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ABSTRACT

The relationship was examined between the reading grade levels (RGLs) of 5797 students and their performance in 46 Navy technical training schools. All incoming students to 41 Navy Class "A" schools and 5 Basic Electricity and Electronics strands were administered the Nelson-Denny Reading Comprehension Test and a learning strategies inventory. The performance of each student was recorded along with other measures such as Armed Services Vocational Aptitude Battery scores, age, years of education, and primary language spoken. The relationship between RGL and performance was found to be small. In self-paced, but not in group-paced, schools, the relationship between reading skills and school performance was a function of the amount and relative difficulty of the reading required. In self-paced courses, increasing the difficulty of the text resulted in a decrease in the relationship between student reading skill and school performance. When the text was very difficult, students seemed to turn to other means of learning, and reading skill became less important. When students used a variety of learning materials and strategies to compensate for and augment the text, no specific strategy was found to relate strongly to performance. (Appendixes include some survey results.) (YLB)

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READING SKILLS, READING REQUIREMENTS, LEARNING STRATEGIES, AND PERFORMANCE IN NAVY TECHNICAL SCHOOLS

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This study examined the relationship between the reading grade levels (RGLs) of 5797 students and their performance in 46 Navy technical training schools. Over all schools, the relationship between RGL and performance was small. The variability among schools, however, showed wide ranges. The impact of learning strategies, educational level, and fleet experience on performance was also studied.

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FOREWORD

This research was performed under program element 63720N, work unit number Z0108.PN.34 (Prerequisite Skills Training System). The purpose of the research was to examine the relationship between reading ability and learning strategies and performance in Navy technical training schools. This report is intended for use by personnel whose work is concerned with the selection and training of Navy recruits.

Appreciation is expressed to the commanding officers and staffs of the Navy "A" schools in San Diego, Great Lakes, Memphis, Meridian, and Treasure Island for providing assistance in this research.

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SUMMARY

Problem

Attempts to achieve the best match between individuals and jobs are complicated by an inadequate understanding of the relationships between personnel skills and job requirements. One result is that Navy personnel are being placed in technical schools where the difficulty of the required reading materials exceeds their reading skills. Since these reading materials constitute the primary mode for delivering instruction, this mismatch between reading skills and reading requirements creates a "literacy gap" that could contribute to training failures and reduced training efficiency.

Purpose

The overall purposes of this research were to determine the extent to which literacy gaps hinder performance, to identify the causal variables, and to identify remediation strategies. In particular, this research was designed to identify literacy gaps in Navy "A" schools and to evaluate the extent to which these gaps are a determinant of school performance. This research was also designed to determine the extent to which each of a variety of learning strategies was used to overcome literacy deficits.

Approach

Forty-one Navy class "A" schools and five Basic Electricity and Electronics (BE/E) strands were selected for the study. For a period of 6 weeks, all incoming students to these schools were administered the Nelson-Denny Reading Comprehension Test and a learning strategies inventory. The performance of each student was recorded along with other measures such as ASVAB scores, age, years of education, and primary language spoken. The reading materials in each school were analyzed to determine the amount and difficulty of the reading assigned.

Results

1. The reading skills of "A" school students declined during the period from 1975 to 1977.

2. Low ability readers from the fleet performed at least as well as high ability readers straight out of boot camp.

3. In self-paced, but not in group-paced schools, the relationship between reading skills and school performance is a function of the amount and relative difficulty of the reading required.

4. In self-paced courses, increasing the difficulty of the text results in a decrease in the relationship between student reading skill and school performance. It would seem that, when the text is very difficult, students turn to other means of learning and thus reading skill becomes less important.

5. While students use a variety of learning materials and strategies to compensate for and to augment the text, no specific strategy was found to relate strongly to performance.

Conclusion

While reading skill tends to be significantly related to school performance, one cannot simply interpret a high correlation as indicative of the "importance" of reading skill (i.e., that reading skill is required for successful performance). The reading skill measure may simply be serving as a proxy of general ability. This seems to be the case with the reading skill/school performance correlations for group-paced schools. Similarly, a low correlation between reading skills and performance does not necessarily mean that the text used in the course is not important or that the text is not presenting difficulties to the students. When a text is difficult, students may turn to other learning materials, making the text less relevant.

Selecting alternative, and more comprehensible, learning materials seems to be an effective way of compensating for difficult text. Other more specific strategies, however, failed to facilitate school performance. When text is difficult, an effective alternative is to gain fleet experience before taking the course. Fleet experience was a major compensator for the effects of reading deficiencies.

Recommendations

1. Learning alternatives, including alternative media, should be provided in self-paced schools to compensate for large reading requirements, even if the text is not of high relative difficulty.

2. While reading skill may predict school performance, a high correlation between these variables does not mean that the low skill readers will necessarily perform poorly. An analysis of the actual reading requirements and the alternative learning strategies (both formal and informal) must be conducted before assuming that a "reading problem" exists.

3. The relationship between reading ability and fleet performance should be examined in all of the Navy's schools to determine where it is feasible to increase the number of "A" school seats that can be made available to fleet experienced personnel, both waivered and nonwaivered.

4. The results suggest that caution must be used when employing reading skill or literacy gap scores to screen students for a school. Depending on the nature of the instruction and the alternative learning sources available, students may be able to compensate for their reading deficiencies.

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INTRODUCTION

Problem

Attempts to achieve the best match between individuals and jobs are complicated by an inadequate understanding of the relationships between personnel skills and job requirements. One result is that Navy personnel are being placed in technical schools where the difficulty of the required reading materials exceeds their reading skills. Since these reading materials constitute the primary mode for delivering instruction, this mismatch between reading skills and reading requirements creates a "literacy gap" that could contribute to training failures and reduced training efficiency.

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The overall purposes of this research were to determine the extent to which literacy gaps hinder performance, to identify the causal variables, and to identify remediation strategies. In particular, this research was designed to identify literacy gaps in Navy "A" schools and to evaluate the extent to which these gaps are a determinant of school performance. This research was also designed to determine the extent to which each of a variety of learning strategies was used to overcome literacy deficits.

Background

The present study evolved from previous research that had raised important questions about the relationship between reading skills, reading requirements, and training success. Duffy and Nugent (1978) studied the reading skills of Navy recruits who had enlisted between May 1974 and May 1975 and who were scheduled to receive technical training preparatory for 69 Navy jobs. Reading skill level was measured on the Gates-MacGinitie Reading Test. The difficulty levels of the reading materials were based on the readability scores of the third and second class rate training manuals for the rates the recruits were scheduled to enter (Biersner, 1975). Duffy and Nugent found that 18.1 percent of the sample were reading below reading grade level (RGL) 8.0. The required manuals were written at RGL 11.0, indicating a literacy gap of three RGLs for a projected population of 19,000 individuals beginning their Navy careers.

The literacy gap found by Duffy and Nugent suggested the need to collect data on the amount of reading time allowed and the correlation between reading ability and course performance. If a course required a great amount of reading in a short time, and if the relationship between reading ability and course performance was substantial, it would seem advantageous to exclude low ability readers or limit their number in the course.

In an attempt to shed light on the relationship between reading skill and school performance, Aiken, Duffy, and Nugent (1977) collected data on students in 10 Class "A" schools and three Basic Electricity and Electronics (BE/E) strands. The Nelson-Denny Reading Test was administered to 1325 students enrolled in the schools, providing an index of reading ability. The amount of reading required in each course (reading density) was determined from the course curricula and the instructors. The reading difficulty of these materials was measured by applying readability formulas to the text. Course performance was measured by the tests normally used in each schools.

Results indicated that reading ability was significantly related to performance in seven of the Class "A" schools and in two of the three BE/E strands. The percentage of

students with reading skills two or more RGLs below the RGLs of the course materials ranged from zero to 55; reading density ranged from two to 20 pages per day. These authors recommended that (1) the assessment of reading skills should be extended to a larger sample of Navy schools, (2) reading density should be measured by the time allowed the students to read the materials rather than by the average number of pages assigned over the number of days in the course, and (3) personnel characteristics that might be mediating the relationship between reading skill and course performance should be studied.

In addition to reading skill per se, it has been shown that study skill is also a potent and trainable variable in school achievement (Dansereau, 1978; O'Neil, 1978; Tuma and Reif, 1980). Dansereau (1978) found that both good and poor learners benefit from instruction in more effective learning strategies. A learning strategies inventory (Dansereau, Long, McDonald, & Actkinson, 1975) was administered to 240 undergraduate students. This inventory was "strategy-oriented"; that is, it revealed what training strategies were being followed and it enabled the prescription of better training strategies. This work showed a positive relationship between the use of different learning strategies and grade point average. Dansereau, Holley, Collins, Brooks, McDonald, and Larson (1980) used some of the more successful strategies identified in the inventory to design a "learning strategy training program." Strategy-trained students performed up to 40 percent better on a technical achievement test than did untrained students. Students with low reading ability obtained higher test scores following strategy training than did such students who were not trained. Benefits derived from learning strategy training appear to be substantial. Including such training in Navy schools could improve academic achievement of low ability personnel.

METHOD

School Selection

The FY78 Enlisted Class "A" School Training Plan was used to select the schools for this study. The criteria for selection were student throughput, school location, and length of course. Schools were excluded if they enrolled less than 300 students per year, were located at a remote site, or had a course length of less than 6 weeks. The schools selected included 41 Navy Class "A" schools and five strands of the BE/E school. (BE/E school provides preparatory training for students going to some of the Class "A" schools.) For the purposes of this research, each strand was considered a "school." The schools selected accounted for 90 percent of the "A" school population. The Ship's Serviceman (SH) School, although only 4 weeks long, was included because it is located in San Diego.

The schools ranged in length from 4 to 30 weeks with an average of 9.9 weeks. Instruction was self-paced in 14 schools and group-paced (lecture) in the remaining 32 schools.

Subjects

All students (N = 5,797) entering the selected schools during a 6-week testing period were used as subjects.[1] The 6-week testing period yielded approximately a 10 percent

[1]Original sample size was 6,197. All nuclear field students were subsequently eliminated because they comprised a select subgroup with very high enlistment standards.

sample of the total FY78 enrollment for the schools. The sample size for each of the schools is shown in Table 1.

Caucasians accounted for 82.8 percent of the trainees, Blacks for 8.4 percent, Hispanics for 2.2 percent, Filipinos for 1.8 percent, American Indians for 1.0 percent, and Orientals, Pacific Islanders, and others not classified for 3.8 percent. English was self-reported as the primary language spoken by 97 percent of the students, Tagalog by 1.3 percent, Spanish by 0.8 percent, and "other" languages by 0.9 percent.

The mean age for the sample was 20, with sizable numbers at 18, 19, and 21 years of age. High school graduates comprised 85.4 percent of the sample, with 8.8 percent of these having received their high school equivalency through the General Education Development (GED) Program. Of all the subjects, 12.8 percent had previously served in the fleet.

The BE/E and Class "A" schools attempt to enroll only those students who meet certain eligibility requirements. When too few qualified students are available, students with lower qualifications are accepted via waivers. Of the subject sample, 13.5 percent had been accepted on waivers.

Variables

Reading Ability

Reading ability was assessed with the Nelson-Denny Reading Comprehension Test, Form B (Brown, 1960). This test measured RGLs from grades 7 to 14.

Learning Strategies and Study Behaviors

A learning strategies inventory was used to assess student learning strategies study behaviors. The inventory consisted of 15 items taken from Sticht, Fox, Hauke, and Zaph (1976), Dansereau, Long, McDonald, and Actkinson (1975), and Weinstein (1977). The items from Sticht et al. were those that a sample of Navy personnel had most frequently selected as strategies for studying. The items from Dansereau et al. were those that correlated most highly with grade point averages of college undergraduates. Those from Weinstein were adapted from a learning activities questionnaire. The format for all items was a description of a learning strategy or a study behavior and a four-choice alternative indicating the degree to which the strategy is used. The inventory is presented in Appendix A.

The reading skill test and learning strategies inventory were combined into one booklet called The Reading Skills Inventory. The inventory was administered at 38 of the "A" schools and at all five of the BE/E strands in May of 1977. It was administered at the BT, EN, and MM schools in December of 1977. Testing was done prior to the beginning of class instruction and required 1 hour.

Table 1

Schools and Subjects

Name of School	Abbreviation	N
Air Traffic Controller	AC	45
Aviation Machinist's Mate	AD	211
Aviation Electrician's Mate	AE	141
Aviation Storekeeper	AK	43
Aviation Structural Mechanic (Safety Equipment)	AME	66
Aviation Structural Mechanic (Hydraulic)	AMH	97
Aviation Structural Mechanic (Structures)	AMS	195
Aviation Ordnanceman	AO	134
Aviation Fire Control Technician	AQ	30
Aviation Electronics Technician	AT	156
Aviation Antisubmarine Warfare Operator	AW	51
Aviation Antisubmarine Warfare Technician	AX	31
Aviation Maintenance Administrationman	AZ	73
Boiler Technician	BT	382[a]
Cryptologic Technician (Maintenance Branch)	CTM	25
Disbursing Clerk	DK	42
Data Processing Technician	DP	45
Dental Technician	DT	60
Electrician's Mate	EM	259[a]
Engineman	EN	174[a]
Electronics Technician	ET	323[a]
Fire Control Technician	FT	181
Gunner's Mate	GM	136
Gunner's Mate (Technician)	GMT	11
Hospital Corpsman	HM	202
Hull Maintenance Technician	HT	144
Interior Communications Electrician	IC	99[a]
Machinist's Mate	MM	313[a]
Machinery Repairman	MR	66
Mess Management Specialist	MS	218
Operations Specialist	OS	220
Personnelman	PN	114
Quartermaster	QM	46
Radioman	RM	433
Ship's Serviceman	SH	44
Storekeeper	SK	171
Signalman	SM	43
Sonar Technician (Surface)	STG	83
Sonar Technician (Submarine)	STS	31
Tradevman	TD	47
Yeoman	YN	159
AT, AQ, AX, and TD Strand (BE/E school)		36
EM Strand (BE/E school)		108
CTM and ET Strand (BE/E school)		87[a]
FT Strand (BE/E school)		110
GM and GTM Strand (BE/E school)		112
Total sample size		5797

[a]Nuclear field students are excluded.

School Performance

At each school, data on each student's performance during the first 6 weeks in the course were collected and recorded on site over a 3-month period. The variable for group-paced courses was the written test score upon completion of either a lesson or module. The variable for five of the self-paced courses (DT, AD, BT, EN, MM) was the score on module tests. The variable for the other self-paced courses was the number of hours or number of days to reach criterion. In both types of course, hands-on performance data were collected when available.

Other Personnel Measures

Data were collected on Armed Services Vocational Aptitude Battery (ASVAB) test scores and on prior fleet experience. The ASVAB scores were obtained from the Enlisted Master Tape Record. Students indicated on their Reading Skills Inventory answer sheet whether or not they had any fleet experience prior to their enrollment in school.

Density and Readability

Density and readability were used to index the difficulty of reading assignments. Density was the number of pages assigned by instructors over the time period allotted for that reading. The readability of the text was computed by the FORCAST Formula (Sticht, 1975b). This formula, developed for use with military text, correlates highly with more well-known readability formulas: .97 with the Flesch formula (Flesch, 1948) and .90 with the revised Flesch formula (Kincaid, Fishburne, Rogers, and Chissom, 1975). The FORCAST formula is easier to apply and takes less time to use than the other formulas. These were significant considerations, given the thousands of pages requiring analysis.

RESULTS AND DISCUSSION

The mean reading skill level for all subjects was an RGL of 11.7. Across schools, mean reading skills ranged from 9.6 to 13.8 (the upper limit on the Nelson-Denny test). The distribution of reading skills from the 8th to the 14th grade level for each school is given in Appendix B.

Table 2 gives the percentages of students having RGLs below 9.9 in 10 schools during 1975 and 1977. A comparison indicates that more students with lower reading skills were being enrolled in 1977. For example, in 1975 only 17.5 percent of the QM students had RGLs below 9.9, as compared with 43.5 percent in the present study. This decline was evident for all but two (EM and IG) of the 10 schools compared.

Table 2

Percentages of Students Below the 9.9 Reading Grade Level in Selected "A" Schools

	School									
Year	MR	QM	DP	RM	SM	HT	MS	SH	EM	IC
1975[a]	38.9	17.5	2.3	25.7	32.9	41.3	37.4	43.4	23.5	20.8
1977[b]	50.0	43.5	13.3	35.1	39.5	42.4	48.2	56.8	20.8	20.2

[a]Data for 1975 taken from Aiken et al. (1977).

[b]Data for 1977 collected as part of the present research.

These data are consistent with the increased accession of low ability personnel over this time period. As shown in Table 3, mental category IV personnel (low aptitude) accounted for only 3 to 5 percent of all accessions during the Aiken et al. study and 21 percent during the data collection effort described here. These results suggest that, as the total pool of available manpower decreases (Borack & Govindan, 1978), the Navy will be forced into enrolling more lower ability personnel in technical schools.

Table 3

Percentages of Navy Accessions in Four AFQT Mental Categories from 1974 to 1980

AFQT Category	Percentages by Year						
	1974	1975	1976	1977	1978	1979	1980
1	3	3	5	5	6	5	5
2	34	35	39	32	35	33	33
3	60	57	48	42	43	44	45
4	3	5	8	21	16	18	17

Note. "Corrected" AFQT scores provided by Wayne S. Sellman, Assistant Director for Military Personnel Testing, Accession Policy Department, Pentagon.

Relationship Between Reading Ability and Performance

Pearson product-moment correlation coefficients were calculated between reading ability and measures of two types of school performance: academic and hands-on. Both paper-and-pencil and hands-on tests were given in 26 schools. As shown in Table 4, the correlations of RGL with the hands-on test scores never exceeded the correlations of RGL with the paper-and-pencil test scores in any school. In general, reading skill was not a good predictor of hands-on performance, with correlations ranging from -.01 (MM) to .37 (OS). Aiken et al. (1977) found a similar weak relationship between RGL and hands-on performance. Similar results were also obtained by Sticht, Caylor, Kern, and Fox (1972) in an assessment of four Army occupations. This finding does not necessarily indicate that reading skill is a less important variable in hands-on performance than in knowledge tests. Indeed, understanding text materials is required for both paper-and-pencil and hands-on tests. The difference in correlations may be due to the test types rather than the knowledge requirements for the two school measures. For example, both the paper-and-pencil performance tests and the reading tests used to determine RGL are timed, multiple-choice tests. Thus, there is a commonality of task demands not present in the hands-on test. In addition, Aiken et al. (1977) have proposed that hands-on performance tests are less reliable paper-and-pencil tests and thus would yield lower correlation values.

Table 4

Correlation of RGL with Academic and Hands-on Performance in Selected "A" Schools

"A" School	Performance		"A" School	Performance	
	Academic	Hands-on		Academic	Hands-on
IC	.58	.24	AD	.29	.17
AZ	.55	.24	STG	.29	.24
QM	.54	-.03	BT	.28	.11
OS	.51	.37	AMS	.27	.22
MM	.49	-.01	HT	.26	.24
AO	.44	.19	MR	.24	-.07
EM	.43	-.07	ET	.24	.24
STS	.43	.21	EN	.22	.09
AMH	.39	.05	FT	.22	.17
DP	.33	-.16	PN	-.21	.05
GM	.31	.06	YN	-.18	.06
AME	.30	.16	SH	-.11	.07
SK	.30	.14	DT	.10	.04

Predicting Academic Performance from Reading and Other Literacy Factors

Tables 5 and 6 present the Pearson product-moment correlations between reading skill and school performance for the group-paced and self-paced schools respectively. Paper-and-pencil test scores were used as the school measure when they were available. The exceptions were some of the self-paced courses where time to complete the course was used. Correlations between reading skill and academic performance ranged from .14 to .58 and were significant ($p \leq .05$) for 32 of the 37 schools. For comparable schools, Aiken et al. (1977) obtained, with few exceptions, very similar correlations.

Why is reading skill strongly related to performance in some schools but not in others? One obvious factor is variations in the reliability of the paper-and-pencil tests. That is, for those schools where there is a low correlation (AC, AK, DK, DT, SM, and SH), it may well be that the paper-and-pencil tests are not reliable. If true, nothing would correlate with these tests.

This hypothesis was tested by determining whether, for those schools where reading did not correlate significantly with performance, the composite ASVAB score would yield significant relationships.

Table 5

Factors Involved in Assessing the Contribution of Reading to Academic Success in Navy Group-paced Schools

"A" School	Correlation of Student RGLs to Performance	Mean RGL of Students	Mean RGL of Course Materials	Students with Two-RGL Reading Deficiency (%)	Reading Density
IC	.58*	12.4	11.4	12.1	15
AZ	.55*	10.9	11.0	30.1	9
QM	.54*	10.5	10.1	17.4	34
QS	.51*	11.4	11.4	23.6	4
AO	.44*	9.6	10.3	35.8	23
EM	.43*	12.8	10.8	11.2	12
STS	.43*	13.8	11.9	.0	30
AMH	.39*	10.0	10.9	32.0	15
HM	.38*	11.4	11.6	22.3	24
AW	.38*	12.8	10.8	5.9	18
DP	.33*	13.3	9.9	6.7	13
AE	.31*	11.4	11.1	20.6	22
GM & GMT[a]	.31*	11.4	10.6	14.7	12
AME	.30*	9.6	11.7	51.5	21
SK	.30*	11.4	12.4	38.0	8
MS	.29*	10.0	10.2	20.2	9
STG	.29*	12.8	11.9	15.7	30
AMS	.27*	9.6	11.1	42.1	24
HT	.26*	10.9	10.6	27.8	11
ET & CTM	.24*	13.8	11.4	6.5	23
MR	.24*	10.5	9.7	12.1	17
FT	.22*	12.8	10.8	3.9	15
AC	.13	12.4	11.6	15.6	17
DK	.12	12.0	11.2	11.9	30
SH	-.11	10.0	11.1	40.9	6
SM	.02	10.9	10.9	25.6	8

[a]GM and GMT "A" schools were combined because of the small N (11) in the GMT school.

*$p \leq .05$.

Table 6

Factors Involved in Assessing the Contribution of Reading to Academic Success in Navy Self-paced Schools

School[a]	Correlation of Student RGL to Performance	Mean RGL of Students	Mean RGL of Course Materials	Students with Two-RGL Reading Deficiency (%)	Reading Density
MM	.49*	12.4	9.9	8.6	94
FT[b]	-.33*	13.8	10.5	5.5	49
CTM & ET[b]	-.32*	12.4	10.5	8.1	49
AD	.29*	10.5	11.0	32.0	68
BT	.28*	10.0	9.9	15.9	94
RM	-.25*	10.9	10.8	18.1	18
EN	.22*	10.9	9.9	11.5	94
PN	-.21*	12.4	11.5	20.2	8
YN	-.16*	11.4	10.7	22.0	7
AK	-.14	11.4	11.4	34.9	47
DT	.10	10.0	10.7	35.0	12

[a]AT, AX, AQ, TD, GM/GMT, and EM strands of BE/E school, although self-paced, were excluded due to insufficient data.

[b]BE/E strand.

*$p \leq .05$.

The composite ASVAB score is used for the selection of "A" school students. It is a subset of the entire ASVAB and varies among the schools. Significant Pearson product-moment correlations were found between academic performance and the composite ASVAB scores for the AC, AK, DK, DT, and SM schools ($r = .26, .63, .62, .31$. and .77 respectively, all $p \leq .05$). Only the SH school failed to yield a significant relationship. Thus, while test reliability may be a variable, it is not the determining factor.

The contributions of four reading-related variables to the variation in the correlation between reading skills and performance were examined next. The four variables are presented in columns 3 to 6 of Tables 5 and 6. These factors were felt to be determinants of the importance of reading skill and it was expected that they would vary across schools. The first variable, mean RGL of the students, may affect the tendency of the class to read the text regardless of the difficulty of the materials. The Pearson product-moment correlation coefficient between reported time spent reading and reading skill among all students sampled was .5. Apparently, students who read poorly tend to read very little.

The second variable is the difficulty of the materials to be read. As can be seen in column 4 of Tables 5 and 6, there was not much variation in this score. Most school materials were written at the 10th or 11th grade level as assessed with the FORCAST readability formula. Given sufficient variation, however, it would be expected that more difficult materials would be avoided, even by good readers.

The "literacy gap" expresses the relationship between reading skills of the individual and reading difficulty of the materials. Column 5 shows the percent of students at a school reading two or more grade levels below the difficulty of the school materials. The percentage of students with a literacy gap thus defined ranges from zero in the STS school to 52 in AME. Sticht (1975a) found that the use of job reading materials in the Army decreased when a literacy gap was present (i.e., when personnel had reading skills below the difficulty of the material.). Further, Kulp (1974) found that performance based on written instructions deteriorated when there was a literacy gap of two or more grade levels.

The final column of Tables 5 and 6 presents reading density--the amount of reading assigned per unit time.

The contribution of the four reading variables to the interschool variations in the correlation of reading skill and performance was assessed through a linear multiple regression analysis. The mean values in each school for each of these variables were converted to z-scores and entered as predictor scores. The dependent measure was the correlation value of reading skill and performance for each school. This analysis was carried out separately for the group-paced and self-paced courses.

Group-paced Courses. The correlation between reading skill and performance in group-paced schools was not significant ($R = .17$, $p \geq .05$); all of the hypothesized causal variables together accounted for only 3 percent of the variance in the school performance-reading skill relationship. The intercorrelation matrix for these variables, Table 7, shows that reading density is the strongest predictor ($r = .12$) of the performance-reading relationship, but this correlation was not significant. The data suggest that, even though the correlations between reading skill and school performance are high in group-paced schools (see Table 5), the strength of the correlation is not a function of the reading requirements. Thus, the measure of reading skill is probably serving as a proxy measure of general ability and the large correlations in Table 5 simply indicate that more able students "do better."

Table 7

Intercorrelations Among Literacy Factors in Group-paced Courses

Factors	Mean RGL of Students	Mean RGLs of Course Materials	Students with Two-RGL Reading Deficiency	Reading Density
Correlation of student RGLs to performance	.05	-.08	-.11	.12
Mean RGL of students	--	.19*	-.81*	.08
Mean RGL of course materials	--	--	.30*	.03
Students with two-RGL reading deficiency	--	--	--	-.15

*$p \leq .05$

The fact that reading variables fail to predict the strength of the relationship between reading skill and school performance may perhaps be explained by the character of the instructional delivery in group-paced courses. While the text is a primary mode for instruction in group-paced courses, there are alternative sources for learning readily available. Primary among these is the lecture. Thus, if reading is a problem, the student can easily turn to alternative modes for learning. This explanation leads to the prediction that text-related variables would be far more important in self-paced schools where the student must depend on the text to a much larger degree.

Self-paced Courses. An examination of the simple correlations in Table 8 indicates that, while the relationships of the reading variables to the reading skill-school performance variable are quite strong, the direction of the relationships is counterintuitive for all but density.

Table 8

Intercorrelations Among Literacy Factors in Self-paced Courses

Factors	Mean RGL of Students	Mean RGL of Course Materials	Students with Two-RGL Reading Deficiency	Reading Density
Correlation of student RGL to performance	.47*	-.52*	-.70*	.60*
Mean RGL of students	--	.09	-.61*	-.08
Mean RGL of course materials	--	--	.62*	-.71*
Students with two RGL reading deficiency	--	--	--	-.39*

*$p \leq .05$

The results of the regression analysis for the self-paced schools showed that the reading variables predicted the correlation of school performance and reading skill ($R = .82$, $F = 4.8$, $df = 3$ and 7, $p \leq .05$). Thus, the predictor variables accounted for 67 percent of the variance in the correlation between reading skill and school performance, which is far above the variance accounted for by these same factors in the group-paced schools. The intercorrelation matrix for these variables, Table 8, shows that the percentage of students reading two grade levels below the reading level of the material was the strongest predictor of the reading-performance relationship ($r = -.70$). The second highest factor predicting the criterion is density ($r = .60$). The positive relationship with density suggests that, as the volume or density of reading required increases, reading is more critical to school performance and hence there is a larger reading skill/school performance correlation.

The direction of the correlation with the other reading variables indicates that the correlation of reading skill and school performance tends toward zero (there were no negative correlations) as text difficulty increases, as there are more personnel with a reading deficiency and as the mean reading skill decreases. The obvious conclusion from these relationships would be that, if the correlation between reading skill and performance was reduced to zero, reading skill could be eliminated as a determinant of school performance by writing texts at a grade level well above the reading skills of all the students. That is, the absurd practical implication would be that the reading problem could be "solved" by making the text unreadable.

More reasonably, however, the results could be interpreted to suggest that, as the text becomes less comprehensible, the students will search out alternative sources of information to aid in learning the course content. Thus, making the text incomprehensible "solves" the reading problem by forcing the students to other nontext sources of learning material. This explanation is consistent with the interpretation for the group-paced data. The important difference between the two types of schools is the ease of access to alternative learning material. In self-paced courses, the text is the primary mode of instruction and other sources are not readily available. Therefore, the students will tend to rely on the text as the sole learning source as long as the text does not become too difficult (tending toward incomprehensible). As long as the text is the primary source, reading skills will be important and a strong correlation between reading skill and school performance can be expected. That is, when students can comprehend and use the text, variations in comprehension will produce the correlations between reading skill and performance. This, of course, assumes that the text is not extremely simple relative to the reading skills of the students--a reasonable assumption for military training.

The results suggest that caution must be used when employing reading skill or literacy gap scores to screen students for a school. Depending on the nature of the instruction and the alternative learning sources available, students may be readily able to compensate for their reading deficiencies. When there is a large literacy gap, the students will be forced away from the text to alternative sources of information. That is, in self-paced courses, as the text becomes very difficult, the students will expend the effort to form study groups, to wait for instructor assistance, etc. The text thus becomes less central to learning as it becomes more difficult. Reading skill, in turn, should show a lesser degree of relationship to school performance. This interpretation of the regression data is simply a statement that students are more resilient than often assumed. If one avenue to learning is blocked, they will identify or develop alternative learning strategies.

The inference here is that the impact of a literacy gap as presented by Duffy and Nugent (1978) may not be generalizable to schools where there are large numbers of students who read two grade levels below the level at which the materials are written. For example, the group-paced AME school has the largest percentage (51.5%) of students reading at least two grade levels below the course materials. The correlation between reading and performance is significant ($r = .30$, $p \leq .05$), but the mean performance difference between the literacy gap students and those students reading at or near the level of the course materials is only three percentage points. The practical significance of the difference would appear to be very little.

The point is that reading ability is a major criterion for selection into a Navy technical training school. All recruits take a reading test and the ASVAB, which is basically a reading test. From the discussion presented above, the utility of the results from reading-related test instruments should be determined separately for each school.

An effort must be made to understand the performance-outcome differences among students with markedly disparate reading abilities. As shown above for the students in the AME school, little difference was observed. Furthermore, the nature of the course--group-paced or self-paced--may moderate the demand for reading and the means by which the students derive the course knowledge.

Reading Ability and Years of Education

The 18 schools with most of the high school nongraduates (85.4%) are listed in Table 9. In these schools, the mean difference in reading skill between graduates was only 1.0 RGL and ranged from no difference (AMS, MS, YN) to 3.3 RGLs (MM).

Only three of these schools showed large mean reading skill differences between the two educational groups: AZ (2.3), OS (2.4), and MM (3.3). In the remaining schools, the difference in mean reading skill between students with 11 or fewer years of education and students with 12 or more years of education was very small, with the largest mean difference being 1.4 RGL for the SM school.

Table 9

Mean RGLs of High School Graduates and Nongraduates in Selected "A" Schools

School	RGL by Years of Education		School	RGL by Years of Education	
	11 or Less	12 or More		11 or Less	12 or More
AD	8.6	9.6	MM	9.1	12.4
AMS	9.6	9.6	MS	10.0	10.0
AME	9.6	10.0	OS	9.6	12.0
AO	9.1	9.6	QM	10.0	10.5
AZ	9.1	11.4	RM	10.9	11.4
BT	9.6	10.5	SH	8.6	10.0
EN	10.5	10.9	SK	10.5	11.4
GM	10.9	11.4	SM	10.0	10.9
HT	9.6	10.9	YN	10.9	10.9

Performance, Fleet Experience, and Waivered Status

The relationship between reading ability and academic performance is not a firm one where the student with a low RGL necessarily attains a low level of performance. Furthermore, student performance may be moderated through exposure to the language and concepts used in their ratings prior to entering an "A" school.

Students with ASVAB scores below the established standard entrance scores are enrolled on "waivered" status. Students who were in the fleet prior to entering the school are shown as "fleet." In Table 10, four groups are represented among 20 schools to demonstrate the effect that fleet experience has on the academic performance of both waivered and nonwaivered students. While the sample sizes of these schools are small and the number of schools used for comparison are few, there are trends worth noting.

The purpose in creating the four distinct groups in Table 10 was to ensure data that reflected the performance of the low ability, fleet-experienced groups (waivered, fleet). There are also personnel serving in the fleet who have never been to an "A" school even though they are qualified (nonwaivered, fleet). Analyzing the data simply by fleet/non-fleet would not have accounted for the expected variability in performance between the waivered and nonwaivered students.

Table 10

Academic Performance and RGLs of Four Groups of Students in Selected Navy "A" Schools

Rate	Academic Performance				Student RGL				Ns			
	1	2	3	4	1	2	3	4	1	2	3	4
AD	83	83	83	--	10.5	9.1	10.5	--	172	11	18	--
AE	84	--	85	--	10.9	--	12.0	--	94	--	12	--
AMH	68	--	76	--	10.0	--	10.9	--	60	--	11	--
AMS	42	44	44	--	9.6	8.2	10.0	--	140	9	12	--
AO	71	68	70	--	9.6	7.7	10.0	--	74	8	21	--
BT	90	87	--	--	10.0	9.1	--	--	216	51	--	--
EM	76	70	--	75	13.3	12.4	--	10.0	192	11	--	15
EN	91	86	--	--	10.9	9.6	--	--	98	18	--	--
FT	80	--	79	--	13.3	--	12.4	--	134	--	14	--
GM & GMT	76	74	--	--	12.4	9.6	--	--	72	33	--	--
HM	86	83	--	--	12.0	10.0	--	--	143	20	--	--
HT	86	85	90	90	11.4	9.1	10.5	9.1	89	14	12	10
MM	93	89	93	86	12.8	10.5	12.0	8.6	197	14	14	10
MR	82	--	84	--	11.4	--	9.6	--	30	--	12	--
MS	84	80	84	--	10.5	8.6	10.5	--	139	26	19	--
OS	76	66	79	--	12.8	9.1	12.4	--	73	53	54	--
PN	50	--	55	56	12.8	--	13.8	9.6	55	--	17	17
RM	324[a]	333[a]	285[a]	--	11.4	8.6	11.4	--	278	21	49	--
SK	87	84	89	89	11.4	10.5	12.0	10.0	108	24	11	9
YN	36[b]	32[b]	42[b]	40[b]	11.4	11.4	12.8	10.5	80	25	19	16

Note. The four groups were (1) nonwaivered nonfleet, (2) waivered nonfleet, (3) nonwaivered fleet, and (4) waivered fleet.

[a]Total hours to completion.

[b]Total number of attempts to achieve criterion.

A test of the main effects of fleet experience and waivered status on academic performance was made using analysis of covariance. Reading ability, which has been shown to be significantly related to performance, was used as the covariate. The analysis shows that fleet experience resulted in a significantly higher level of academic performance than did no fleet experience: $F(1,3145) = 22.25$, $p \leq .001$. The same trend was found for the nonwaivered students who performed significantly better than did the waivered students: $F(1,3145) = 15.62$, $p \leq .001$. The interaction between the two factors was not significant: $F(1,3145) = 2.84$, $p > .05$. The results of this analysis show that, while a student may read at a comparably low level and enter an "A" school on a waivered status, fleet experience seems to offer this student an orientation to the language of that school. The result from this fleet experience is performance that is equal to or better than that of students whose reading ability is greater but who have no fleet experience.

Learning Strategies and Academic Performance

Dansereau (1980), Dansereau, Long, McDonald, and Actkinson (1975), and Dansereau, Long, McDonald, Actkinson, Collins, Evans, Ellis, and Williams (1975) have been developing and assessing cognitively based strategies designed to assist learners in acquiring and using academic and technical information. The premise is that providing students with effective and efficient learning strategies will reduce educational costs, improve the transfer of knowledge and skills to work environments, and help students adapt to less than optimal instructional situations. It has already been stated that the Navy may use more low ability readers in technical positions. A Navy learning-strategies program could provide the less qualified personnel with skills enabling them to perform more successfully in the technical training environment.

Dansereau, Long, McDonald, and Actkinson (1975) developed a learning strategies inventory and found that reported use of many of the strategies correlated significantly with grade point average. Some of these strategies were used by Dansereau, Long, McDonald, Actkinson, Collins, Evans, Ellis, and Williams (1975) in an experiment designed to test the effectiveness of a learning strategies training program. Dansereau used college undergraduates (mostly female) as subjects and grade point averages as criteria in compiling the initial list of strategies. The results showed that students receiving training in the highly rated strategies showed better long term retention of factual material than did a control group.

As indicaated previously in the present study, 15 strategies were rated for frequency of use on a 4-point scale (Appendix A). The relationship between the rated use of each of these strategies and school performance was assessed by correlation analysis. Separate analyses were carried out for self-paced and group-paced courses. For this analysis, performance scores were converted to z-scores based on the mean and variance for each school, thus permitting the Pearson product-moment correlation coefficients to be calculated across all schools having a common instructional strategy. The correlations for group-paced and self-paced schools are shown in Table 11. The strategies are grouped into categories beginning with the lowest level of required processing (no strategy) to the highest level of processing (active generation). It was hypothesized that the higher levels of processing would show the higher correlations. The relationships between the self-reported use of learning strategies and academic performance, while statistically significant, are very small, indicating, in general, little practical relationship between strategy usage and performance. The highest correlation for the group-paced schools was item 7 ($r = .14$)--relating material to other knowledge. The better performers tried to relate reading material to other things that they knew more often than did the poorer performers. For the self-paced schools, the highest correlation was shown for item 14 ($r = .14$)--using both figures and text. The better performers used both figure and text to help them understand a passage more often than did the poorer performers.

Table 11

Correlations Between Learning Strategies and Academic Performance

Learning Strategy Categories, Item Numbers[a] and Summaries of Strategies	Group-paced Schools[b] (N = 28)	Self-paced Schools[b] (N = 11)
No Strategy:		
2. Finish reading without understanding.	-.10*	-.06*
Rote Activity:		
3. Reread material until understood.	.01	.03*
4. Memorizing without understanding.	-.12*	-.09*
Use of Text Materials and Study Aids:		
9. Working practice problems.	.02	.02
10. Completing sample tests in assignments.	.04*	.03*
11. Answering questions in chapter.	.01	-.02
14. Using both figures and text.	.11*	.14*
Identifying Key Points:		
13. Underlining material.	-.06*	-.07*
Active Generation:		
1. Relating material to outside interests.	.07*	.07*
7. Relating material to other knowledge.	.14*	.06*
12. Studying with classmates.	-.04*	-.06*

[a]Items 5, 6, 8, and 15 of the questionnaire in Appendix A are not included here. Items 5 and 6 covered study behaviors, not strategies, and items 8 and 15 were similar to item 14.

[b]A negative correlation indicates that the better performers used the strategy less than did the poorer performers.

*$p \leq .05$.

The correlations between strategies and performance at individual schools range up to .56. However, because of the large number of correlations calculated in such an analysis (over 600), the results are difficult to interpret without some theoretical framework. Thirty of the correlations could be expected to be significant at $p \leq .05$ by chance alone. These individual correlations are presented in Appendix A.

CONCLUSIONS

While reading skill tends to be related to school performance, one cannot simply interpret a high correlation as indicative of the "importance" of reading skill (i.e., that reading skill is required for successful performance). The reading skill measure may simply be serving as a proxy of general ability, as seems to be the case with the reading skill/school performance correlations for group-paced schools. In a similar manner, a low correlation between reading skill and performance does not necessarily mean that the text used in the course is not important or is not presenting difficulties to the student. When a text is difficult, students turn to other sources of learning material, making the text less relevant.

Selecting alternative, comprehensible learning materials would seem to be an effective learning strategy to compensate for difficult text. However, other more specific reported learning strategies failed to facilitate school performance. When text is difficult, an alternative is to gain fleet experience before taking the course. Fleet experience was a major compensator on the effects of reading deficiencies.

RECOMMENDATIONS

1. Learning alternatives, including alternative media, should be provided in self-paced schools to compensate for large reading requirements, even if the text is not of high relative difficulty.

2. While reading skill may predict school performance, a high correlation between these variables does not mean that students with low reading skills will necessarily perform poorly. An analysis of the actual reading requirements and the alternative learning strategies (both formal and informal) must be conducted before assuming that a "reading problem" exists.

3. The relationship between reading ability and fleet performance should be examined in all of the Navy's schools to determine where it is feasible to increase the number of "A" school seats that can be made available to fleet experienced personnel, both waivered and nonwaivered.

4. The results suggest that caution must be used when employing reading skill or literacy gap scores to screen students for a school. Depending on the nature of the instruction and the alternative learning sources available, students may be able to compensate for their reading deficiencies.

REFERENCES

Aiken, E. G., Duffy, T. M., & Nugent, W. A. Reading skills and performance in a sample of Navy Class "A" schools (NPRDC Tech. Rep. 77-28). San Diego: Navy Personnel Research and Development Center, April 1977. (AD-A038 535)

Biersner, R. J. Reading grade levels of Navy rate training manuals and nonresident career courses (CNET Rep. 2-75). Pensacola: Chief of Naval Education and Training, May 1975.

Borack, J., & Govindan, M. Projections of the U.S. population of 18-year old males in the post-1993 period (NPRDC Tech. Rep. 78-16). San Diego: Navy Personnel Research and Development Center, April 1978. (AD-A053 628)

Brown, J. I. The Nelson-Denny reading test (Revised). Boston: Houghton Mifflin Company, 1960.

FY78 enlisted Class "A" school training plan. Washington, DC: Bureau of Naval Personnel, 1977.

Dansereau, D. The development of a learning strategies curriculum. In H. F. O'Neil, Jr. (Ed.). Learning strategies. New York: Academic Press, 1978.

Dansereau, D., Holley, C. D., Collins, K. W., Brooks, L. W., McDonald, B., & Larson, D. Validity of learning strategies/skills training (Tech. Rep. 79-84). Denver, CO: Lowry Air Force Base: Air Force Human Resources Laboratory, April 1980.

Dansereau, D., Long, G. L., McDonald, B. A., & Actkinson, T. R. Learning strategy inventory development and assessment (Tech. Rep. 75-40). Denver, CO: Lowry Air Force Base: Air Force Human Resources Laboratory, June 1975. (a)

Dansereau, D., Long, G. L., McDonald, B. A., Actkinson, T. R., Collins, K. W. Evans, S. H., Ellis, A. M., & Williams, S. Learning strategy training program: Visual imagery for effective learning (Tech. Rep. 75-47). Denver, CO: Lowry Air Force Base: Air Force Human Resources Laboratory, June 1975. (b)

Duffy, T. M., & Nugent, W. A. Reading skill levels in the Navy (NPRDC Tech. Rep. 78-19). San Diego: Navy Personnel Research and Development Center, April 1978. (AD-054 859)

Flesch, R. F. A new readability yardstick. Journal of Applied Psychology, 1948, 32, 221-223.

Kincaid, J. P., Fishburne, R. P., Jr., Rogers, R. L., & Chissom, B. S. Derivation of new readability formulas (Automated Readability Index, Fog Count, and Flesch Reading Ease Formula) for Navy enlisted personnel (NTTC-RBR 8-75). Millington, TN: Naval Air Station, Memphis; Chief of Naval Technical Training, 1975.

Kulp, M. J. The effects of position practice readability level on performance (Unpublished Master's Thesis). San Jose, CA: San Jose State University, November, 1974.

O'Neil, H. F., Jr. (Ed.). Learning strategies. New York: Academic Press, 1978.

Sticht, T. G. Learning by listening. In R. O. Freedle & J. B. Carroll (Eds). Language comprehension and the acquisition of knowledge. New York: Wiley, 1972.

Sticht, T. G. A program of Army functional job reading training, development implementation, and delivery systems (Rep. 75-7). Alexandria, VA: Human Resources Research Organization, 1975. (a)

Sticht, T. G. Reading for working: A functional literacy anthology. Alexandria, VA: Human Resources Research Organization, 1975. (b)

Sticht, T. G., Caylor, J. S., Kern, R. P., & Fox, L. C. Project REALISTIC: Determination of adult functional literacy skill levels (Professional Paper 20-72). Alexandria, VA: Human Resources Research Organization, 1972.

Sticht, T. G., Fox, L. C., Hauke, R. N., & Zaph, D. W. Reading in the Navy (Tech. Rep. 76-14). Alexandria, VA: Human Resources Research Organization, 1976.

Tuma, D. T., & Reif, F. Problem solving and education: Issues in teaching and research. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers, 1980.

Weinstein, C. E. Seven learning activities (Unpublished manuscript). Austin: 1977. (Available from Department of Educational Psychology, University of Texas at Austin.)

APPENDIX A

LEARNING STRATEGIES AND STUDY BEHAVIORS INVENTORY AND CORRELATION RESULTS

INSTRUCTIONS:

For the following 15 items, select the answer that describes how you actually study. Answer in terms of what you do, not what you think is the best method. Mark your answer in Section C on your answer sheet. Begin with item 1.

1. You are reading a course assignment and find that the material relates to something you know about outside of class and are interested in. How often does this happen?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

2. You are reading some course material and are not understanding it, but you keep going anyway in order to finish the reading assignment. How often do you do this?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

3. You are reading some course material and are not understanding it, but you go back over the material until you do. How often do you do this?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

4. I find myself memorizing rules, definitions, formulas, etc., without understanding them.

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

5. In comparison to the amount of time spent reading your notes and the textbooks, how much time do you spend testing yourself on the material when studying for an exam?

   a. generally not at all
   b. a small amount of time
   c. a moderate amount of time
   d. a large amount of time

6. You have read some material for a course, and you feel that you understood pretty much what was being said. A classmate then asks you a question on the material or you try to recall some of the material yourself and find that you can't remember much of what you have read. How often does this happen to you?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

7. When reading do you consciously try to relate the material to other things that you know?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

8. How often do you look at only the figure and not read the related text that explains the figure?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

Figure A-1. Learning strategies and study behaviors inventory.

9. When practice problems are included in your reading assignment, how often do you do these problems?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

10. How often do you take sample tests that are included as part of the reading assignment?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

11. How often do you answer the questions that are included in the chapter?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently.

12. How often do you study with other people in your class?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

13. When reading course assignments, how often do you underline the material?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

14. When reading material consisting of both figure and text, how often do you use both to help you understand the passage?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

15. How often do you read a passage and not use the related figures?

   a. almost never
   b. sometimes
   c. frequently
   d. very frequently

Figure A-1. (Continued)

Table A-1

Correlations Between 15 Learning Strategies and Academic Performance in Self-paced Schools

School	Correlation Coefficients by Learning Strategy														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Class "A"															
YN	.03	-.09	.03	.08	.06	-.08	.05	-.08	.10	.04	-.08	-.06	.17*	.13	-.09
PN	.11	-.06	.02	-.14	.06	-.23*	.16	-.11	.15	.12	.16	-.26*	.03	.35*	-.08
BT	.02	-.02	.11*	-.06	-.03	-.09*	-.09*	-.02	.02	.03	-.05	-.02	-.03	.13*	-.13*
EN	-.05	-.07	-.05	-.02	-.09	-.19*	.05	-.13*	-.09	-.07	-.26*	.02	-.18*	.13*	-.16*
MM	.08*	-.11*	.03	-.17*	.01	-.15*	.03	-.21*	-.02	.05	-.02	-.12*	-.10*	.26*	-.22*
AK	.29*	.01	.19	-.27*	.23	.06	.04	-.15	.17	.20	.07	-.05	-.05	.23	-.16
RM	-.09	.15*	-.11*	.01	-.10*	.08	-.10*	.02	-.05	-.03	-.12*	.02	-.19*	-.15*	.02
AD	.15*	-.20*	.16*	-.13	.04	-.15*	.16*	-.05	.11	.09	.01	-.09	-.10	.25*	-.21*
DT	.01	-.07	.00	-.13	.06	.16	-.07	-.16	.10	-.05	-.02	.14	.02	.07	.03
BE/E															
ET & CTM	-.10	.21	-.10	.14	-.24	.32*	-.23	-.09	-.20	-.36*	-.28*	-.01	.31*	-.29*	-.05
FT	-.12	.13	.40*	.10	-.04	.38*	.30*	-.03	-.17	-.01	.02	-.36*	.00	.17	-.12

*p.< .05.

Table A-2

Correlations Between 15 Learning Strategies/Study Behaviors and Academic Performance in Group-paced Schools

Class "A" Technical School	Correlation Coefficients by Learning Strategy														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AC	.22	-.05	-.11	.19	-.11	-.13	.26*	.04	-.16	-.21	-.28*	-.12	.01	-.05	.05
HM	.24*	-.17*	.13*	-.17*	.09	-.16*	.26*	-.07	.16*	.16*	.05	.11	-.09	.19*	-.15*
SM	.00	-.21	-.04	-.16	.16	-.18	.32*	.14	.08	.01	-.01	-.04	-.10	.00	.03
QM	.21	-.12	.04	-.11	.13	-.04	.44*	-.07	.18	.37*	.30*	.21	.34*	.56*	.26*
MS	-.07	-.16*	.04	-.08	-.13*	.03	.01	-.18*	-.01	.11	.02	-.16*	-.08	.03	-.01
SK	-.05	-.12	.03	-.11	.11	-.14*	.17*	.02	.03	.13*	.11	.08	-.06	.19	-.09
GM	.04	.02	-.01	-.13	-.11	-.09	-.01	.06	-.05	.02	.03	-.19*	-.05	.09	-.12
ET & CTM	.12*	-.25*	.04	-.16*	-.09*	-.21*	.07	-.11*	-.02	.08	.00	-.17*	-.24*	.20*	-.13*
EM	.21*	-.08	.04	-.21*	-.04	-.08	.21*	-.10	-.01	.06	.01	-.05	-.06	.22*	-.09
AME	.15	-.10	.16	-.12	.18	-.07	.23*	-.07	.06	-.02	.00	.00	-.25*	.13	.00
AO	-.06	-.07	.07	-.20*	-.07	-.25*	.18*	-.13	.13	.06	-.08	.07	-.11	.12	-.11
AMS	-.04	-.15*	-.02	-.16*	.04	.00	-.05	-.07	.07	.02	.00	-.04	.06	.11	.00
AW	.19	-.18	.00	-.30*	.05	-.19	.00	.07	-.07	.05	-.22	-.21	-.19	-.02	-.26*
GMT	.11	.18	-.22	-.29	.07	-.57*	.51*	-.09	-.08	-.29	.09	.56*	-.28	.00	-.42
CTM	-.14	.09	-.19	.03	-.03	-.26	.03	.24	-.40*	-.18	-.08	-.15	-.21	-.07	.11
FT	.28*	-.14*	.14*	-.13*	.12	-.26*	.17*	-.06	.15*	.09	.18*	.02	.03	.14	-.07
AZ	.08	.08	.08	-.02	-.15	.13	-.34*	.11	.12	.00	.00	.00	-.15	.14	.22*
DK	-.09	-.10	-.07	-.13	.28	-.22	.06	-.02	-.08	-.12	.00	-.26	-.36*	-.21	.09
HT	-.09	-.18*	.08	-.30*	.03	-.04	.01	-.04	.00	.05	.02	-.11	-.01	.06	-.03
SM	.00	-.21	-.04	-.16	.16	-.18	.32*	.14	.08	.01	-.01	-.04	-.10	.00	.03
OS	.10	-.19*	.00	-.20*	-.03	-.25*	.32*	-.26*	.15*	.12*	.03	-.18*	-.09	.20*	-.27*
STG	.09	-.06	-.02	-.01	-.08	-.02	.03	-.04	-.06	-.09	-.01	-.03	.03	-.05	.02
AE	.15*	-.04	.13	-.12	-.20*	.03	.16*	.03	-.05	-.02	-.06	-.11	-.19*	.08	-.08
MR	-.06	-.12	.01	-.06	-.03	-.08	.27*	-.06	.15	.19	.15	-.02	.16	.17	-.22*
IC	.20*	-.13	-.16*	-.14	.15	-.13	.10	-.04	.01	.04	-.15	-.06	-.08	.22*	-.16
DP	.06	-.21	.19	-.32*	.39*	-.20	.20	-.31*	.29*	.39*	.19	-.14	.10	.44*	-.30*
AMH	-.09	-.16*	-.09	-.10	-.13	-.03	-.02	-.02	-.03	-.01	.00	-.04	-.02	.02	-.09
SH	-.01	-.13	.00	-.18	-.25*	-.18	-.24*	-.19	.04	-.16	-.17	-.19	-.10	.05	.03

*p < .05.

APPENDIX B

CUMULATIVE PERCENTAGE DISTRIBUTIONS FOR READING TEST PERFORMANCE IN SELECTED NAVY "A" AND BE/E SCHOOLS

Table B-1

Distribution of Students by RGLs in Selected Class "A" Schools and BE/E Strands

School	Cumulative Percentages by RGL							$\bar{X}$	N
	<7.9	<8.9	<9.9	<10.9	<11.9	<12.9	≤13.8		
AC	6.7	13.3	20.0	28.9	33.3	60.0	73.3	12.4	45
AD	20.9	33.2	46.9	63.0	75.4	82.5	88.2	10.5	211
AE	8.5	20.6	30.5	41.8	58.9	74.5	81.6	11.4	141
AK	16.3	30.2	34.9	39.5	51.2	69.8	79.1	11.4	43
AME	25.8	43.9	57.6	77.3	84.8	92.4	95.5	9.6	66
AMH	16.5	32.0	48.5	63.9	78.4	90.7	93.8	10.0	97
AMS	27.7	42.1	54.9	73.8	84.1	93.3	95.4	9.6	195
AO	26.9	41.8	59.0	66.4	76.9	89.6	95.5	9.6	134
AQ	3.3	6.7	10.0	26.7	36.7	53.3	60.0	13.3	30
AT	4.5	7.1	16.0	26.3	39.1	51.3	62.2	12.4	156
AW	3.9	5.9	11.8	15.7	23.5	54.9	64.7	12.8	51
AX	0.0	3.2	6.5	12.9	25.8	48.4	51.6	13.8	31
AZ	15.1	24.7	43.8	52.1	58.9	75.3	86.3	10.9	73
BT	16.3	31.9	48.1	64.4	73.1	82.4	88.9	10.0	382
CTM	0.0	0.0	12.0	24.0	32.0	48.0	56.0	13.3	25
DK	7.1	9.5	16.7	31.0	47.6	66.7	81.0	12.0	42
DP	6.7	6.7	13.3	17.8	33.3	46.7	57.8	13.3	45
DT	16.7	35.0	55.0	66.7	76.7	86.7	93.3	10.0	60
EM	6.2	11.2	20.8	30.1	39.8	53.7	63.7	12.8	259
EN	11.5	23.0	34.5	47.7	63.2	79.3	86.2	10.9	174
ET	3.1	5.3	10.2	15.8	26.9	42.1	50.5	13.8	323
FT	1.1	3.9	14.4	26.0	36.5	56.4	64.6	12.8	181
GM	11.0	16.9	25.0	41.9	55.1	70.6	80.9	12.8	136
GMT	0.0	27.3	27.3	45.5	54.5	63.6	72.7	11.4	11
HM	7.9	15.3	27.2	38.6	54.0	72.3	77.2	11.4	202
HT	17.4	27.8	42.4	53.5	62.5	77.8	86.1	10.9	144
IC	9.1	12.1	20.2	30.3	37.4	52.5	64.6	12.4	99
MM	8.6	14.1	25.2	34.5	45.7	59.4	71.9	12.4	313
MR	15.2	30.3	50.0	56.1	63.6	75.8	86.4	10.5	66
MS	20.2	34.4	48.2	60.6	72.5	85.3	91.7	10.0	218
OS	8.2	16.8	29.1	42.7	51.8	72.7	81.8	11.4	220
PN	7.9	13.2	20.2	31.6	41.2	61.4	70.2	12.4	114
QM	17.4	30.4	43.5	63.0	71.7	91.3	93.5	10.5	46
RM	10.4	20.1	35.1	48.0	62.6	75.8	83.6	10.9	433
SH	25.0	40.9	56.8	61.4	77.3	93.2	93.2	10.0	44
SK	12.3	22.2	30.4	45.0	57.3	80.1	85.4	11.4	171
SM	14.0	25.6	39.5	53.5	69.8	83.7	86.0	10.9	43
STG	3.6	8.4	15.7	21.7	31.3	47.0	63.9	12.8	83
STS	0.0	0.0	0.0	9.7	19.4	41.9	54.8	13.8	31
TD	0.0	0.0	6.4	12.8	23.4	44.7	57.4	13.8	47
YN	12.6	22.0	32.1	43.4	56.0	66.7	78.6	11.4	159
AQ[a b]	0.0	8.3	16.7	25.0	36.1	50.0	58.3	12.8	36
EM[b]	6.5	16.7	28.7	33.3	44.4	66.7	77.8	12.0	108
ET/CTM[b]	6.9	16.1	24.1	33.3	43.7	56.3	65.5	12.4	87
FT[b]	3.6	10.0	10.9	18.2	28.2	40.9	48.2	13.8	110
GM/GMT[b]		4.5	11.6	22.3	42.0	49.1	66.1	76.8	12.0

[a]Includes AQ, AT, AX, and TD.

[b]BE/E strand.

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