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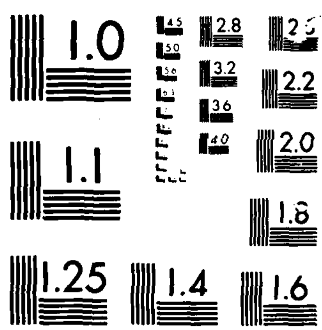

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Final Report

The Use of Tailored Testing With Instructional Programs

Mark D. Reckase

Research Report ONR 86-1
March 1986

ACT
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Assessment Programs Area
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Iowa City, Iowa 52243

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This report describes the computerized testing system that was implemented in conjunction with the Radar Technician Training Course at the Naval Training Center at Great Lakes, Illinois and the research that was performed using the system. The system was a [illegible] microprocessor-based computer network with each testing station capable of [illegible] as a stand-alone test administering computer. The system was used to administer [illegible] sequential, fixed length format for the purpose of gaining information on the [illegible] mode of administration on test items.

The project demonstrated that the system design was viable and that microcomputers [illegible] used to administer achievement tests in an instructional program environment. [illegible] were found to have no difficulty taking the test on the computer terminals. For [illegible] item pools available for this course, a one-parameter logistic based testing

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procedure was found to operate adequately. Some items were found to operate differently when administered on a computer screen as compared to a paper-and-pencil administration. Further research is needed to determine the cause of the differences in item performance.

Contents

Final Report

The Use of Tailored Testing with Instructional Programs

The primary objective of the project was to investigate issues that are related to the implementation of tailored, or adaptive, testing in the instructional programs environment. These issues are of two major types:

- Those related to the design of a computer system for the administration, scoring, and reporting of results in tailored tests.
- Those related to the psychometric theory that is the foundation of tailored testing.

To address these issues in a practical and realistic way, this project involved the staff at the Great Lakes Naval Training Center in developing and testing a computer system for use in administering tests in conjunction with instructional programs at the base. This report is a summary of the knowledge gained from the development and implementation of the system.

The report is composed of three sections. The first describes the instructional environment at the training center that served as a test site for the tailored testing system. The second section describes the computer hardware used for the project and the software that was developed for the implementation of instructional testing at Great Lakes Naval Training Center. The third section describes the psychometric research that was performed as part of the project and summarizes the results of the research.

Instructional Environment

Since the goal of this project was to evaluate tailored testing for instructional purposes in a realistic educational environment, arrangements were made to implement tailored testing in the Radar Technician Training Course in the Electronics Technician School at the Naval Training Center at Great Lakes, Illinois. This course was selected for use because it was taken by a relatively large number of trainees (approximately 60 new trainees started the course each week), it had fairly extensive item pools available for the material covered by the course, the trainees were fairly sophisticated about computer equipment, and systems programming support was available from the Naval Education and Training Program Development Center Detachment at Great Lakes.

Course Description

The Radar Technician Training Course is a six week course that is divided into three major areas. These areas, in turn, are subdivided into instructional modules. Table 1 presents a brief outline of the course, showing the major areas and the modules. The performance of trainees in the course was evaluated using examinations covering the three major areas: power, transmitter, and receiver. The trainees were required to receive a score equal to or greater than 64% of the total possible on each exam in order to proceed through the course. If they failed a test they were given remediation and retested over the same material, but with an alternate form of the test. Trainees who failed an examination three times were dropped from the course.

Although the testing and remediation procedure implied a self-paced instructional strategy, in actuality there was little flexibility in the rate at which trainees could proceed through the course. At most, trainees were allowed to spend three extra days on the material from a section of the [illegible]

Table 1
Course Outline
for the Radar Technicians Training Course

Major Area	Module Number	Description
	4.1.1	Introduction to AN/SPS-10 Radar Set
Power	4.1.2	Primary Power Distribution
	4.1.3	AC Voltage Regulator
	4.1.4	DC Power Supply
	4.2.1	Modulator
Transmitter	4.2.2	Radar Transmitter
	4.2.3	RF System
	4.3.1	Radar Receivers
Receiver	4.3.2	Adapter, Indicator
	4.3.3	Video Clutter Suppressor
	4.3.4	Antenna System

The instructional schedule for the course is given in Table 2. This table gives the topic number for the class, the type of class, the class period, the topic description, and the ratio of students to instructor. The first three digits of the topic number refer to the instructional modules listed in Table 1. The fourth digit refers to specific topics within the module. The class period indicates the number of hours since the beginning of training. The Radar Technician Training Course begins at hour 741 with a three hour class on "Introduction to Radar Systems" and ends at hour 980 after the four hour performance test on receivers. Thus, the course is 240 hours long, arranged into 30, eight hour days.

Table 2
Advanced Electronics Field Master Schedule
Radar Technicians Training Course

TOPIC NO.	TYPE	PERIOD	TOPIC	RATIO
4.1.1.1	Class	741	Introduction to Radar Systems	20:1
		742		20:1
		743		20:1
	Class	744	GMT	
4.1.1.1	Class	745	Intro to Radar Sys (cont'd)	20:1
		746		20:1
		747		20:1
		748		20:1
4.1.1.2	Class	749	Radar Principles	20:1
		750		20:1
		751		20:1
	Class	752	GMT	
4.1.1.2	Class	753	Radar Principles (cont'd)	20:1
		754		20:1
		755		20:1
4.1.1.3	Class	756	Introduction to AN/SPS-10	20:1
		757		20:1
		758		20:1
		759		20:1
		760		20:1
4.1.1.3	Class	761	Intro to AN/SPS-10	20:1
		762		20:1
		763		20:1
		764		20:1
		765		20:1
		766		20:1
		767		20:1
	Class	768	GMT	20:1
4.1.1.4	Lab	769	AN/SPS-10 Lab	6:1
		770	4.1.1.4 1J Familiarization	6:1
		771	with the AN/SPS-10 Radar Set	6:1
		772	4.1.1.4 2J AN/SPS-10 Radar Set	6:1
		773	and AN/SPA-25 Indicator	6:1
		774	operating procedures	6:1
		775		
	Class	776	GMT	

Table 2 (Continued)

TOPIC NO.	TYPE	PERIOD	TOPIC	RATIO
4.1.2.1	Class	777	Primary Power Distribution	20:1
		778		20:1
		779		20:1
		780		20:1
		781		20:1
		782		20:1
		783		20:1
	Class	784	GMT	
4.1.2.1	Class	785	Pri Power Dist (cont'd)	20:1
		786		20:1
		787		20:1
		788		20:1
		789		20:1
		790		20:1
		791		20:1
	Class	792	GMT	
4.1.3.1	Class	793	AC Voltage Regulator	20:1
		794		20:1
		795		20:1
		796		20:1
4.1.4.1	Class	797	DC Power Supply	20:1
		798		20:1
		799		20:1
		800		20:1
4.1.2 - 4.1.3	Lab	801	AC Voltage Regulator Lab	6:1
		802		6:1
		803	DC Power Supply Lab	6:1
		804		6:1
4.1.2.2		805		6:1
	Lab	806	Primary Power Distribution Lab	6:1
4.1.3.2		807	4.1.2.2 1J	6:1
	Class	808	GMT	
4.1.3.2	Class	809	Written Exam (Power)	20:1
4.1.4.2		810		20:1
		811		20:1
		812		20:1
4.1.2.2	Lab	813	Primary Power Distribution Lab	6:1
		814	4.1.2.2 2J	6:1
		815		6:1

Table 2 (Continued)

TOPIC NO.	TYPE	PERIOD	TOPIC	RATIO
	Class	816	GMT	
4.1.2.2	Lab	817	Primary Power Distribution Lab	6:1
		818	4.1.2.2 2J (cont'd)	6:1
		819		6:1
		820		6:1
		821		6:1
		822		6:1
		823		6:1
	Class	824	GMT	
4.1.2 - 4.1.3	Lab	825	Performance Test (PPD/ACVR)	6:1
		826		6:1
		827		6:1
		828		6:1
4.2.1.1	Class	829	Vacuum Tube TPG	20:1
		830		20:1
		831		20:1
	Class	832	GMT	20:1
4.2.1.1	Class	833	Vacuum Tube TPG (cont'd)	20:1
		834		20:1
		835		20:1
		836		20:1
		837		20:1
		838		20:1
		839		20:1
		840		20:1
4.2.1.2	Class	841	Modulator (MPG)	20:1
		842		20:1
		843		20:1
		844		20:1
		845		20:1
		846		20:1
4.2.1.4	Class	847	Solid State TPG	20:1
	Class	848	GMT	
4.2.1.4	Class	849	Solid State TPG (cont'd)	20:1
		850		20:1
		851		20:1
		852		20:1
4.2.2.1	Class	853	Microwave Devices	20:1
		854		20:1
		855		20:1

Table 2 (Continued)

TOPIC NO.	TYPE	PERIOD	TOPIC	RATIO
	Class	856	GMT	20:1
4.2.2.1	Class	857	Microwave Devices (cont'd)	20:1
		858		20:1
		859		20:1
4.2.2.2	Class	860	Microwave Xmtr Tubes	20:1
		861		20:1
		862		20:1
		863		20:1
	Class	864	GMT	
4.2.2.3	Class	865	Transmitter	20:1
		866		20:1
		867		20:1
		868		20:1
4.2.3.1	Class	869	RF Systems	20:1
		870		20:1
4.2.1.3	Lab	871	TPG and MPG Lab 4.2.1.3 1J	6:1
	Class	872	GMT	
4.2.1.3	Lab	873	TPG and MPG Lab 4.2.1.3 2J	6:1
		874		6:1
		875		6:1
		876		6:1
		877		6:1
		878		6:1
4.2.2.4	Lab	879	Transmitter Lab 4.2.2.4 1J	6:1
		880		6:1
		881	Transmitter Lab (cont'd)	6:1
		882	4.2.2.4 2J & 3J	6:1
		883		6:1
4.2.3.2	Lab	884	RF System 4.2.3.2. 1J	6:1
		885		6:1
		886		6:1
		887		6:1
	Class	888	GMT	
4.2.1 - 4.2.2	Class	889	Written Exam (Xmtr)	20:1
		890		20:1
		891		20:1
4.2.1 - 4.2.2	Lab	892	Performance Test (Xmtr)	6:1
		893		6:1
		894		6:1
		895		6:1
	Class	896	GMT	

Table 2 (Continued)

TOPIC NO.	TYPE	PERIOD	TOPIC	RATIO
4.3.1.1	Class	897	Introduction to Receivers	20:1
4.3.1.1	Class	898	Introduction to Receivers (cont'd)	20:1
		899		20:1
		900		20:1
		901		20:1
		902		20:1
		903		20:1
	Class	904	GMT	
4.3.1.2	Class	905	IF Strip	20:1
		906		20:1
4.3.1.3	Class	907	Detectors and Video Circuits	20:1
4.3.1.5	Class	908	Automatic Frequency Control	20:1
		909		20:1
		910		20:1
		911		20:1
	Class	912	GMT	
4.3.1.4	Class	913	Interference Elimination Circuits	20:1
		914		20:1
		915		20:1
		916		20:1
		917		20:1
4.3.2.1	Class	918	Adapter Indicator Trigger Ckts	20:1
		919		20:1
		920		20:1
4.3.2.2	Class	921	Adapter Indicator Video Ckts	20:1
4.3.2.2	Class	922	Adapter Indicator Video Ckts	20:1
		923		20:1
4.3.3.1	Class	924	Video Clutter Suppressor	20:1
		925		20:1
4.3.4.1	Class	926	Synchros/Servos/Antennas	20:1
		927		20:1
	Class	928	GMT	
4.3.4.1	Class	929	Synchros/Servos/Antennas	20:1
4.3.4.2	Class	930	Antennas Systems	20:1
		931		20:1
		932		20:1
4.3.4.3	Lab	933	Antenna System Lab	6:1
		934	4.3.4.3 1J & 2J	6:1

Table 2 (Continued)

TOPIC NO.	TYPE	PERIOD	TOPIC	RATIO
		935		6:1
	Class	936	GMT	6:1
4.3.1.6	Lab	937	Receiver Lab 4.3.1.6 1J	6:1
		938		6:1
		939		6:1
		940		6:1
		941		6:1
		942		6:1
		943		6:1
		944	GMT	6:1
4.3.1.6	Lab	945	Receiver Lab (cont'd)	6:1
		946		6:1
		947		6:1
		948		6:1
		949		6:1
4.3.2.3	Lab	950	Adapter Indicator Lab	6:1
		951		6:1
	Class	952	GMT	
4.3.2.3	Lab	953	Adapter Indicator Lab (cont'd)	6:1
		954		6:1
		955		6:1
	Lab	956	Overall Systems Labs	6:1
		957		6:1
		958		6:1
		959		6:1
		960		6:1
	Lab	961	Overall Systems Lab (cont'd)	6:1
		962		6:1
		963		6:1
		964		6:1
		965		6:1
		966		6:1
		967		6:1
	Class	968	GMT	
	Class	969	Area Review	20:1
		970		20:1
		971		20:1
4.3.1 - 4.3.2	Class	972	Written Exam (Rcvr)	20:1
		973		20:1
		974		20:1

Table 2 (Continued)

TOPIC NO.	TYPE	PERIOD	TOPIC	RATIO
		975		20:1
	Class	976	GMT	
4.3.1 - 4.3.2	Lab	977	Performance Test (Rcvr)	6:1
		978		6:1
		979		6:1
		980		6:1

Course Exams

The three tests used for this project were administered at hour 809 (Power), 889 (Transmitter), and 972 (Receiver). Two forms of each of the tests were available for use. Table 3 summarizes the characteristics of each of the tests. The tests are quite variable in quality and some have fairly low reliabilities. Each of the tests was constructed by selecting the items from an item pool that had been developed for each content area. A description of the item pool for each of the course content areas is given in Table 4. Since the items were sampled from the item pool with replacement, the test forms frequently had items in common and not all items in the pool were used. Therefore, the number of items available for calibration using item response theory models was less than the total number of items in the pool. The fifth column of the table indicates the number of items available for calibration and the sixth column gives the sample size for calibration. For tests A22 and A23, the sample sizes varied for the items within the pool because of overlap in the tests.

Table 3
Characteristics of Course Examinations

Examination	Number of Items	$\overline{X}$	SD	KR-20	$\overline{p}$	$\overline{r}_{pt.bis}$	N
A211	43	34.12	5.34	.83	.79	.38	497
A212	44	32.15	3.41	.51	.73	.13	428
A221	30	23.88	4.05	.76	.80	.32	515
A222	30	25.83	2.30	.50	.86	.12	415
A231	30	24.24	2.80	.52	.81	.12	448
A232	30	23.67	2.79	.49	.79	.13	410

Note: The first two digits of the examination code indicate the course component and the last digit indicates the form.

Table 4
Radar Technicians Training Course
Item Pool

Test	Module	Number of Items	Total	Number of Item Calibrated	N
A21	1	60			
	2	34			
	3	17			
	4	8			
			119	86	1160
A22	1	52			
	2	34			
	3	11			
			97	60	400-700
A23					
	1	40			
	2	10			
	3	1			
	4	27			
			78	60	400-700

System Design

Hardware

The system design for the computerized adaptive testing project at Great Lakes was predicated on several assumptions. They were:

1. Each testing station should be capable of functioning as a stand-alone test administrator for reasons of system reliability.
2. The results of a test would have to be accumulated for a class so that class reports and item analyses could be generated.
3. The system should be able to administer different tests to different students.

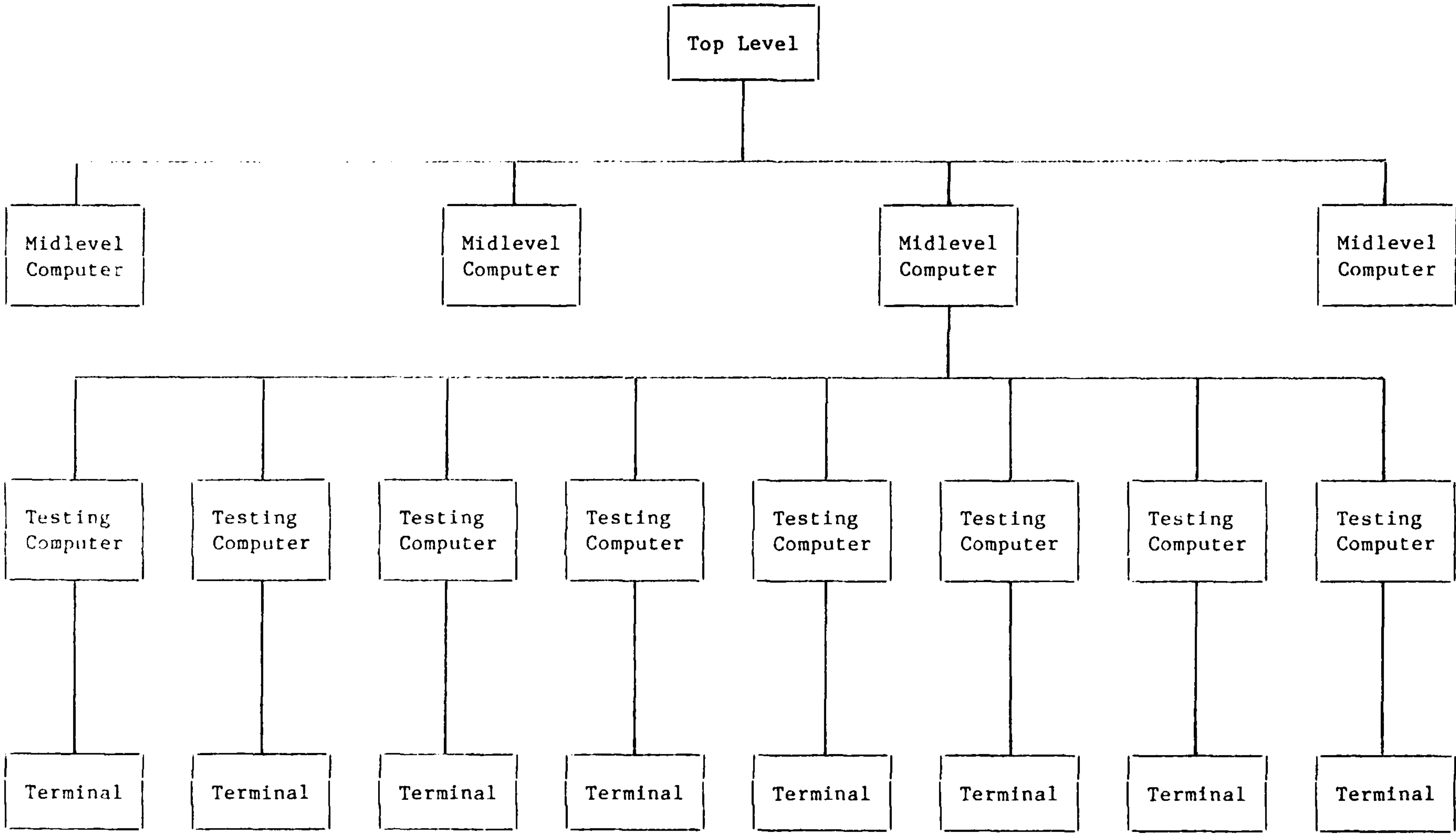
In order to meet the assumptions with equipment that was available at the start of the project, a hierarchical computer structure was designed. The system had three levels: (1) the testing stations, (2) midlevel computers for collecting results from eight testing stations and sending them to a central processor, and (3) a large, top level computer that would compile data and generate the reports. This configuration is shown schematically in Figure 1.

Each testing station consisted of an Ohio Scientific Challenger computer with two floppy disk drives and the OS 65U V1.3 operating system and a Hazeltime 1420 terminal. The terminals were located in carrels in a testing room. The computers were located in a separate room that was under the control of the instructional staff.

Eight of the testing stations were connected to each midlevel computer. This computer was also an Ohio Scientific Challenger computer with two floppy disk drives and the OS 65U V1.3 operating system. Although four midlevel computers were in place at Great Lakes, only 22 testing stations were available. Thus, the full 32 testing station capacity of the system was not realized.

The four midlevel computers transmitted test results to the top level computer. This computer was an Ohio Scientific C-3B microprocessor with 48K random disk and a 74 megabyte (formated) Winchester hard disk. The computer also had two floppy disk drives and a tape backup. Two of these computers were purchased for the project. One served as a backup for the other to insure system reliability. The two top level computers also allowed for potential expansion to 64 testing stations.

Figure 1
Computer System
Hierarchical Structure



Software

Two test administration programs were developed to run on the system. The first was a program that administered a fixed set of test items to each examinee with a randomly selected order. That is, each examinee received the same set of test items, but the order of the items was randomly determined for each individual. This program was to be used at the initiation of computerized testing to collect data addressing the issue of whether items function the same when administered on a computer screen as when administered in paper-and-pencil form. The fixed set of items administered by the computer was the same item set used on the regular paper-and-pencil tests.

The second administration program developed during the project was for the adaptive administration of the course tests. This program was based on the one-parameter logistic (Rasch) item characteristic curve model. This model was selected as a result of a research study that will be described later in this report.

Adaptive testing procedures require algorithms for selecting items, for estimating ability, and for terminating the testing session. The program produced for this project used maximum information item selection, maximum likelihood ability estimation, and a sequential probability ratio test (Reckase, 1983) for the pass/fail decision to terminate testing. Since the maximum likelihood estimation procedure cannot compute ability estimates until both correct and incorrect responses have been obtained, a fixed stepsize, up-and-down procedure was used to obtain ability estimates before both types of responses were available.

After the final ability estimate was obtained for each examinee, the item response theory theta estimate was converted to an estimated true-score based on the entire item pool for that test. The estimated true score was the score reported to both the examinee and the instructor.

Both of the test administration programs were written in Ohio Scientific BASIC for use with the OS 65U V1.3 operating system. They both accessed item pools stored on floppy disks at the testing station computers.

System software for the communications among computers was also developed as part of the project. Personnel from the Naval Education and Training Program Development Center Detachment at Great Lakes assisted with the development of this software. This set of programs accumulated test results from the testing stations and stored them on the hard disk at the top level computers. Other software developed on the project was used to generate reports for the instructor using this information.

The computer system used for administering the test at Great Lakes was described in several professional papers during the life of the project. The references for these papers are given below.

McKinley, R.L., & Reckase, M.D. (1983). Adaptive testing in a military training environment. In Proceedings of the 25th Annual Conference of the Military Testing Association (pp. 118-123). Pensacola, Florida: Naval Education and Training Program Development Center, Sanfley.

McKinley, R.L., & Reckase, M.D. (1984, April). Implementing an adaptive testing program in an instructional program environment. Paper presented at the meeting of the American Educational Research Association, New Orleans.

Reckase, M.D., & McKinley, R.L. (1984, August). The use of adaptive testing for instructional programs. Paper presented at the meeting of the American Psychological Association, Toronto.

Research Projects

[illegible] studies were performed as part of this research project. They [illegible] study to gain information needed to select the appropriate item response theory model for use with the item pools available for the project, (b) a study to determine the effect of mode of test administration (paper-and-pencil or computer) on the operation of the test items, and (c) a survey of the attitudes of trainees toward taking tests on a computer.

The results of the first study, on the appropriate item response theory model for adaptive testing using the radar technician item pool, were reported in a technical report and a convention paper. The references for the report and paper are given below.

McKinley, R.L., & Reckase, M.D. (1983). An evaluation of one-and three-parameter logistic tailored testing procedures for use with small item pools. (Research Report ONR 83-1). Iowa City, Iowa: The American College Testing Program.

McKinley, R.L., & Reckase, M.D. (1984, April). An evaluation of one-and three-parameter logistic tailored testing procedures for use with small item pools. Paper presented at the meeting of the National Council on Measurement in Education, New Orleans.

This study used a two-stage evaluation plan to compare the ability estimates yielded by computerized adaptive testing procedures based on the one parameter logistic (1PL) and the three parameter logistic models (3PL). The first stage of the study used real data, while the second stage used simulated data. In the first stage, response data for 3000 examinees were obtained for the 40 items on a form of the ACT Assessment Mathematics Usage Test. The first 2000 cases were used to obtain item parameter estimates for both models. Using these estimates, 1PL and 3PL tailored tests were simulated using the response data for the remaining 1000 cases. Both computerized adaptive testing procedures employed maximum likelihood ability estimation and maximum information item selection. The sets of ability estimates obtained from the two procedures were then compared.

In the second stage of the study, response data for 3000 cases were simulated using the 3PL item parameter estimates from the first stage as true parameters. True abilities were selected for the simulation from the standard normal distribution. The first 2000 cases of the generated data were used for the 1PL and 3PL calibration of the items, and the remaining 1000 cases were used to simulate 1PL and 3PL adaptive tests. The ability estimates obtained from the two procedures were compared to each other and the true ability parameters.

The results of both stages of the study indicated that the 1PL and 3PL adaptive tests yielded highly correlated ability estimates, and there was not apparent advantage in terms of ability estimation to using one of the models over the other. Because the 1PL procedure was less expensive to use, it was the recommended model for this application.

The result of the second study, on the effect of mode of test administration, was reported in a convention paper. The reference for the paper is given below.

Ackerman, T.A. (1985, October). An investigation of the effect of administering test items via the computer. Paper presented at the meeting of the Midwest Educational Research Association, Chicago.

This study compared the performance of 86 items from the item pool for the [illegible] Technician Training Course when administered on a paper-and-pencil [illegible] that when administered on a computer screen. The responses to the items were first analyzed using the one-parameter logistic model to obtain difficulty parameter estimates from each of the administrations. The pairs of [illegible] the items were then analyzed using a principal components technique to determine which items had difficulty parameter estimates that did not fall along a simple linear function.

Of the 86 items analyzed, 26 were found to exhibit significant differences in performance related to administrative medium. Eleven items were found to be harder when administered on the computer screen, and 15 were found to be easier. No obvious reasons could be determined for the differences. Several hypotheses, such as the differences being related to amount of verbal material in an item or item format were eliminated. Further work needs to be done to determine the cause of the "mode effect".

The third research study carried out as part of this project was a survey of the attitudes of trainees at Great Lakes toward the administration of tests by computer. A sample of 136 trainees was administered an attitude survey immediately following the administration of a test to them by computer. A copy of the survey is included in an appendix to this report. The distribution of responses to the 23 items in the survey is presented in Table 5.

Table 5
Distribution of Responses
to the computerized Testing Survey

Item	Response a	b	c	d
1	16	40	56	25
2	7	12	80	38
3	124		13	
4	1	4	132	
5	30	20	84	
6	75	13	48	
7	7	78	52	
8	2	20	1	113
9	3	12	23	98
10	118	13	4	
11	115	18	3	
12	21	115		
13	135		1	
14	56	64	16	
15	26	92	18	
16	3	129	4	
17	1	132	3	
18	54	67	14	
19		135	1	
20	32	70	33	
21	85	26	24	
22	93	31	11	
23	12	114	9	

The responses generally show that the trainees had no difficulty taking the test on the computer and, in fact, 62% indicated that they "enjoyed" the computerized test. They felt that the instructions to the test were clear and that the pacing of the test was not too fast (the items were untimed), although they indicated that taking the test on the computer was faster than for a paper-and-pencil test. There was little indication of problems with reading the terminal screen or with eye fatigue. The trainees had no difficulty finding the proper keys on the terminal keyboard. The only negative comment concerned examinees being unable to go back to questions once they were off the screen. Sixty-eight percent indicated that they were bothered by being unable to go back to previous items. Overall, the trainees had no difficulty with the computerized test administration.

Summary and Conclusions

This report describes the computerized testing system that was implemented in conjunction with the Radar Technician Training Course at the Naval Training Center at Great Lakes, Illinois and the research that was performed using the system. The system was a multilevel, microprocessor-based computer network with each testing station capable of operating as a stand-alone test administration system. The system was used to administer tests in a sequential, fixed length format for the purpose of gaining information on the effect of mode of administration on test items.

Although software was developed for an adaptive administration of test items, the system was never used for adaptive testing because of repeated hardware failures. These failures were particularly vexing because the hardware manufacturer, Ohio Scientific Inc., went out of business [illegible] project, and maintenance was difficult to obtain. The computer system used is now obsolete and cannot be obtained through any source. The hardware problems emphasize the need for developing a computerized testing system using hardware from a well established manufacturer.

Despite the hardware difficulties, the project did demonstrate that the system design was viable and that microcomputers could be used to administer achievement tests in an instructional program environment. The survey research showed that the trainees had no difficulty taking the test on the computer terminals. The research on model selection showed that, for the small item pools available for this course, a one-parameter logistic based testing procedure would perform adequately.

One research finding from this project indicated that some caution should be exercised when implementing computerized testing. It was found that some test items performed differently when administered on a terminal screen than when administered on a paper-and-pencil test. Further research is needed to determine the kinds of items that are affected by mode of administration and whether the effect will make the item easier or harder than the paper-and-pencil form.

Overall, this project has shown that computerized testing can be effectively used, but that system reliability should be a major factor in the development of such a system. With the recent advances in microcomputer hardware, widespread implementation of computerized testing in support of instruction can soon be expected.

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Appendix

Computerized Testing Evaluative Survey

PLEASE COMPLETE THE FORM BELOW AND RETURN IT TO THE TEST ADMINISTRATOR BEFORE LEAVING THE TESTING ROOM.

NAME ____

LAST	FIRST (Please Print)	MIDDLE INITIAL

SOCIAL SECURITY NUMBER _______ - ______ - ______

DATE ________________________

CLASS NUMBER ________________________ SHIFT ______________________

QUESTIONNAIRE

We are interested in your reactions to this new form of testing. Your answers to these questions will provide useful information about this testing process. Please read each question carefully before responding.

CIRCLE THE LETTER OF THE APPROPRIATE ANSWER TO EACH ITEM.

1. I have used a computer. . .
   a. never before.
   b. once or twice.
   c. occasionally.
   d. frequently.

2. I have used a typewriter. . .
   a. never before.
   b. once or twice.
   c. occasionally.
   d. frequently.

3. If you needed assistance, was the test administrator helpful?
   a. yes
   b. no
   c. I did not need assistance

4. The test questions appeared on the screen. . .
   a. too quickly.
   b. too slowly.
   c. at about the right speed.

5. Overall, the computerized test was. . .

   a. more difficult than a paper-and-pencil test.

   b. easier than a paper-and-pencil test.

   c. about as difficult as a paper-and-pencil test.

6. The computerized test was. . .

   a. faster than a paper-and-pencil test.

   b. slower than a paper-and-pencil test.

   c. about the same as a paper-and-pencil test.

7. I could read the test questions on the screen. . .

   a. with great difficulty.

   b. with some difficulty.

   c. easily.

   d. very easily.

8. The test was confusing. . .

   a. only during the instructions.

   b. only when answering questions.

   c. during both instructions and answering questions.

   d. not at all.

9. My eyes felt tired. . .

   a. frequently.

   b. occasionally.

   c. once or twice.

   d. not at all.

10. How clear do you feel the computerized instructions were?

    a. Very clear - I had no trouble at all with them

    b. Clear enough, in general - but could be improved

    c. Unclear in places or in part

    d. Very unclear and confusing

11. Did you have enough time to give your answers?

    a. I didn't feel rushed or pressured at all

    b. I felt a little rushed and could have used more time

    c. I felt rushed and pressured for time

12. What is your opinion of the difficulty level of the questions?

    a. They were too difficult

    b. They were about right

    c. They were too easy

13. I understood the test administrator's instructions and introduction to the test.

    a. Agree

    b. Disagree

    c. Undecided

14. I did not need the test administrator's instructions in order to take the test.

    a. Agree

    b. Disagree

    c. Undecided

15. I did not need the computerized instructions in order to take the test.

a. Agree

b. Disagree

c. Undecided

16. I had difficulty in locating the proper keys on the keyboard.

a. Agree

b. Disagree

c. Undecided

17. I had difficulty in pressing in right keys.

a. Agree

b. Disagree

c. Undecided

18. I felt uneasy about taking the test on a computer.

a. Agree

b. Disagree

c. Undecided

19. The noise from the computer bothered me while I was taking the test.

a. Agree

b. Disagree

c. Undecided

20. Computerized testing is more impersonal than paper and pencil testing.

a. Agree

b. Disagree

c. Undecided

21. I enjoyed taking the test on a computer.

    a. Agree

    b. Disagree

    c. Undecided

22. I was bothered by not being able to change my answers at the end of the test.

    a. Agree

    b. Disagree

    c. Undecided

23. My eyes were tired by the end of the test.

    a. Agree

    b. Disagree

    c. Undecided

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