 20%	4 20%	9 45%	12 60%	1 5%
A-9	6 35.29	6 35.29	0 -	3 17.65	5 29.41	0 -	9 52.94	14 82.35	8 47.06	3 17.65	2 11.76	3 17.65	8 47.06	2 11.76	9 52.94	7 41.18	5 29.41		
B-9	3 17.65	6 35.29	9 52.94	2 11.76	10 58.82	1 5.88	1 5.88	9 52.94	1 5.88	6 35.29	3 17.65	5 29.41	2 11.76	1 5.88	7 41.18	3 17.65	1 5.88		
A-10	2 11.76	8 47.06	0 -	2 11.76	3 17.65	2 11.76	0 -	1 5.88	3 17.65	7 41.18	2 11.76	4 23.53	5 29.41	16 94.12	0 -	1 5.88	1 5.88		
B-10	2 11.76	5 29.41	1 5.88	11 64.71	2 11.76	0 -	3 17.65	10 58.82	1 5.88	6 35.29	1 5.88	2 11.76	2 11.76	12 70.59	1 5.88	4 23.53	2 11.76		
A-11.1	2 11.11	8 44.44	1 5.55	6 33.33	2 11,11	2 11.11	1 5.55	4 22.22	4 22.22	1 5.55	7 38.88								
B-11.1	2 11.11	5 27.77	6 33.33	1 5.55	3 16.66	1 5.55	2 11.11	2 11.11	2 11.11	5 27.77	1 5.55								
A-11.2												2 11.11	5 27.77	10 55.55	0 -	4 22.22	2 11.11	4 22.22	
												3 16.66	7 38.88	10 55.55	1 5.55	3 16.66	0 -	3 16.66	
A-12.1	7 17.07	1 2.44	8 19.51	6 14.63	3 7.32	7 17.07	2 4.88	0 -	1 2.44	0 -	8 19.51	0 -	3 7.32	4 9.76	4 9.76				
B-12.1	0 -	2 4.88	10 24.39	5 12.20	4 9.76	6 14.63	0 -	2 4.88	6 14.63	1 2.44	6 14.63	3 7.32	8 19.51	1 2.44	4 9.76				
A-12.2																0 -	1 2.44	3 7.32	3 7.32
B-12.2																0 -	0 -	0 -	0 -
A-12.3																			
B-12.3																			
A-13	0 -	6 60%	6 60%	0 -	13 130%	0 -	2 20%	5 50%	3 30%	5 50%									
B-13	0 -	2 20%	1 10%	5 50%	6 60%	5 50%	5 50%	0 -	2 20%	8 80%									
A-14.1	0 -	2 5%	5 12.50	4 10%	8 20%	5 12.50	6 15%	7 17.50	5 12.50	0 -	0 -	2 6%	4 10%	0 -	0 -	1 2.50	4 10%	1 2.50	2 6%
B-14.1	0 -	4 10%	1 2.50	4 10%	3 7.50	1 2.50	5 12.50	12 30%	6 15%	1 2.50	3 7.50	2 5%	0 -	2 5%	6 15%	3 7.50	1 2.50	8 20%	1 2.50

Table B-1 Continued

Class & Test #	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A-8	10 50%																				
B-8	3 15%																				
A-9																					
B-9																					
A-10																					
B-10																					
A-11.1																					
B-11.1																					
A-11.2																					
A-12.1																					
B-12.1																					
A-12.2	9 21.95	2 4.88	1 2.44	0 -	12 29.27	18 43.90	15 36.59	14 34.15													
B-12.2	4 9.76	2 4.88	0 -	2 4.88	3 7.32	6 14.63	9 21.95	1 2.44													
A-12.3								2 4.88	1 2.44	4 9.76	2 4.88	13 31.71	2 4.88	3 7.32	3 7.32	8 19.51	3 7.32	10 24.39	4 9.76	3 7.32%	2 4.88
B-12.3								7 17.07	2 4.88	1 2.44	4 9.76	5 12.20	4 9.76	3 7.32	3 7.32	4 9.76	4 9.76	2 4.88	2 4.88	3 7.32%	5 12.20
A-13																					
B-13																					
A-14.1	2 5%	1 2.50	1 2.50	6 15%	10 25%	7 17.50	6 15%	10 25%	3 7.50	14 35%	9 22.50	1 2.50	1 2.50	9 22.50	9 22.50	10 25%	14 35%	12 30%	8 20%	7 17.50	6 15%
B-14.1	0 -	1 2.50	0 -	0 -	8 20%	7 17.50	3 7.50	9 22.50	2 5%	7 17.50	7 17.50	2 5%	12 30%	12 30%	13 32.50	4 10%	3 7.50	4 10%	6 15%	13 32.50	6 15%

Table B-2

NUMBER AND PERCENTAGE OF SUBJECTS IN EXPERIMENTAL GROUP MISSING EACH MID-TERM TEST QUESTION

CLASS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	1 2.17%	0 -	1 2.17%	3 6.52	1 2.17%	0 -	0 -	4 8.70	0 -	6 13.04	5 10.87	5 10.87	2 4.35	0 -	0 -	0 -	1 2.17	14 30.43	1 2.17	2 4.35
B	2 4.35%	2 4.35%	4 8.70	5 10.87	1 2.17	0 -	1 2.17	5 10.87	0 -	11 23.91	19 41.30	11 23.91	6 13.04	0 -	0 -	3 6.52	6 13.04	19 41.30	2 4.35	3 6.52

CLASS	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A	0 -	2 4.35%	2 4.35%	5 10.87	0 -	4 8.70	3 6.53	3 6.52	3 6.52	2 4.35	2 4.35	10 21.74	1 2.17	0 -	0 -	6 13.04	9 19.57	2 4.35	9 19.57	1 2.17
B	0 -	3 6.52	4 8.70	5 10.87	0 -	4 8.70	6 13.04	3 6.52	0 -	2 4.35	4 8.70	10 21.74	4 8.70	5 10.87	4 8.70	11 23.91	14 30.43	6 13.04	16 34.78	6 13.04

CLASS	41	42	43	44	45	46
A	3 6.52	6 13.04	6 13.04	1 2.17	1 2.17	3 6.52
B	7 15.22	8 17.39	13 28.25	7 15.22	7 15.22	5 10.87

* BE/E Series P

** Heading numbers (1-46) indicate test item numbers

Table B-3

NUMBER AND PERCENTAGE OF SUBJECTS IN EXPERIMENTAL GROUP MISSING EACH POST-COMPREHENSIVE TEST QUESTION

CLASS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	0	3	2	4	0	0	2	4	2	3	0	3	4	8	1	5	1	5	2	3
	-	3%	2%	4%	-	-	2%	4%	2%	3%	-	3%	4%	8%	1%	5%	1%	5%	2%	3%
B	1	6	9	3	6	1	8	7	8	10	1	4	10	10	7	8	0	13	4	8
	1%	6%	9%	3%	6%	1%	8%	7%	8%	10%	1%	4%	10%	10%	7%	8%	-	13%	4%	8%

CLASS	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A	0	0	2	2	6	3	5	0	0	3	1	7	11	3	3	1	1	7	12	4
	-	-	2%	2%	6%	3%	5%	-	-	3%	1%	7%	11%	3%	3%	1%	1%	7%	12%	4%
B	1	2	2	1	13	8	7	6	3	9	6	3	12	4	8	4	5	9	15	7
	1%	2%	2%	1%	13%	8%	7%	6%	3%	9%	6%	3%	12%	4%	8%	4%	5%	9%	15%	7%

CLASS	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
A	4	5	6	2	21	10	4	7	9	2	8	9	5	2	1	1	4	5	1	0
	4%	5%	6%	2%	21%	10%	4%	7%	9%	2%	8%	9%	5%	2%	1%	1%	4%	5%	1%	-
B	9	11	12	5	18	12	8	10	10	6	14	12	11	5	9	4	12	8	7	3
	9%	11%	12%	5%	18%	12%	8%	10%	10%	6%	14%	12%	11%	5%	9%	4%	12%	8%	7%	3%

CLASS	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
A	11	2	9	0	7	1	5	0	10	7	17	1	10	3	1	7	5	1	11	1
	11%	2%	9%	-	7%	1%	5%	-	10%	7%	17%	1%	10%	3%	1%	7%	5%	1%	11%	1%
B	18	5	8	6	16	4	4	4	9	12	16	11	10	8	8	17	1	3	13	4
	18%	5%	8%	6%	16%	4%	4%	4%	9%	12%	16%	11%	10%	8%	8%	17%	1%	3%	13%	4%

CLASS	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
A	5	8	3	5	1	3	5	4	3	7	4	6	13	10	5	10	4	2	8	12
	5%	8%	3%	5%	1%	3%	5%	4%	3%	7%	4%	6%	13%	10%	5%	10%	4%	2%	8%	12%
B	7	11	4	10	6	4	13	12	9	13	8	9	16	13	9	16	11	8	10	13
	7%	11%	4%	10%	6%	4%	13%	12%	9%	13%	8%	9%	16%	13%	9%	16%	11%	8%	10%	13%

* BE/E Series G ** Heading numbers (1-100) indicate test item numbers

APPENDIX C

CONTENT VALIDITY ANALYSIS OF COMPREHENSIVE TEST ITEMS

CONTENT VALIDITY ANALYSIS OF BE/E TEST ITEMS

(Prepared by GM1 Jarrett)

SUBJECT: TEST ITEM DISCREPANCIES SERIES "E"

TEST

1-E (Item 10) Answer "D" should read "lamp" vice "load"

2-E (Item 19) Question relates to objective "2-1-1" vice "2/3/1"

3-E (All Items) Satisfactory

4-E (All Items) Satisfactory

5-E (All Items) Satisfactory (5-1-E and 5-2-E)

6E (Item 18) Repetitious of Item 17

7-1-E (Item 7-16) VA's over half of the test are not supported by narrative, PI, summary or objectives. VA is an important concept for the understanding of troubleshooting and should be properly implemented into Module 7. Also in order for equal question weight, there should be several VA's with 3-4 questions relating to each.
NOTE: If Ohmic Value is changed, that resistor should be shown as variable.

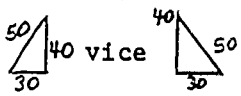
7-2-E (Item 4-13) (See 7-1-E above)

8-E (All Items) Satisfactory

9-E (All Items) Satisfactory

10-E (All Items) Satisfactory

11-E (All Items) Satisfactory (11-1-E and 11-2-E)

12-1-E (Item 8) Reverse vector triangle 

12-2-E (Item 27) Question relates to objective "12-6-1" vice 12-3-2" and belongs with test 12-2-E

12-3-E (All Items) Satisfactory

13-E (Item 3) Question should read "1 ufd" vice "1 uh"

(Item 10) Answer "D" $F_o = \frac{1.99}{\sqrt{LC}}$ vice $F_o = \frac{.199}{\sqrt{LC}}$

NOTE: Answer is a "Draw Answer" but within 4% of correct answer (i.e., $F_o = \frac{.159}{\sqrt{LC}}$

TEST

14-1-E (Item 10-19) (See 7-1-E)

14-2-E (Item 2) Answer "C" to read "I_L to equal I_c" vice "X_L to equal X_c"

(Item 12-21) (See 7-1-E)

SUBJECT: TEST ITEM DISCREPANCIES SERIES "G" FINAL

TEST

G (Item 14) Question to read "... and a DC generator" vice "... and a generator"

G (Item 45) Answer "A" to read "changing magnetic field" vice "magnetic field"

SUBJECT: TEST ITEM DISCREPANCIES SERIES "D"

TEST

1-D (All Items) Satisfactory

2-D (Item 6) Delete or rewrite

3D (All Items) Satisfactory

4D (All Items) Satisfactory

M/M (All Items) Satisfactory

5D (All Items) (5-1-D and 5-2-D)

6D (All Items) Satisfactory

7-1-D (Item 7-16) (See 7-1-E)

7-2-D (Item 4-15) (See 7-1-E)

8D (Item 9) Rewrite question: Lenz's law relates to I not E_A

9-D (Item 8) Schematic should show switch at Position 2

10-D (All Items) Satisfactory

11-1-D (All Items) Satisfactory

11-2-D (Item s) Change question to read "pfd" vice "uufd"

TEST

12-1-D (Item 15) Objective is "12-3-1" vice "12-2-1"

12-2-D (All Items) Satisfactory

12-3-D (All Items) Satisfactory

13-D (All Items) Satisfactory

14-1-D (Item 3) Change all answers to read "VA" vice "VARS"

(Item 10-19) (See 7-1-E)

14-2-D (Item 12-21) (See 7-1-E)

It is quite evident that the tests are not a fair measure of a student's comprehension in Modules 7 and 14, so far as variational analyses are concerned.

The method for testing of variational analysis is of a matrix type, whereby, a trainee missing the first few answers of a group will fail the entire test.

The VAs used in Modules 7 and 14 represent over half of each test and the student's records of comprehension substantiate this problem. The test failure problem is compounded by the fact that some objectives are covered on the tests, but to a degree, not in keeping with materials covered by instruction or programmed instruction, nor consistent with the time allocation on particular material.

A coordinated effort should be made by instructors, examination and objective writers to validate the tests so that they provide a more objective indication of a student's comprehension.

APPENDIX D

ITEM ANALYSIS OF ATTITUDINAL QUESTIONNAIRE

NUMBER AND PERCENTAGE OF EXPERIMENTAL GROUP Ss RESPONDING TO EACH POSITION OF THE SEMANTIC DIFFERENTIAL ON INDIVIDUAL COURSE ASPECT ITEMS

COURSE ASPECT:	INSTRUCTORS/LEARNING SUPERVISORS							
Knows Subject Matter	(33) 70.21	(8) 17.02	(4) 8.51	(2) 4.26	0	0	0	Doesn't Know Subject Matter
Poorly Educated	0	(2) 4.26	0	(1) 2.13	(3) 6.38	(10) 21.28	(31) 65.96	Well Educated
Well Organized	(21) 44.68	(15) 31.91	(6) 12.77	(4) 8.51	(1) 2.13	0	0	Poorly Organized
Easy to Understand	(17) 36.96	(9) 19.15	(9) 19.15	(4) 8.70	(4) 8.70	(2) 4.35	(1) 2.17	Hard to Understand
Doesn't Use Examples	0	0	0	(1) 2.13	(4) 8.51	(11) 23.40	(31) 65.96	Uses Examples
Not Interested in Subject	0	(1) 2.13	0	(5) 10.64	(3) 6.38	(8) 17.02	(30) 68.33	Interested in
Clear	(13) 28.26	(14) 30.43	(9) 19.15	(4) 8.70	(3) 6.52	(2) 4.35	(1) 2.17	Confusing
Doesn't Give Training Objectives	0	(1) 2.13	(1) 2.13	(6) 12.77	(8) 17.02	(19) 40.43	(12) 25.53	Gives Training Objectives
Experienced	(32) 69.57	(10) 21.74	(3) 6.52	(2) 4.35	0	0	(1) 2.17	Inexperienced
Gives Individual Help	(30) 63.83	(11) 23.40	(6) 12.77	0	0	(1) 2.13	0	Doesn't Give Individual Help
Answers Questions	(33) 70.21	(8) 17.02	(4) 8.51	(1) 2.13	(1) 2.13	0	0	Evades Questions
Boring	(1) 2.17	(2) 4.35	(4) 8.70	(6) 13.04	(4) 8.70	(18) 39.13	(11) 23.91	Interesting
Interested in You	(15) 32.61	(14) 30.43	(6) 13.04	(10) 21.74	(1) 2.17	0	0	Uninterested in You
Discouraging	(1) 2.22	0	(1) 2.22	(1) 2.22	(6) 13.33	(22) 48.89	(14) 31.11	Motivating

COURSE ASPECT: TRAINING MATERIALS

Related to Course Objectives	(24) 50.00	(11) 22.92	(7) 14.58	(4) 83.33	(1) 2.08	(1) 2.08	0: Unrelated to Course Objectives
Teach Performance	(15) 30.61	(15) 30.61	(14) 28.57	(4) 8.16	0	(1) 2.04	0: Do Not Teach Performance
Do Not Support Lectures	(4) 8.16	(2) 4.08	(2) 4.08	(3) 6.12	(15) 30.61	(11) 22.45	(12) 24.49: Supports Lectures
No Variation	(2) 4.08	(3) 6.12	(3) 6.12	(10) 20.41	(11) 22.45	(12) 24.49	(8) 16.33: Lots of Variation
Not Understandable	0	(3) 6.38	(1) 2.13	(6) 12.77	(16) 34.04	(13) 27.66	(8) 17.02: Understandable
Current	(17) 35.42	(13) 27.08	(7) 14.58	(5) 10.42	(3) 6.25	(2) 4.17	(1) 2.08: Out-of-Date
Well Illustrated	(13) 27.08	(14) 29.17	(12) 25.00	(4) 8.33	(3) 10.42	0	0: Poorly Illustrated
Shallow	(1) 0	(2) 2.08	(7) 4.17	(10) 14.58	(13) 20.83	(15) 27.08	31.25: Detailed

COURSE ASPECT: CLASSROOMS

Too Small	(2) 4.17	(2) 4.17	(3) 6.25	(3) 6.25	(2) 4.17	(7) 14.58	(29) 60.42: Large Enough
Too Hot or Too Cold	(25) 52.08	(9) 18.75	(4) 8.33	(5) 10.42	(2) 4.17	(2) 4.17	(1) 2.08: Comfortable Temperature
Sufficient Lighting	(31) 64.58	(13) 27.08	(1) 2.08	(1) 2.08	(2) 0	4.17	0: Insufficient Lighting
Well Ventilated	(3) 6.25	(5) 10.42	(3) 6.25	(6) 12.50	(8) 16.67	(8) 16.67	(15) 31.25: Poorly Ventilated
Comfortable Furniture	(7) 14.58	(12) 25.00	(4) 8.33	(6) 12.50	(2) 4.17	(4) 8.33	(13) 27.08: Uncomfortable Furniture
Noisy	(9) 18.75	(7) 14.58	(3) 6.25	(12) 25.00	(10) 20.83	(4) 8.33	(3) 6.25: Quiet

COURSE ASPECT: TESTS

Not Understandable	(2) 4.17	(2) 4.17	(6) 12.50	(4) 8.33	(10) 20.83	(15) 31.25	(9) 18.75	Understandable
Reflect What You Should Know	(13) 27.66	(13) 27.66	(7) 14.89	(7) 14.89	(3) 6.38	(3) 6.38	(1) 2.12	Do Not Reflect You Should Know
Time to Finish	(37) 77.08	(7) 14.58	(2) 0	(1) 4.17	(1) 2.08	0	(1) 2.08	No Time to Finish

COURSE ASPECT: BEQ

Too Small	(5) 10.42	(2) 4.17	(5) 10.42	(8) 16.67	(4) 8.33	(6) 12.50	(18) 37.50	Large Enough
Too Hot or Too Cold	(21) 43.75	(5) 10.42	(7) 14.58	(6) 12.50	(3) 6.25	(2) 4.17	(4) 8.33	Comfortable Temperature
Insufficient Lighting	(16) 34.04	(3) 6.38	(6) 12.77	(5) 10.64	(3) 6.38	(6) 12.77	(8) 17.02	Sufficient Lighting
Well Ventilated	(8) 17.02	(3) 6.38	(6) 12.77	(8) 17.02	(7) 14.89	(6) 12.77	(9) 19.15	Poorly Ventilated
Uncomfortable Furniture	21.28	8.51	8.51	17.02	8.51	14.89	21.28	Comfortable Furniture
Quiet	(1) 0	(1) 2.08	(4) 0	(3) 8.33	(7) 6.25	(33) 14.58	68.75	Noisy
Clean	(2) 4.26	(3) 6.38	(4) 8.51	(5) 10.64	(2) 4.26	(10) 21.28	(21) 44.68	Dirty
Insufficient Recreation Facilities	79.17	10.42	4.17	4.17	0	4.17	4.17	Sufficient Recreation Facilities
Good Study Conditions	(1) 2.13	(5) 10.64	0	(6) 12.77	(6) 12.77	(9) 19.15	(20) 42.55	Poor Study Conditions
Unreasonable Watch Bill	(26) 54.17	(3) 6.25	(3) 6.25	(3) 6.25	(1) 2.08	(5) 10.42	(7) 14.58	Reasonable Watch Bill
Friendly Classmates	(28) 58.33	(9) 18.75	(3) 6.25	(5) 10.42	(2) 4.17	0	(1) 2.08	Unfriendly Classmates
Poor Class Spirit	0	(2) 4.17	(3) 6.25	(8) 16.67	(3) 6.25	(16) 33.33	(16) 33.33	Good Class Spirit

COURSE ASPECT: IN GENERAL

Provides for Individual	(11) 22.92	(14) 29.17	(11) 22.92	(6) 12.50	(3) 6.25	(1) 2.08	(2) 4.17	Doesn't Provide For Individual
Comfortable Pace	(12) 25.00	(12) 25.00	(4) 8.33	(3) 6.25	(6) 12.50	(6) 12.50	(5) 10.42	Too Fast or Too Slow
Will Help as Civilian	(19) 39.58	(14) 29.17	(7) 14.58	(5) 10.42	(2) 4.17	(1) 0	2.08	Won't Help as Civilian
Ignores Your Skills	(5) 10.64	(3) 6.38	(3) 6.38	(7) 14.89	(10) 21.28	(10) 21.28	(9) 19.15	Uses Your Skill
Ignores Your Background	(6) 12.50	(1) 2.08	(3) 6.25	(9) 18.75	(9) 18.75	(14) 29.17	(6) 12.50	Uses Your Background
Unenjoyable	(2) 4.17	0	(3) 6.25	(4) 8.33	(16) 33.33	(14) 29.17	(9) 18.75	Enjoyable
Easy	(2) 4.17	(10) 20.83	(5) 10.42	(11) 22.92	(9) 18.75	(7) 14.58	(4) 8.33	Difficult
Boring	(3) 6.25	(4) 8.33	0	(9) 18.75	(6) 12.50	(17) 35.42	(9) 18.75	Interesting
Better Than High School	(17) 35.42	(9) 18.75	(5) 10.42	(8) 16.67	(3) 6.25	(2) 4.17	(4) 8.33	Worse Than High School
Would Not Like More Training Like This	(4) 8.33	(1) 2.08	(2) 4.17	(3) 6.25	(6) 12.50	(11) 22.92	(21) 43.75	Would Like More Training Like This

NUMBER AND PERCENTAGE OF CONTROL GROUP Ss RESPONDING TO EACH POSITION OF THE SEMANTIC DIFFERENTIAL ON INDIVIDUAL COURSE ASPECT ITEMS

COURSE ASPECT: INSTRUCTORS/LEARNING SUPERVISORS

Knows Subject Matter	(20) 66.67	(7) 23.33	(2) 6.67	0	0	0	(1) 3.33	Doesn't Know Subject Matter
Poorly Educated	(1) 3.33	(3) 10.00	0	0	(3) 10.00	(7) 23.33	(16) 53.33	Well Educated
Well Organized	(15) 50.00	(7) 23.33	(4) 13.33	(3) 10.00	(1) 3.33	0	0	Poorly Organized
Easy to Understand	(11) 36.61	(7) 23.33	(4) 13.33	(2) 6.67	(5) 16.67	0	(1) 3.33	Hard to Understand
Doesn't Use Examples	(3) 10.00	(1) 3.33	(2) 6.67	0	(4) 13.33	(8) 26.67	(12) 40.00	Uses Examples
Not Interested in Subject	(3) 10.00	(1) 3.33	0	0	(1) 3.33	(7) 23.33	(18) 60.00	Interested in Subject
Clear	(7) 23.33	(10) 33.33	(5) 16.67	(1) 3.33	(3) 10.00	(2) 6.67	(2) 6.67	Confusing
Doesn't Give Training Objectives	(1) 3.33	(4) 13.33	0	(2) 6.67	(4) 13.33	(9) 30.00	(10) 33.33	Gives Training Objectives
Experienced	(18) 60.00	(8) 26.67	(4) 13.33	0	0	0	0	Inexperienced
Gives Individual Help	(20) 66.67	(5) 16.67	(1) 3.33	(3) 10.00	(1) 3.33	0	0	Doesn't Give Individual Help
Answers Questions	(21) 70.00	(3) 10.00	(3) 10.00	(1) 3.33	(1) 3.33	0	(1) 3.33	Evades Questions
Boring	(2) 6.67	(3) 10.00	(2) 6.67	(3) 10.00	(5) 16.67	(10) 33.33	(5) 16.67	Interesting
Interested in You	(13) 44.83	(6) 20.69	(2) 6.90	(5) 17.24	(1) 3.45	(2) 6.90	0	Uninterested in You
Discouraging	0	0	(3) 10.00	(6) 20.00	(2) 6.67	(4) 13.33	(15) 50.00	Motivating

COURSE ASPECT: TRAINING MATERIALS

Related to Course Objectives	(14) 46.67	(8) 26.67	(6) 20.00	(2) 6.67	0	0	0	Unrelated to Course Objectives
Teach Performance	(9) 30.00	(7) 23.33	(9) 30.00	(2) 6.67	(1) 3.33	(2) 6.67	0	Do Not Teach Performance
Do Not Support Lectures	(3) 10.00	(4) 13.33	0	(7) 23.33	(6) 20.00	(7) 23.33	(3) 10.00	Supports Lectures
No Variation	(2) 6.67	(2) 6.67	(1) 3.33	(8) 26.67	(4) 13.33	(8) 26.67	(5) 16.67	Lots of Variation
Not Understandable	(1) 3.33	(5) 16.67	(5) 16.67	0	(12) 40.00	(2) 6.67	(5) 16.67	Understandable
Current	(14) 46.67	(6) 20.00	(5) 16.67	(2) 6.67	(2) 6.67	(1) 3.33	0	Out-of-Date
Well Illustrated	(9) 30.00	(8) 26.67	(5) 16.67	(1) 3.33	0	(3) 10.00	(4) 13.33	Poorly Illustrated
Shallow	(1) 0	(2) 3.33	(5) 6.67	(4) 16.67	(14) 13.33	(4) 46.67	13.33	Detailed

COURSE ASPECT: CLASSROOMS

Too Small	(2) 6.67	(3) 10.00	(1) 3.33	(2) 6.67	(3) 10.00	(7) 23.33	(12) 40.00	Large Enough
Too Hot or Too Cold	(5) 16.67	(3) 10.00	(2) 6.67	(4) 13.33	(5) 16.67	(3) 10.00	(8) 26.67	Comfortable Temperature
Sufficient Lighting	(18) 60.00	(3) 10.00	(3) 10.00	(1) 3.33	0	(3) 10.00	(2) 6.67	Insufficient Lighting
Well Ventilated	(12) 40.00	(5) 16.67	(3) 10.00	(2) 6.67	(2) 6.67	(5) 16.67	(1) 3.33	Poorly Ventilated
Comfortable Furniture	(8) 26.67	(4) 13.33	(5) 16.67	(2) 6.67	0	(5) 16.67	(6) 20.00	Uncomfortable Furniture
Noisy	(3) 0	10.00	(1) 0	(3) 3.33	(13) 10.00	(10) 43.33	33.33	Quiet

COURSE ASPECT: TESTS

Not Understandable	(1) 3.33	(2) 6.67	(3) 10.00	(3) 10.00	(5) 16.67	(11) 36.67	(5) 16.67	Understandable

COURSE ASPECT: TESTS (CONTINUED)

Reflect What you Should Know	(7) 23.33	(17) 56.67	(1) 3.33	(3) 10.00	(1) 3.33	(1) 0	(1) 3.33	Do Not Reflect You Should Know
Time to Finish	(22) 73.33	(4) 13.33	(2) 6.67	0	(1) 3.33	(1) 3.33		No Time to Finish

COURSE ASPECT: BEQ

Too Small	(5) 16.67	(2) 6.67	(2) 6.67	(1) 0	(6) 3.33	(14) 20.00	46.67 Large Enough
Too Hot or Too Cold	(8) 26.67	(2) 6.67	(3) 10.00	(2) 6.67	(2) 6.67	(6) 20.00	(7) 23.33 Comfortable Temperature
Insufficient Lighting	(4) 13.33	(1) 3.33	(2) 6.67	(1) 3.33	(3) 10.00	(6) 20.00	(13) 43.33 Sufficient Lighting
Well Ventilated	(8) 26.67	(5) 16.67	(4) 13.33	(5) 16.67	(3) 10.00	(1) 3.33	(4) 13.33 Poorly Ventilated
Uncomfortable Furniture	(4) 13.33	(4) 13.33	(2) 6.67	(3) 10.00	(3) 10.00	(5) 16.67	(9) 30.00 Comfortable Furniture
Quiet	(3) 10.00	(4) 13.33	(1) 3.33	(2) 6.67	(7) 23.33	(2) 6.67	(11) 36.67 Noisy
Clean	(9) 30.00	(12) 40.00	(2) 6.67	(3) 10.00	(1) 0	(3) 3.33	10.00 Dirty
Insufficient Recreation Facilities	(9) 30.00	(2) 6.67	(1) 3.33	(5) 16.67	(5) 16.67	(2) 6.67	(6) 20.00 Sufficient Recreation Facilities
Good Study Conditions	(4) 13.33	(8) 26.67	(2) 6.67	(5) 16.67	(1) 3.33	(5) 16.67	(5) 16.67 Poor Study Conditions
Unreasonable Watch Bill	(3) 10.00	(1) 3.33	(3) 10.00	(5) 16.67	(2) 6.67	(6) 20.00	(10) 33.33 Reasonable Watch Bill
Friendly Classmates	(18) 60.00	(7) 23.33	(2) 6.67	(2) 6.67	(1) 3.33	0	0 Unfriendly Classmates
Class Spirit	(1) 0	(2) 3.33	(10) 6.67	(2) 33.33	(8) 6.67	(7) 26.67	23.33 Good Class Spirit

COURSE ASPECT:	IN GENERAL							
Provides for Individual	(5) 16.67:	(13) 43.33:	(5) 16.67:	(2) 6.67:	(2) 6.67:	(1) 3.33:	(2) 6.67:	Doesn't Provide for Individual
Comfortable Pace	(3) 10.00:	(2) 6.67:	(4) 13.33:	(4) 13.33:	(5) 16.67:	(3) 10.00:	(9) 30.00:	Too Fast or Too Slow
Will Help as Civilian	(15) 50.00:	(7) 23.33:	(3) 10.00:	(3) 10.00:	(1) 0:	(1) 3.33:	(1) 3.33:	Won't Help as Civilian
Ignores Your Skills	(2) 0:	(3) 6.67:	(5) 10.00:	(4) 16.67:	(7) 13.33:	(9) 23.33:	30.00:	Uses Your Skills
Ignores Your Background	(4) 13.33:	(4) 13.33:	(5) 16.67:	(4) 13.33:	(2) 6.67:	(7) 23.33:	(4) 13.33:	Uses Your Background
Unenjoyable	(2) 6.67:	(3) 10.00:	(2) 6.67:	(8) 26.67:	(6) 20.00:	(6) 20.00:	(3) 10.00:	Enjoyable
Easy	(3) 10.00:	(1) 3.33:	(3) 10.00:	(6) 20.00:	(8) 26.67:	(3) 10.00:	(6) 20.00:	Difficult
Boring	(5) 16.67:	0:	(3) 10.00:	(1) 3.33:	(5) 16.67:	(14) 46.67:	(2) 6.67:	Interesting
Better Than High School	(11) 36.67:	(3) 10.00:	(4) 13.33:	(2) 6.67:	(4) 13.33:	(4) 13.33:	(2) 6.67:	Worse Than High School
Would Not Like More Training Like This	(3) 10.00:	(2) 6.67:	(3) 10.00:	(6) 20.00:	(3) 10.00:	(5) 16.67:	(8) 26.67:	Would Like More Training Like This

APPENDIX E

INSTRUCTOR COMMENTS ON EXPERIMENTAL BE/E COURSE

INSTRUCTOR COMMENTS ON EXPERIMENTAL BE/E COURSE

GMM1 Smith

1. "I believe this one factor (pre-study) contributed heavily to the success of this course."

2. "Reevaluation and revision (of tests) is needed because some of the tests do not reflect time allocations and the depth to which some of the subject matter is covered. In several areas instruction is considerably more detailed than the knowledge factor needed to successfully pass the examination."

ETC Duvall

1. "The single factor which I feel helped many of the T/Es complete the course was the fact that those who were considered in academic trouble were assigned to compulsory night study and forced to prepare for the next day's lesson."

GMM1 Jarrett

1. "The Basic Electricity and Electronics Course of instruction recently completed at Gunner's Mate School indicates that, if used as a multimedia for the slower learners, could establish a higher degree of understanding and lower the attrition rate."

2. "Since lock step instruction reduces the demand on a student's reading comprehension, the slower reader is utilizing the classroom environment to subsidize his learning."

3. "With this in mind, some basic criteria should be set forth to preclude the faster learner from using lock-step instruction as the "simple way" through BE/E."

4. "The most dominant problem areas were those directly involving learning objectives and testing. Many of the objectives are very broad and under instructional conditions, allow an excessive amount of deviation while still meeting the objectives."

5. "Considering the minimum of advance preparation, for materials and support facilities and instructors, the program was relatively free of problems and could be considered a complete success."

GMT1 Benfield

1. "I believe the course did help some of the students to get through BE/E School who, if went through the regular program of instruction would not have made it. The course supports the fact that a pre-study of the modules helped a lot of the students to get through the second half of the course, and to understand it more, where if they had had the pre-study on the slower students on the first half where most of the basic laws are learned, they would have had better results of the first half and the midterm."

2. "The course also supports the fact that the instructor does have a lot of influence on the student, from the number of students that changed their rate to Gunners Mate, just because their instructor and the classes were held in the Gunner's Mate School, which they would relate to the rate more than they could to the ones they were going to."

APPENDIX F

MODULE READABILITY AND STUDENT READING ABILITY

Table F-1 presents the readability grade levels of both the narrative/ summary and programmed instruction portions of the instructional modules presently used in the BE/E training system. This data was derived from a ten percent sample of the modules through the application of the recently modified version of the Automated Flesch Count which was designed specifically for Navy use. In consideration of the fact that this formula tends to predict lower readability grade levels than conventional formulae, and the California reading test tends to predict higher reading ability levels than would be expected for this population, the resulting mismatch is significant. Note also, that this mismatch is in terms of mean grade levels and is much more serious for a number of individuals. Particularly interesting is the finding that the programmed instruction is generally more difficult than the narratives and summaries.

Table F-1

MODULE READABILITY AND STUDENT READING ABILITY

Automated Flesch Count (modified for Navy use).

MODULE	GRADE LEVEL	
	SUMMARY/ NARRATIVE	PI
1	7.95	9.86
2	9.64	8.41
3	8.67	12.48
4	9.45	11.51
5	8.63	12.16
6	9.48	7.95
7	9.60	11.69
8	9.72	12.97
9	10.45	11.29
10	10.50	11.96
11	11.52	13.45
12	11.19	14.57
13	9.44	11.40
14	10.44	13.39

CALIFORNIA READING TEST

(MEAN GRADE LEVEL)

"SLOW GROUP"		"FAST GROUP"	
EXPERIMENTAL	CONTROL	EXPERIMENTAL	CONTROL
$\bar{X}$ - 10.12	$\bar{X}$ = 9.70	$\bar{X}$ = 12.79	$\bar{X}$ = 13.10

APPENDIX G

"Pre-study" Concept

"Pre-study"

The "pre-study" concept was instituted within the experimental group subsequent to the failure of nine individuals to meet the prescribed criterion on the mid-term examination. Investigation into the learning difficulties experienced by these and other individuals revealed both a lack of preparation outside of class and a general lack of success with remediation. Accordingly, the Academic Review Board assigned these individuals to attend nightly two and one-half hour "pre-study" sessions for remainder of the course. It was further determined that all individuals failing a subsequent modular test would be required to attend nightly "pre-study" sessions till passing two consecutive modular tests. The purpose of these nightly "pre-study" sessions was to provide advance organizers in the form of "overview" lectures and instructor-involved programmed instruction. In practice, the lectures usually amounted to approximately ten percent of the study time. Although the remainder of the time involved programmed instruction, it should be noted that this was of a much more interactive nature than that of the traditional role situation of learning center supervisors. One other pertinent point in this regard is that the "pre-study" was designed to increase the probability of success on an upcoming test prior to the experience of failure with a particular module rather than after-the-fact. Thus there is an important motivational aspect inherent within this procedure.

APPENDIX H

COST BREAKDOWN FOR CONDUCT OF FORMATIVE EVALUATION OF EXPERIMENTAL BE/E PROGRAM

COST BREAKDOWN FOR CONDUCT OF FORMATIVE
EVALUATION OF EXPERIMENTAL BE/E PROGRAM

	Salary	TAD
Project Manager (LT - 56 days)	$ 4,026.40	$1,016.33
Experimental Group Coordinator (LT - 56 days)	4,026.40	996.51
Control Group Coordinator (GS-9 - 67 days)	3,872.60	1,074.90
Research Assistant (CPO - 10 days)	499.30	256.42
Research Assistant (CPO - 3 days)	149.79	179.17
	$12,574.49	$3,523.33
Technical Assistants for Instructor Guide (2 POIs - CNTECHTRA funded TAD)		$ 537.72

ESTIMATED TOTAL COST - $16,635.54

DISTRIBUTION LIST

Assistant Secretary of the Navy (Manpower & Reserve Affairs) (2)
Assistant Secretary of the Navy (Research & Development)
Chief of Naval Operations:
(OP-39)
(OP-59)
(OP-098T)
(OP-099) (2)
(OP-964)
(OP-987E)
Chief of Naval Personnel:
(Pers-0d) (Pers-212)
(Pers-1) (Pers-226)
(Pers-5) (Pers-51)
(Pers-6) (Pers-52)
(Pers-10c) (Pers-524)
(Pers-2x) (Pers-61)
Chief of Naval Research:
(Code 450) (4)
(Code 458) (2)
Chief of Naval Education and Training
(CNET N-2)
(CNET N-3)
(CNET N-33)
Chief of Naval Material (NMAT-030B)
Chief of Naval Education and Training Support
Office of Assistant Secretary of Defense (M&RA)
Commander in Chief, U. S. Pacific Fleet
Commander in Chief, U. S. Atlantic Fleet
Commander SECOND Fleet
Commander THIRD Fleet
Commander Training Command, U. S. Pacific Fleet
Commander Training Command, U. S. Atlantic Fleet
Commander, Navy Recruiting Command
Commander, Naval Training Center, Great Lakes
Commander, Naval Training Center, Orlando
Commander, Naval Training Center, San Diego
Commander, Naval Electronics Laboratory Center (2)
Commanding Officer, Manpower & Material Analysis Center, Pacific
Commanding Officer, Naval Health Research Center
Commanding Officer, Naval Aerospace Medical Institute (2)
Commanding Officer, Naval Education & Training Program Development Center (2)
Commanding Officer, Naval Development & Training Center (Code 0120)
Commanding Officer, Naval Submarine Medical Center (2)
Commanding Officer, Naval Medical Research Institute
Commanding Officer, Service School Command, Naval Training Center, Bainbridge
Commanding Officer, Service School Command, Naval Training Center, Great Lakes
Commanding Officer, Service School Command, Naval Training Center, Orlando
Commanding Officer, Service School Command, Naval Training Center, San Diego

Commanding Officer, Naval Training Equipment Center
Commanding Officer, Naval Education & Training Support Center, Pacific
Center for Naval Analyses
Chief of Research & Development, U. S. Army
U. S. Army Enlisted Evaluation Center (2)
Human Resources Development Division, U. S. Army Personnel & Administration Combat Developments Activity, Fort Benjamin Harrison
Army Research Institute for Behavioral & Social Sciences
Personnel Research Division, Air Force Human Resources Laboratory (AFSC), Lackland Air Force Base (2)
Occupational Research Division, Air Force Human Resources Laboratory (AFSC), Lackland Air Force Base
Headquarters, U. S. Marine Corps (Code MPI)
Commandant, U. S. Coast Guard (Code B-5)
Superintendent, U. S. Naval Academy
Superintendent, U. S. Air Force Academy
Superintendent, Naval Postgraduate School
Superintendent, U. S. Military Academy
Superintendent, U. S. Coast Guard Academy
National Research Council
National Science Foundation
Science & Technology Division, Library of Congress
Director, Defense Documentation Center (12)

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author)

Chief of Naval Technical Training

2a. REPORT SECURITY CLASSIFICATION

9-75

2b. GROUP

3 REPORT TITLE

Formative Evaluation of an Experimental BE/E Program

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

5 AUTHOR(S) (First name, middle initial, last name)

LT R. P. Fishburne, Jr., MSC, USNR and Diane Mims

6 REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
March 1975	93	None

8a. CONTRACT OR GRANT NO	9a. ORIGINATOR'S REPORT NUMBER(S)
N.A. b. PROJECT NO N.A. c. d.	RBR 9-75 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10 DISTRIBUTION STATEMENT

11 SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	Chief of Naval Technical Training

13 ABSTRACT

An experimental Basic Electricity and Electronics Course utilizing a lock-step, instructor presentation methodology was developed and evaluated at the Service School Command, Great Lakes. The study which was primarily directed toward the training of lower mental group, school non-qualified personnel investigated comparative data on test performance, attitude, and attrition of fifty students in an experimental group matched to a control group within the ongoing individualized BE/E training system. The results of this investigation revealed significantly reduced attrition within the experimental group, control group and overall Great Lakes BE/E School with no significant differences in quality of the graduates of the two treatment groups. Attitudinal data was in general positive for both groups and not significantly different. Two factors were concluded to be responsible for the success of the experimental program: (1) the focus of management attention to the problems of training the lower mental group, school non-qualified individual in the BE/E curriculum of both groups, and (2) the introduction of "pre-study" advance organizer lectures/instructor involved programmed instruction into the experimental group.

DD FORM 1 NOV 65 1473 (PAGE 1)

S/N 0102-014-6700

Unclassified

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Advance Organizers						
Attrition						
Basic Electricity and Electronics Training						
Formative Evaluation						
Individualized Instruction						
Lock-Step Instruction						
Pre-Study						
Programmed Instruction						
Training by Mental Groups						
Training Management						

95