THE MAINE EDUCATIONAL ASSESSMENT

1985-86

STATE SUMMARY

AND

INTERPRETATIONS REPORT

Department of Educational and Cultural Services
Division of Educational Assessment

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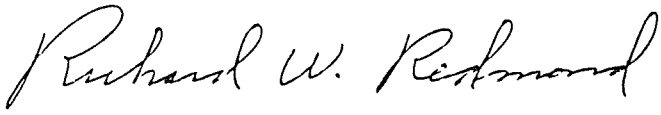
FOREWORD

The first year of the Maine Educational Assessment has provided important benchmark information on student achievement which will be of great value in determining the future impact of the Educational Reform Act of 1984. Local school and district reports provide a rich source of information to support local efforts to plan and improve school programs. While local results accurately reflect how a particular class of students performed on the assessment instruments, year-to-year fluctuations in performance levels of students taking the tests warrant the use of caution in using one year's set of results to determine program strengths and weaknesses. It will be necessary for schools to examine multiple years' data to analyze performance trends accurately.

Results of the 1985-86 testing, together with other performance indicators and knowledge of local programs and the students who took the tests, can certainly lead local educators to suspect that they may have areas of strength and weakness in their programs. In that event, this State Summary and Interpretations Report can be of great use. Curriculum experts from across the state have examined the statewide results. Their interpretations and recommendations discussed in the various sections of this report are intended to assist local school improvement. The loose-leaf format and different colored sections are designed to facilitate the reproduction of the report sections and distribution to the appropriate school personnel.

I wish to thank the school district staff whose cooperation and support were so helpful in making this first year's effort so successful.



Richard W. Redmond, Commissioner

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TABLE OF CONTENTS

SECTION I

INTRODUCTION

The Maine Educational Assessment is a program growing out of the Educational Reform Act of 1984. That legislation called for a comprehensive set of reforms directed toward school improvement. According to the legislation, the goals to be achieved by the assessment program are to:

- o provide information on the academic achievement and progress of Maine students;
- o establish a process for continuing evaluation of state educational goals and to aid in the development of educational policies, standards and programs;
- o provide school officials with information to assess the quality, effectiveness and appropriateness of educational materials, methods and curriculum needs, including remediation and enrichment;
- o provide school staffs with information about the individual students which may be used, with other information, to meet individual educational needs of the student;
- o identify year-to-year trends in student achievement; and
- o provide parents with information about the achievement of their children on the assessment tests.

The assessment program is being administered by the Division of Educational Assessment of the Department of Educational and Cultural Services with the cooperation of the Division of Curriculum, the Division of Special Education, and the Bureau of Vocational Education. Assisting the state personnel is the contractor for the assessment, Advanced Systems in Measurement and Evaluation, Inc. of Dover, New Hampshire.

The Maine Educational Assessment Program is a far more comprehensive statewide testing program than previously operated in Maine, and one with aspects making it unique among testing programs nationally. In 1985-86, between 96 percent and 98 percent of the fourth, eighth, and eleventh grade students in Maine completed the testing, which required four and one-half to five and one-half hours of testing time. The students were tested in seven different subject areas. For purposes of program assessment, the test instruments were designed to provide coverage of a broad range of curricular objectives within each area. Test development was a cooperative effort of state curriculum advisory committees (consisting of Maine educators), the Department of Educational and Cultural Services, and the contractor for the assessment. Those same groups were responsible for the interpretations of statewide results presented in this report. Individual student scores were reported in reading, writing, and mathematics; and school and district scores were reported in those three areas as well as in writing conventions, science, social studies, and humanities.

SECTION II

PROGRAM DESIGN, TEST ADMINISTRATION, AND REPORTING

Design of the Program

Type of Testing

The MEA program combines aspects of standardized achievement testing and program assessment. A set of "common questions" in reading, mathematics, and writing were administered to all Maine students in grades 4, 8, and 11. This enabled the reporting of test scores for individual students in those three subject areas. The common question set alone does not provide the broad coverage of content areas required for purposes of program evaluation. Therefore, other questions, called "matrix sampled" questions, were distributed over many booklets so that each of these questions would be answered by only a sample of students. These additional questions pertained not only to reading and mathematics, but to other subject areas as well. There were sixteen test forms used at each grade level tested, and each contained the common questions and one-sixteenth of the matrix-sampled questions. Thus, the matrix sampling technique allowed for broader, more reliable assessment of many content areas at the school level using a minimum amount of testing time.

An assessment should be thought of as a survey of competencies covering as much of a subject domain as possible. In this way, it is unlike many other types of tests which address more restricted domains and include repeated measures of particular skills or concepts. In an assessment, it is appropriate to include not only questions on skills and concepts expected to be understood by any student in any school, but also questions dealing with content not taught to all students or in all schools. A program evaluation should look at what is being covered as well as how well it is being covered by an instructional program. A school giving undue emphasis to mastery of basic skills may be shortchanging students in terms of the attention given to different subjects or higher order skills within a subject area. Such an emphasis might be reflected in good scores in some subjects or subtests within a subject and poorer scores in others. It is up to the school or district to decide if such a pattern of results is acceptable in light of decisions made regarding the design of the curriculum. It may be that an apparent weakness at grade 8, for example, is the result of a deliberate practice calling for the neglecting of this area until after grade 8.

MEA Assessment Instruments

The table below shows the number of test questions administered in the various subject areas tested.

	Common Questions						Matrix Sampled Questions		
	Multiple-Choice			Open Ended			(all multiple-choice)		
Subject	Gr.4	Gr.8	Gr.11	Gr.4	Gr.8	Gr.11	Gr.4	Gr.8	Gr.11
Reading	36	39	40	8	10	10	160	160	160
Writing	--	--	--	2	2	2	--	--	--
Writing Conventions	--	--	--	--	--	--	64	80	80
Mathematics	40	40	40	10	10	10	128	160	160
Science	--	--	--	--	--	--	96	100	100
Social Studies	--	--	--	--	--	--	79	101	100
Humanities	--	--	--	--	--	--	64	87	87

The tests were tailored to the frameworks for objectives developed by various advisory committees consisting of Maine teachers, administrators, and curriculum experts. The committees reviewed, revised, and selected test questions for inclusion in the tests. The predominant test question format was multiple-choice. However, writing was measured directly through the use of writing prompts eliciting samples of students' writing. In addition, students were administered some open-ended questions as part of the reading and mathematics tests. These questions were particularly useful for measuring some higher order thinking skills and for examining strategy usage in math. Writing samples and responses to open-ended questions required hand scoring. More complete information on the test content in the different subject areas is provided in later sections of this report.

Student, teacher, and principal questionnaires assessed a variety of background, experiential, attitudinal, and instructional variables. These instruments produced important information on correlates of performance of use in interpreting and explaining results.

Test Administration

The tests were administered by local school personnel in November at grade 8, February at grade 4, and late April/early May at grade 11. Scheduled testing sessions were held early in the two- to three-week testing periods so that there would be ample time to complete make-up testing. Detailed instruction manuals and regional training workshops conducted a few weeks prior to the testing at each grade level were used to provide test coordinators and administrators with the information they needed regarding testing procedures.

All public school students and students approved for tuition purposes in the three target grades were tested. Most special education students were tested. An extensive list of approved testing modifications allowed the testing of these students in a manner consistent with their regular instructional programs.

The testing was organized into separate sessions -- student questionnaire, reading, mixed subjects, mathematics, open-ended mathematics, open-ended reading, first writing prompt, and second writing prompt. The total testing time required was approximately five and one-half hours at grades 8 and 11 and four and one-half hours at grade 4. It was recommended that the scheduled testing sessions be spread over a minimum of four days, thereby requiring only an hour to an hour and a half of testing on any one day.

School/district personnel were also responsible for providing accurate information on students who were partially or totally excluded from testing, who were tested with modifications, who belonged in special programs, etc.

Reporting

Student level results in reading, writing, and mathematics were reported to the schools in a variety of ways. The Item Level Class Report (shown below) presented each student's response to every one of the "common" questions included in the assessment. It also provided the percent of students responding correctly to each of these questions for the state, the school, and, if requested, classroom.

On the reverse side of this report was the Number Correct by Objective Report which presented each student's raw scores (number correct in reading and mathematics; ratings of scorers in writing) and corresponding percentile rank in the various reporting categories of reading, writing, and mathematics. All of this information was provided on gummed labels for individual student school records and in tailored letters from the Commissioner of Education to the parents of every student tested.

ITEM LEVEL CLASS REPORT

District: Springwater
School: Springwater High School
Class: AAAAA
Group size: 17
Grade 11
April 1986
Page 1

	READING							MATHEMATICS				OPEN-ENDED		WRITING
							OPEN-END							
ADAMS	++A++++++H	A+++++++B+	+++HAHA+++	++A++B+++	+97++9+393	+++++++B+	++++++++CG	+++++++++E	+G+EBH+G++	645+9++++9	666666445654
	+++G+++++E	++++C++E+H	++A+AHA+++	++A+DGB+D+	++3+496999	+++GB++++++	+GD++++++++	+++++F+G++	C+B+++++++	+4+++3++6+	244666435455
	CGBHBGBEB+	DGBEAFCHC+	AFCHC+AFCH	BGBHAGBGB+	08606+++53	BHAGDFD+C+	C++GB+AHB+	+H+++F+++AE	CGB++HDG++	+99090+060	444665444244
	+H+++++++++	++++++++++	+++++HA+++	++A+BG++++	6+1+3++363	++++++++++	++D+++++C+	+++++++++E	C++++F++++	+4+++7++6+	565666888776
	++A++++++H	++A+++AE+H	+++++EA+B+	++A+B++++	782+++6363	+++G+++C+	+FD+B+++C+	+++++F+++E	+G+E++++++	+47+9++++9	665666445666
	+H+++++++++	++++++++++	++++++A+++	++A+++B+++	++2++++++	++++++++++	++++++++++	+++++++++E	+++E++++++	+4++++++++	877667666778
	+++++G++++	++++AH+++H	++++A+A++H	++A++GB+++	++7+++7+++	C++++++H++	AFD+A++G++	+++++++++E	+G++D+++++	+46++++8+	645667555665
	+GBE++++++	+++++HA+BH	B+A+AHD++G	B+BED+B+++	++1+6+++++	+G+H+H++C+	+F+HB++GCH	++D++F+H++	CFA+++++AE	+499779699	664464576656
	++++++++++	++++D+++BH	+++++EA+++	++++A+DF++	++7++++++3	+++++F++B+	+F+EBF+GCG	+E+F+GC++G	+++GD+CED+	+4+065+664	445665565666
	+H++++++++	++++++C++H	++++BE+EB+	++B+D+B+++	++1++++363	++B+D++++F	++++++++C+	+++++++++E	+++++H+E++	+4++++++++7	666566665556
	+++++G++++	+++++H++BH	++++AE++++	++C+DGB+++	++1+++++63	+G+G+H+HD+	+++H+++HDG	++++++BG++	DF++BHDE+E	+46++O+O6O	676665444565
	++++++++++	++++++++A+	+++FCHA+++	++++B+++++	++2++++++	++++++++++	+E++B++H+G	++++++++++	+++E++++++	+4+O5+++7+	776668666667
	++++++++++	++++++++BH	++++BH+E++	++C++GC+D+	++2+5+++4+	+++F++++B+	++D+B++++G	+++++++E+E	C++++++++	+4+++7+69+	565666544555
	+G+G+G++++	++A+++A+BH	+++++H+E++	+FC++FC+++	+87+4+++53	++BG+H++D+	+G+++++G+G	+++F+++G++	++++C++E++	+47++06090	777664322434
	++BH+G+H++	++A++GBE+E	A+++BH++C+	DECG++BF++	++59+++53	++++++++B+	+FDH+++G+H	+++++FB+DG	DG+EB++E+E	+4++64++59	555665334554
	+G+H+++H+E	+++++HC++H	+H++AH++C+	++AGD+++++	++5+696399	C++F+++ED+	A+++A++GDF	+++GC+++DE	C++GBHD+AE	++9++7669+	6666764433333
	+G+++F+++H	+ED+CH++BH	++AFAGAF++	D+CGD+B++H	++5+++7353	+++G+H+EC+	CF+++++GCF	+EDG+++++E	D+BH+H+E+E	476+705699	645454444666
CLASS PERCENT CORR.											MEAN SCORE
SCHOOL PERCENT CORR.											MEAN SCORE
STATE PERCENT CORR.											MEAN SCORE

RAW SCORE-PERCENTILE RANK — NUMBER CORRECT BY OBJECTIVE REPORT

	READING								MATHEMATICS				WRITING		
	COMPREHENSION	MANAGEMENT	LITERARY	CONTENT	PRACTICAL	LONG PASSAGES	SHORT PASSAGES	TOTAL READING	COMPUTATION	CONCEPTS	APPLICATION	TOTAL MATH	INFORMATIONAL	EXPOSITORY	TOTAL WRITING
MAXIMUM RAW SCORE	32	18	19	17	14	26	24	50	17	16	17	50	48	48	96
ADAMS	26-82	8- 9	13-65	12-72	9-19	21-80	13-31	34-54	15-80	10-51	11-54	36-64	36-73	28-36	64-53
	20-40	9-14	11-41	8-25	10-27	17-40	12-25	29-29	13-63	13-82	13-72	39-73	28-15	26-24	54-13
	3- 1	4- 1	2- 1	3- 2	2- 1	2- 1	5- 1	7- 1	5- 4	6-21	7-16	18- 6	29-20	22- 8	51- 8
	25-76	13-67	12-54	13-80	13-91	21-80	17-65	38-75	16-89	13-82	13-72	42-84	34-56	44-99	78-94
	21-47	11-36	10-31	10-46	12-68	18-51	14-39	32-43	12-53	10-51	14-82	36-64	35-64	31-57	66-64
	29-98	16-97	16-94	16-98	13-91	24-99	21-96	45-99	17-97	14-90	16-96	47-97	41-95	40-95	81-97
	23-61	15-89	13-65	13-80	12-68	18-51	20-91	38-75	15-80	12-71	10-44	37-68	34-56	32-63	66-64
	17-24	13-67	8-15	11-60	11-43	15-25	15-46	30-33	8-17	7-29	8-25	23-22	30-26	35-80	65-59
	26-82	14-80	16-94	11-60	13-91	21-80	19-84	40-85	9-24	6-21	9-35	24-25	30-26	34-76	64-53
	25-76	11-36	12-54	11-60	13-91	21-80	15-46	36-63	13-63	13-82	15-90	41-81	35-64	33-69	68-70
	25-76	12-51	14-76	11-60	12-68	18-51	19-84	37-69	12-53	4- 6	10-44	26-31	36-73	28-36	64-53
	27-89	16-97	15-86	16-98	12-68	23-95	20-91	43-96	15-80	14-90	12-63	41-81	40-93	37-88	77-93
	25-76	13-67	14-76	11-60	13-91	20-69	18-75	38-75	13-63	12-71	13-72	38-71	34-56	28-36	62-44
	22-54	10-23	11-41	9-35	12-68	16-32	16-55	32-43	11-44	11-61	10-44	32-52	37-81	18- 2	55-17
	16-21	11-36	10-31	7-17	10-27	13-15	14-39	27-22	13-63	5-12	11-54	29-40	32-41	24-13	56-20
	18-30	11-36	10-31	10-46	9-19	16-32	13-31	29-29	10-34	7-29	8-25	25-28	37-81	20- 5	57-24
	17-24	7- 5	9-22	7-17	8-12	13-15	11-20	24-16	10-34	6-21	6-10	22-18	28-15	30-49	58-28

Figure 2-1. Student level results.

The school and district reports followed the same format. The sample report sections shown below are from a district report. Near the beginning of the report, the students tested in the school were described. That is, data were provided on the number of students enrolled, the number whose results were used in the computation of school/district scores (i.e., students completing the entire test battery and not special education students in self-contained or Composite B instructional programs), the number partially or totally excluded from testing and the number of special education students included and not included in the school/district score computations.

Figure 2-2 below shows the section of a report depicting a district's test scores in the major content areas.

Content Areas	Year	Average Test Score			Comparison Score Band	Your scaled score is shown as a vertical line and the Comparison Score Band as a horizontal bar. 100 150 200 250 300 350 400
		State	District	School		
Reading	1985-86 1986-87 1987-88	250	230		220-260	
Writing	1985-86 1986-87 1987-88	250	240		215-255	
Writing Conventions	1985-86 1986-87 1987-88	250	250		225-265	
Mathematics	1985-86 1986-87 1987-88	250	275		215-255	
Science	1985-86 1986-87 1987-88	250	260		225-265	
Social Studies	1985-86 1986-87 1987-88	250	260		220-260	
Humanities	1985-86 1986-87 1987-88	250	240		205-245	

Figure 2-2. Scaled scores for a district.

Scaled scores were used in the program because of the ease with which they may be used for interpreting relative performance. For example, they allow performance comparisons between subtests within a content area, between content areas, between groups of students, and across years. The scaled scores for a school or district are complex aggregations of test question results (not student results since students did not all answer the same questions). The scaling process applies the techniques of Item Response Theory currently used by most large-scale testing programs. More detail on the MEA scaling procedures is provided in a separate technical summary.

In 1985-86, the scale selected for the reporting of school and district results had a mean of 250 and a standard deviation of 50. An MEA scaled score indicates where on a distribution of scores for Maine schools or districts a particular school or district scored. This is an important point, because a school could score above national averages in other testing programs, but find itself below the statewide average in Maine. In fact, 50 percent of the Maine schools must be below the statewide average. The focus of the MEA is on performance within Maine, not between Maine and the nation. In the figure

above, the data show that the district scored very close to the statewide average in all areas.

The horizontal bars in Figure 2-2 are Comparison Score Bands. These bands are derived from data on the actual relationships between various background factors and 1985-86 MEA performance results. They permit a school or district to compare its results with results of similar populations of students. If there were many districts with exactly the same background characteristics as the one in question (there need not be), 25 percent of them would score below the band, and 25 percent would score above it. Thus, the Comparison Score Band itself represents the middle 50 percent of "similar" populations. Taking into account the background factors, the district represented in Figure 2-2 did well in mathematics. A later section of the reports described the school or district status relative to statewide averages with respect to the background factors, which were socioeconomic factors. Additional information on Comparison Score Bands and background factors is also provided in the technical summary for the assessment.

FOR EXAMPLE, 18 PERCENT OF YOUR STUDENTS HAD READING SCORES IN THE TOP QUARTER OF THE STATEWIDE DISTRIBUTION.

Content Areas	Year	The Number and Percentage of Students in Each Quarter of the State Student Distribution							
		Lowest Quarter		Second Quarter		Third Quarter		Highest Quarter	
		N	%	N	%	N	%	N	%
Reading	1985-86 1986-87 1987-88	58	24	73	31	67	28	42	18
Writing	1985-86 1986-87 1987-88	68	29	54	23	60	25	58	24
Writing Conventions	1985-86 1986-87 1987-88	27	22	29	24	33	27	32	26
Mathematics	1985-86 1986-87 1987-88	49	21	63	26	62	26	64	27
Science	1985-86 1986-87 1987-88	57	24	68	29	62	26	51	21
Social Studies	1985-86 1986-87 1987-88	64	27	56	24	63	26	55	23
Humanities	1985-86 1986-87 1987-88	54	23	72	30	59	25	53	22

Figure 2-3 shows the display in a district report that tells how scores for that district's students are distributed relative to statewide student scores. The statewide distribution of student scores was divided into four groups of equal size by the state quartile scores for each content area. Each quartile marks off, respectively, the lowest quarter of scores, the next highest quarter, and so on. The percentages of students in the district with scores in each of these score ranges are presented for each content area. Statewide, 25 percent of the students have scores in each quarter of the distribution. The district represented in the figure has 18 percent of its students in the highest quarter for reading. Therefore, it has a smaller proportion of its students in that quarter than do schools statewide.

Figure 2-3. Student score distribution.

Scaled scores were also reported for various areas within each of the major subject areas. Figure 2-4 shows a district's Program Diagnostic Display for mathematics. This district did relatively well in mathematics, but the display does show two areas of relative weakness -- Variables and Relationships and Other Topics. This finding should encourage district personnel to refer to other MEA documents to learn more about the test content in these areas. Then, by examining their curriculum, they may find shortcomings in their program in algebra, probability and statistics, etc.

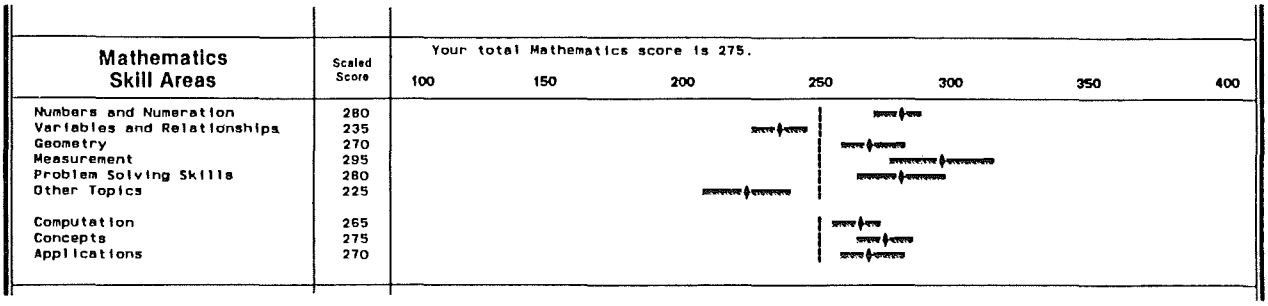


Figure 2-4. Program diagnostic display -- mathematics.

The school and district reports also provided subgroup results. Subgroups were based on responses to questionnaire items and data on involvement in special programs, language fluency, etc. The reports gave the percentage of students in each subgroup for the school/district and statewide. Also, average test scores were provided for the subgroups. Figure 2-5 is a page from the Subgroup Report section of a district report.

	DISTRICT								STATE							
	STUDENTS	SCALED SCORES							STUDENTS	SCALED SCORES						
	%	READ	WRIT	CONV	MATH	SCI	S.S.	HUM	%	READ	WRIT	CONV	MATH	SCI	S.S.	HUM
HOW OFTEN DO YOU USE A CALCULATOR IN MATH?																
NEVER.	40	160	173	116	146	239	187	158	30	210	210	204	183	219	212	217
A FEW TIMES A YEAR.	10	205	231	198	297	313	295	222	16	278	267	265	309	294	287	266
A FEW TIMES A MONTH.	17	225	258	260	400	215	372	315	14	284	280	285	313	277	280	282
A FEW TIMES A WEEK.	15	383	327	260	400	351	388	400	18	291	285	300	311	295	297	294
ALMOST EVERY DAY.	17	260	320	321	247	354	281	272	22	239	250	248	218	210	229	229
HOW DOES ALGEBRA II APPLY TO YOU?																
COMPLETED.	6	278	295	268	400	297	377	400	19	392	357	400	400	400	400	400
CURRENTLY ENROLLED.	44	265	301	232	400	323	361	355	30	347	322	342	400	378	392	351
WILL COMPLETE NEXT YEAR.	15	238	196	398	250	400	349	219	10	238	235	217	195	229	239	254
DO NOT PLAN TO TAKE COURSE.	31	139	172	100	100	100	126	153	39	126	158	126	100	100	100	107
WHAT DO YOU PLAN TO DO AFTER HIGH SCHOOL?																
GET A FULL-TIME JOB.	28	100	120	179	100	100	100	100	18	100	135	115	100	100	100	101
ENTER A TRADE OR VOCATIONAL SCHOOL.	16	195	206	100	175	332	217	187	17	149	173	131	118	157	129	117
GO TO COLLEGE.	44	338	342	400	400	344	400	332	55	352	332	356	383	359	374	358
JOIN A BRANCH OF THE ARMED SERVICES.	11	156	176	265	195	400	135	234	10	151	153	100	150	201	198	167
WHICH WILL BE MOST IMPORTANT IN NEXT 25 YEARS?																
SOLVING COMMUNITY PROBLEMS.	0								1	281	280	234	260	297	291	320
MARRIAGE AND FAMILY.	22	170	186	287	133	209	100	114	22	228	238	257	207	198	187	225
MONEY.	6	157	165	100	177	269	395	169	7	156	166	143	179	193	198	165
LEISURE TIME.	7	286	199	290	393	400	380	224	9	250	221	214	286	321	309	269
SUCCESSFUL CAREER.	64	237	264	303	308	224	262	236	61	264	267	263	264	267	263	262
WHAT KIND OF READER DO YOU THINK YOU ARE?																
A POOR READER.	6	100	111	139	156	100	100	118	6	100	118	100	131	116	100	100
A GOOD READER.	57	191	223	257	203	191	188	183	57	228	235	215	223	223	212	214
A VERY GOOD READER.	31	335	309	400	400	400	400	330	29	371	338	400	366	374	400	400
I DON'T KNOW.	5	165	182	100	162	257	100	100	8	100	137	100	117	135	100	100
DO YOU GET ANY OUT-OF-STATE PERIODICALS?																
YES.	47	218	255	265	286	253	328	240	44	299	289	293	316	318	335	313
NO.	48	247	238	368	291	251	206	197	54	219	227	226	209	209	193	210
I DON'T KNOW.	4								3	119	130	100	100	119	100	110
HOW OFTEN DO YOU READ AT HOME FOR PLEASURE?																
EVERY DAY.	24	339	302	335	400	400	400	294	22	327	299	327	325	349	370	354
TWO OR THREE TIMES A WEEK.	19	227	213	138	190	141	256	277	29	290	278	291	277	285	293	288
ONCE A WEEK.	9	238	289	400	274	326	181	400	13	251	269	259	247	248	216	244
LESS THAN ONCE A WEEK.	30	244	253	335	336	252	230	163	23	220	230	225	227	208	199	204
NEVER.	18	100	143	232	100	100	100	100	13	100	130	100	121	116	100	100

Figure 2-5. Subgroup report.

In the figure, the data for the last set of subgroups suggest that the students in this district may read for pleasure a little less than students statewide (see the district and state percentages of students) and that frequency of pleasure reading is related to reading performance (see state reading scores). Although one must be cautious in inferring causal relationships from such data, one may often see possible ways to improve performance by examining these results.

SECTION III

DEMOGRAPHICS, QUESTIONNAIRE RESULTS AND COMPARATIVE ACHIEVEMENT

Demographics

Students Tested, Test Modifications, and Exclusions

As noted in Section II, all public school students and students approved for tuition purposes in grades 4, 8, and 11 were tested, including most special education students.

The school reports for each grade include statistics on students enrolled, students tested or excluded, and special needs students included in the report. A summary for the three grades follows.

TABLE 3-1

Numbers of Students Tested in the 1985-86 MEA

	Grade 4 Number (%)	Grade 8 Number (%)	Grade 11 Number (%)
Students enrolled	14,657 (100%)	16,802 (100%)	15,546 (100%)
Handicapped students tested, but not included in reports	322 (2%)	337 (2%)	173 (1%)
Students excluded or otherwise unaccounted for	323 (2%)	597 (4%)	523 (3%)
Students included in report	14,012 (96%)	15,868 (94%)	14,850 (96%)
Students with handicapping conditions included in the reports	1536 (10%)	1796 (11%)	570 (4%)

The MEA program, as directed by the legislation, tests many students who might have been excluded from previous Maine testing programs. An extensive list of approved testing modifications allowed the testing of special education students in ways consistent with their regular instructional programs. A summary of their handicapping conditions and the test modifications made to accommodate their needs is presented on the following page.

TABLE 3-2

Students' Handicapping Conditions and Test Modifications

Handicapping Condition	# of Students w/Each Condition* Grade 4	Grade 8	Grade 11
Mental development or maturation	788	572	438
Audition (hearing impaired)	41	16	4
Audition (deaf)	21	10	15
Speech and language (speech impaired)	182	54	6
Vision (visually impaired)	57	12	20
Behavior (emotionally handicapped)	662	491	132
Physical mobility (orthopedically handicapped)	58	4	17
Other health impaired (chronic illness)	27	16	23
Cerebral or perceptual (learning disabled)	1842	1364	721
Multi-handicapped	145	24	33
Pregnancy or temporary traumatic injury	6	2	3

Test Modifications	# of Students for Whom Each Modification Was Made* Grade 4	Grade 8	Grade 11
Tests were administered:			
at time of day beneficial to student	285	150	89
in short periods followed by rest breaks	200	147	69
until student could no longer sustain activity	196	159	74
in a small group	453	360	203
in a carrel	17	12	6
in the special education classroom	457	307	161
at the student's home	3	1	0
with the student seated in front of classroom	41	26	6
with teacher facing student	186	120	62
by the special education teacher	490	342	212
by other school staff known to student	170	115	51
individually	152	81	55
in large print	9	6	5
in Braille	1	0	0
with student using magnifying equipment	2	3	3
with student wearing noise buffers	1	0	0
using template	2	0	0
with student using amplification equipment	11	5	0
with student using typewriter or word processor	3	8	0
Student marked booklet; answers transferred	170	85	15
Student's answers were recorded by another	31	34	9
Tests (except reading test) read to student	535	302	128
Interpreter-tutor gave test directions	191	169	115
Student excluded from: reading test	103	45	52
math test	12	22	31
writing test	78	35	45
other test	27	28	21
Other test modifications	2	3	0

* Because some students had multiple handicapping conditions and modifications, the numbers of handicapping conditions and modifications add to more than the number of students with handicapping conditions and modifications.

Student Participation in Special Programs

Schools were asked to provide background information on each student regarding participation in special programs. The information for all grades is summarized below.

TABLE 3-3

Student Participation in Special Programs and English Language Fluency

Program	Percentages at:	Grade 4	Grade 8	Grade 11
ECIA Chapter I Program		18%	8%	--
State-approved gifted/talented/ enrichment program		1%	3%	4%
Migrant program		6%	1%	1%
English language fluency:				
	English only	98%	93%	95%
	Limited English proficient	--	--	1%
	Home language other than English	1%	2%	6%
Identified handicapping conditions		12%	13%	5%

Information from Student, Teacher, and Principal Questionnaires

Student Questionnaires

Student questionnaires asked about attitudes toward school, educational experiences, and activities both inside and outside the classroom that influence learning. The factors measured in these questionnaires are, in many cases, strongly related to achievement in the MEA tests; those relationships will be covered in greater detail in Sections IV through VIII of this report. There are, however, general trends that frame the school experience for fourth, eighth, and eleventh graders in Maine.

Student populations in Maine are relatively stable. Almost 70 percent of the students in grades 8 and 11, for example, indicate that they started school in their district before grade 3.

Students responded to several questions about activities that may influence learning in the subject areas of the MEA tests. Students in all three grades were asked how often they had visited museums as part of a school program. As might be expected, some 60 percent of the third graders answered "never" or "once." By eighth grade, however, 30 percent of the students had visited a museum more than three times, and 50 percent had visited more than twice;

almost 40 percent of the eleventh graders had made such a field trip more than three times, and 60 percent had been to a museum more than twice.

All students were also asked about their sources for news and current events. As might be expected, television ranks as the most frequently-used news source, with more than half of the students depending on that medium for news. Although well over three-quarters of the families of students receive a newspaper regularly, "teachers, family, and friends" ranks as a strong second news source for students at each level, outranking newspapers and radio at third grade and competing with those two media at the upper levels. Teachers of all subjects might find news and current events in their field to be a valuable addition to classroom work, considering the importance of this means of sharing information in the students' lives.

Computer literacy has been a much-publicized topic recently, and younger Maine students indicate that they are becoming familiar with computers as a learning tool. Third graders and eighth graders were asked about computers at home and at school. About 30 percent of the students at each grade indicate that they have computers at their home. Almost half of the third graders use computers several times a month in school, and 30 percent of them use computers at least weekly. Almost 60 percent of the eighth graders indicated they use computers at school.

Maine's eleventh graders were asked several questions about career education, plans after high school, and career guidance. Seventy-two percent of the students plan to further their education, either in college (55 percent) or in a trade/vocational school (17 percent) after graduation. Nineteen percent plan to work full time after graduation, and 10 percent indicate they will enlist in the armed services. Table 3-4 depicts the post high school plans for eleventh grade males and females separately. As expected, more males than females plan to attend trade or vocational schools and join the armed services. More females intend to go to college. One should keep in mind that the question did not specify types of colleges or college programs. Students could have considered some trade schools (e.g., business colleges) as "college" and not "trade school."

TABLE 3-4

Post High School Plans of Grade 11 Males and Females in Maine

	full-time job	trade or VOC school	college	armed services
percent of males	17	21	45	16
percent of females	19	12	65	3

Table 3-5 shows the average test scores for males and females with different post high school plans. The male/female differences in the different subject areas (discussed later in this section) are preserved across the

categories of future plans. Clearly, the students intending to go to college are the higher achieving students, as expected.

TABLE 3-5

Average Percents Correct of Grade 11 Males and Females by Post High School Plans

Subject	Gender	full-time job	trade or VOC school	college	armed services
Reading	Male	59	63	76	65
	Female	64	67	77	66
Writing	Male	53	58	71	59
	Female	62	66	73	62
Math	Male	52	57	76	58
	Female	50	53	67	52
Science	Male	56	59	74	61
	Female	50	54	63	53
Social Studies	Male	57	60	71	62
	Female	54	57	64	56
Humanities	Male	51	51	70	57
	Female	54	57	67	54

Career choices have not been strongly influenced by the people closest to these students: almost half of the eleventh graders chose "others" over parents, teachers, guidance counselors, or peers as influential in future plans. In another question, 38 percent of the students indicated that their guidance counselor had given them little or no help in the choice of college, vocational, or trade school; 54 percent said they experienced the same lack in selection of career. Forty-six percent of the students indicate they need help in planning education or training--help in making decisions and plans which, for them, are imminent and pressing.

In questions relating to this, eleventh grade teachers were asked about formal and informal career guidance they provide for students. Almost 70 percent of the teachers do not work with school guidance staff in any formal career education; only 38 percent of the teachers say they feel very well prepared to handle career discussion in their subject in the classroom.

Teacher Questionnaires

Teachers of fourth, eighth, and eleventh grade students completed a questionnaire asking about their professional backgrounds and experience and their classroom activities.

Eighty-one percent of all fourth grade teachers in Maine are female. The teaching force is almost evenly divided between males and females for grade eight. Sixty-two percent of all eleventh grade teachers in Maine are male.

As indicated in previous Maine assessments, Maine has a stable core of experienced teachers. Almost one-third of the teachers for all grades have taught for more than nine years, and another one-third to one-half have taught for more than 15 years. Some 74 percent of the fourth grade teachers, 56 percent of the eighth grade teachers, and 66 percent of the eleventh grade teachers believe they will still be teaching in five years.

Some 20 percent of Maine's fourth grade teachers, 30 percent of the eighth grade teachers, and 40 percent of eleventh grade teachers hold master's degrees. At the early elementary level, most teachers earned their bachelor's and/or master's degrees in education. Junior high school teachers who hold bachelor's degrees are more evenly divided among education and the different subject areas; 60 percent of the teachers at that level who hold a higher degree specialized in education. High school teachers are much less likely to have earned a B.A. in education, although that is the most frequent specialty for those with advanced degrees.

Principal Questionnaires

All principals of schools housing fourth, eighth, and eleventh grade students were asked to fill out a questionnaire examining school-wide policy and practices. The questionnaires revealed how diverse factors affect the schools, and give some background or context for, and contrast to, responses offered by students and teachers.

The majority of school principals in Maine--68 percent at the elementary level, 84 percent in the junior high/middle schools, and 92 percent in the high schools--are male. Approximately one-third of the principals for grades 4 and 8, and over one-half of the principals for grade 11, have taught for over fifteen years.

School principals for all three grades reported that school administration and faculty are jointly responsible for curriculum decision-making in their schools: that is true for 90 percent of the fourth grade schools, and 80 percent of the eighth and eleventh grade schools.

According to the principals' responses, in-service training opportunities for teachers in science and social studies are lacking. Over half of the school systems have not provided specific in-service opportunities for fourth or eighth grade teachers in those fields during the last five years. At grade 8, over one quarter of the schools have not provided specific in-service opportunities for writing or mathematics teachers during the last five years.

Maine principals were asked to select what they believe to be the most and least effective programs in their schools. Seventy-five percent of the elementary principals chose reading as their school's most effective program; 46 percent believe science is least effective. At grade 8, 51 percent chose reading as a particular strength; writing and science (with 38 percent and 29

percent response respectively) were the two least effective programs for junior high schools. Mathematics and English/language arts were chosen by almost one-third of the high school principals as the two most effective programs at that level; similarly, school principals were split on the weakest programs in secondary schools, with 35 percent selecting social studies and 26 percent selecting foreign languages as the problems in their schools.

As will be discussed in Section VII of this report, junior high and high school principals report "a great deal of difficulty" in filling vacant faculty positions in science and mathematics. About one quarter of the eighth grade principals and almost half of the eleventh grade principals indicated they have problems in finding qualified science and math teachers.

National Comparisons

The design of the Maine Educational Assessment allows for some comparisons to be made between Maine students at all levels and their peers nationwide. Because of the differing natures of the Maine assessment and national testing, these results should be viewed cautiously. For example, the MEA provides local reports of performance; since results "count," there is additional incentive for students to do better. Also, the test items on which the national comparisons are based are few in some instances, and they are not likely to be distributed across subdomains of a subject area in the same proportions as total MEA or national item sets. The national data used in the comparisons for math, science, and social studies were gathered in the late 1970s.

TABLE 3-6

National Comparisons

Difference from Nation in Average Percent Correct
(Maine percentage minus U.S. percentage)

Subject		Grade 4	Grade 8	Grade 11
Reading	difference	+13.5	+3.7	+6.2
	(# questions)	(8)	(27)	(15)
Math	difference	+6.9	-0.9	+1.3
	(# questions)	(11)	(19)	(4)
Science	difference	+2.2	+4.7	+4.2
	(# questions)	(17)	(18)	(13)
Social Studies	difference	+0.4	-7.5	-4.9
	(# questions)	(14)	(12)	(9)

Generally, Maine students score at or slightly above national averages. In reading, Maine students perform slightly better than eighth and eleventh graders across the nation; fourth graders show a greater relative strength than the two upper grades. In mathematics, fourth graders again take the edge; eighth and eleventh grade scores are comparable to those of students nationwide. In science, students at all three level continue to perform as well as fourth, eighth, and eleventh graders nationally. In social studies, fourth graders are on a par with students in that grade across the country; eighth and eleventh grade achievement may be slightly below national average.

Gender Differences in Performance

Figures 3-1 through 3-4 show the differences in percents correct between males and females for the various reporting categories within each of the major areas tested. In reading and writing, female students consistently outperform male students across the grades and across the reporting categories.

At grades 4 and 8, the mathematical performance of males and females is relatively close with two notable differences. At those grade levels females have the advantage in computation and males perform better in measurement. By grade 11, males seem to have the advantage in all areas of mathematics, the largest advantage being in the area of measurement where the greatest difference was evidenced at the earlier grades as well.

Table 3-7 below shows two important findings. First, when course background is controlled (at least in terms of "Algebra II Status"), male students still have the advantage in mathematics performance. Second, by the time students have completed high school, males will have taken more and more advanced mathematics courses than females.

TABLE 3-7

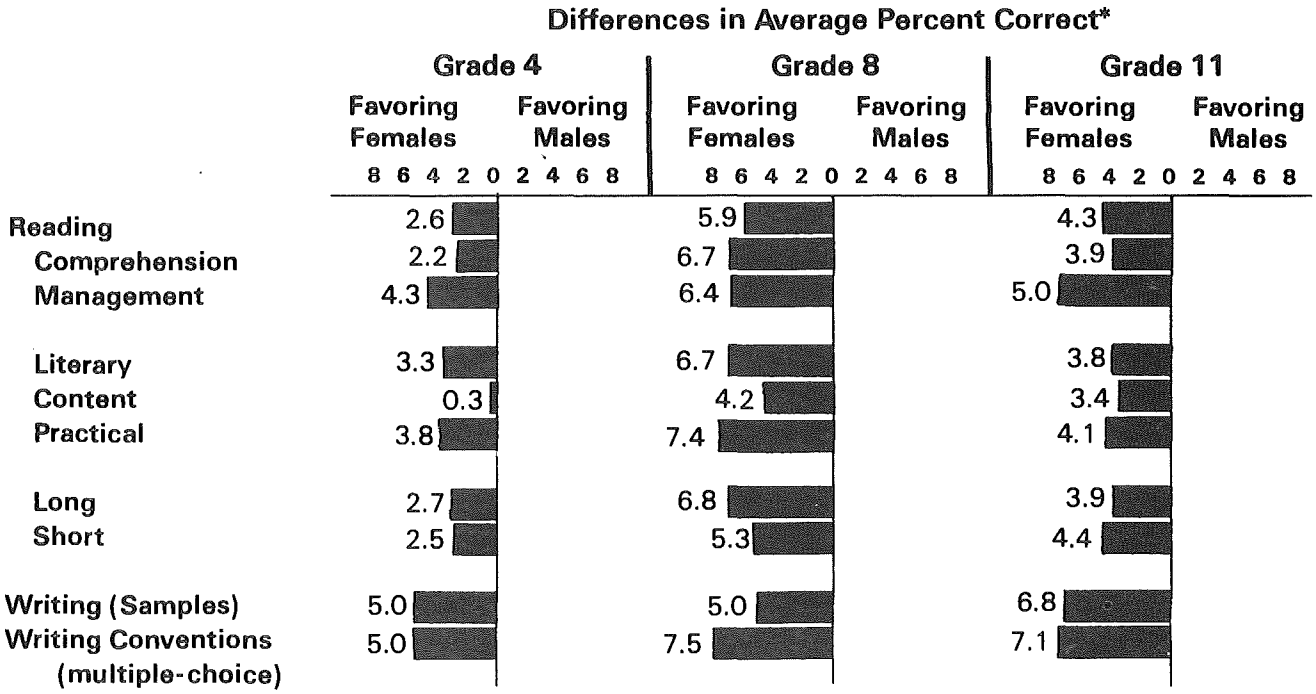
Average Percent Correct in Grade 11 Math by Gender and Algebra II Status

	Algebra II Status			
	Completed	Currently Enrolled	Will Take Next Year	Do Not Plan to Take
Males % Correct	81	74	61	51
(% of Males)	(20)	(32)	(12)	(37)
Females % Correct	74	71	59	50
(% of Females)	(18)	(29)	(10)	(43)

Males outperform females in the various disciplines of science. The gap between the sexes appears to widen as students progress through their school years. By grade 11, male students enjoy a substantial advantage in the areas

of physical and earth sciences. Knowledge of scientific inquiry and inquiry skills is the area with the smallest male/female difference in performance.

Males tend to outscore females in social studies increasingly across the grade levels. At grade 11, their areas of greatest strength relative to females are physical environment, world history, and economics. Females appear to have a slight advantage in the humanities at all grade levels, although there are areas within the humanities in which males slightly outperform females. Particular areas of relative strength for female students appear to be literature; performing arts; knowledge of forms, elements, and techniques of art forms; and the interpretation of meaning in various works of art.



For writing samples, differences represented are differences in percent of 96 total possible points instead of percent correct.

Figure 3-1. Gender differences in reading and writing performance.

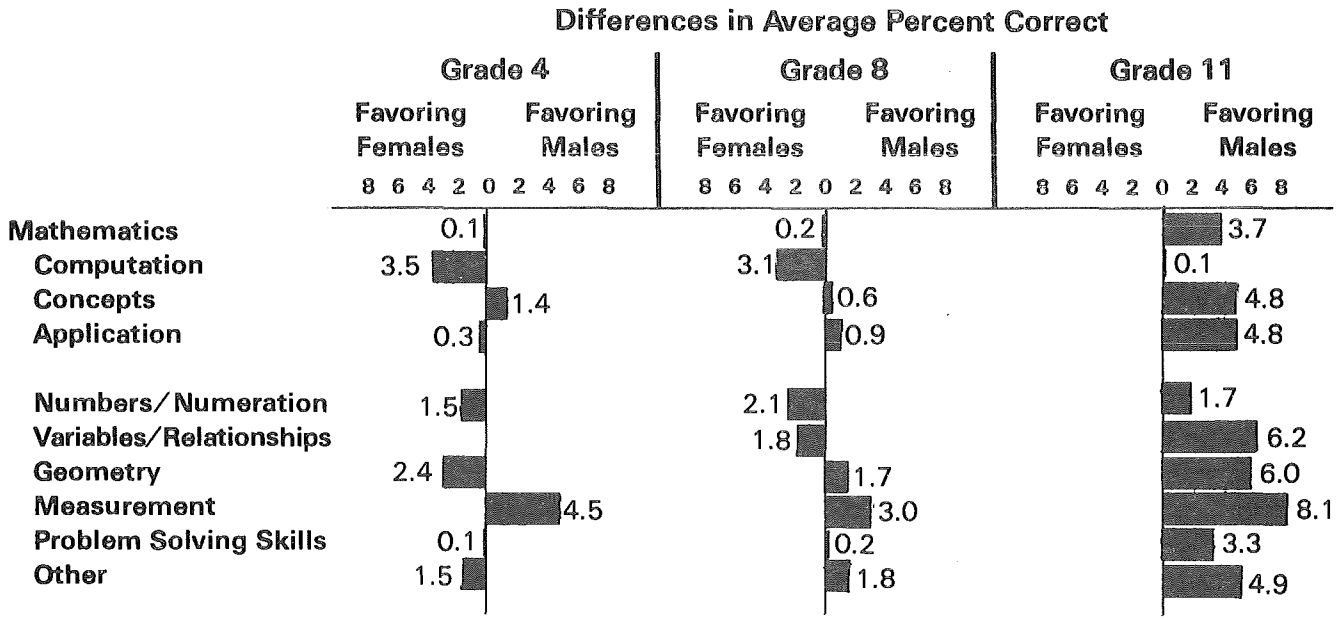


Figure 3-2. Gender differences in mathematics performance.

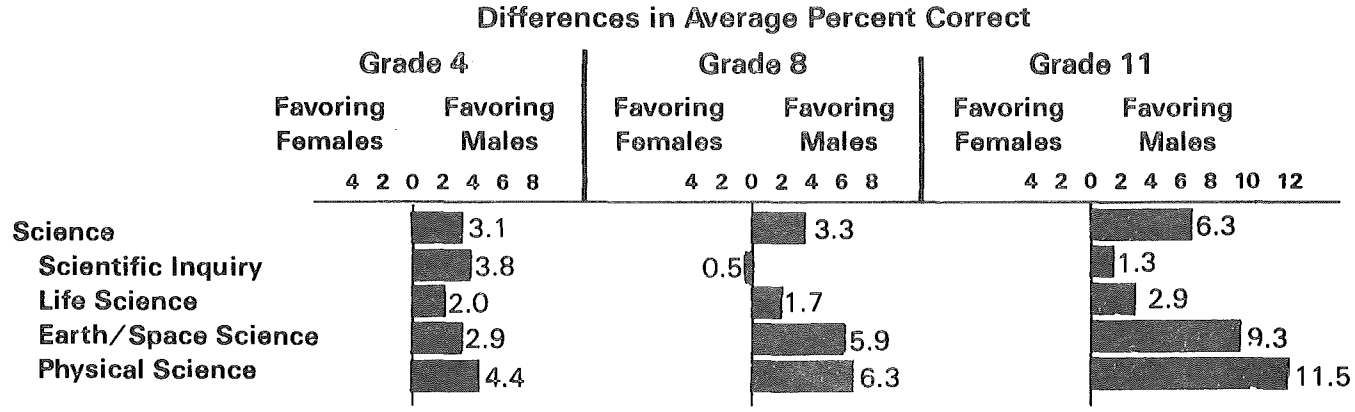


Figure 3-3. Gender differences in science performance.

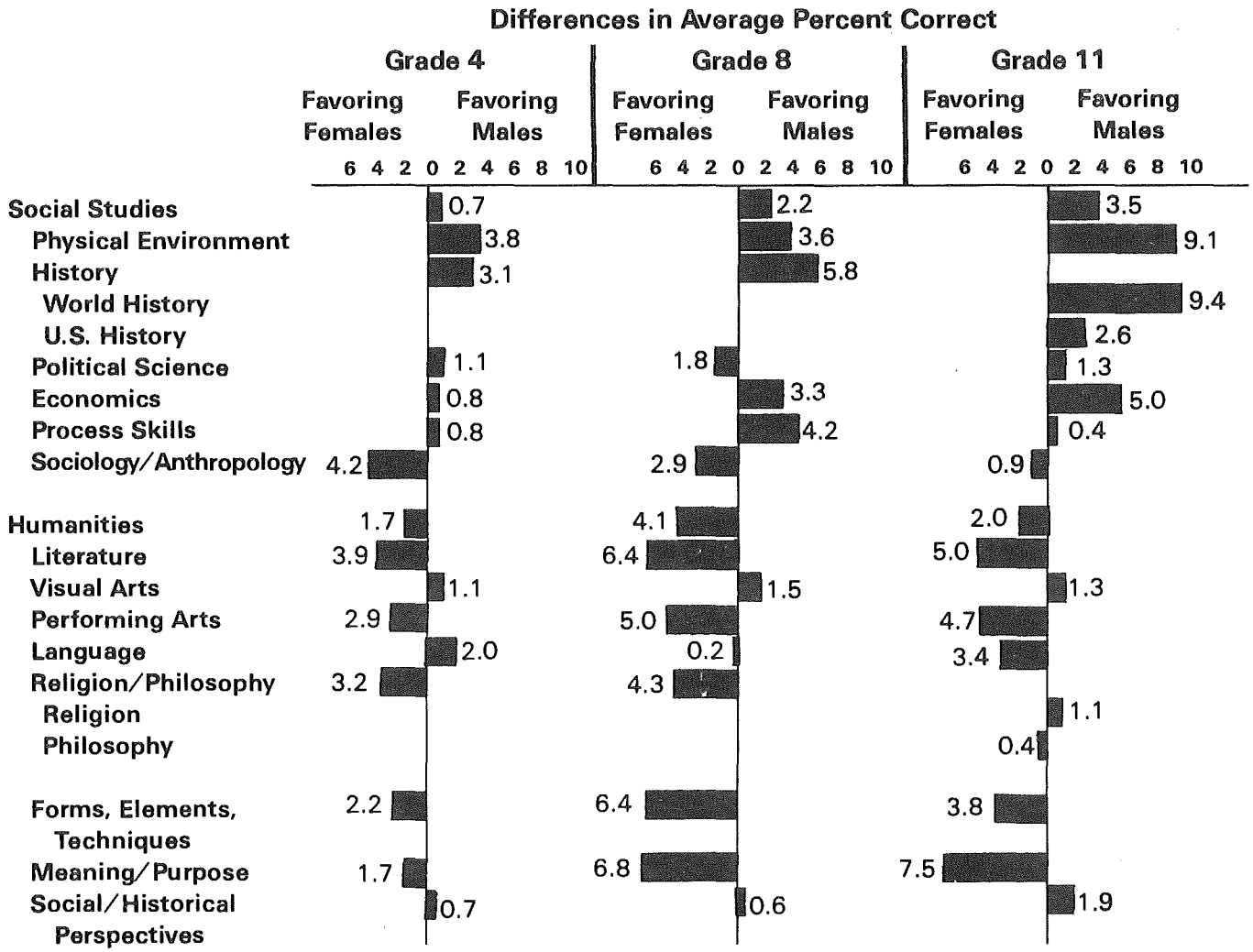


Figure 3-4. Gender differences in social studies and humanities performance.

SECTION IV

READING

The reading portion of the 1985-86 MEA required students to read both long and short passages from literature, the content areas, and practical sources. Literary passages included selections from the genres of biography, drama, essay, novel, poetry, and short story. Passages in the content category included selections from content area magazines, nonfiction trade books, and excerpts from science and social studies textbooks. Practical sources included directions to complete a task, excerpts from manuals or pamphlets, and reference tools such as tables of contents and indexes. The reporting categories used for individual and school results are those shown in the figure below.

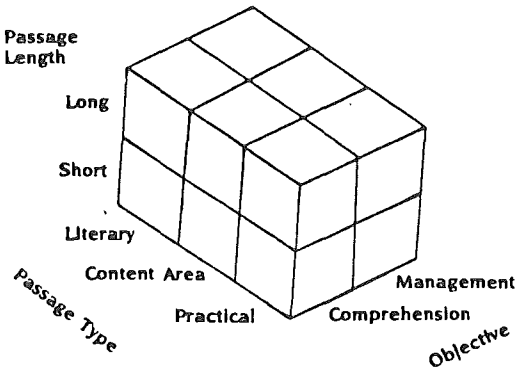


Figure 4-1. Reading reporting categories.

The reading committee's holistic approach to reading evaluation is reflected in the interpretation of results for two broad categories: reading comprehension and reading management. The following summary of the advisory committee's review of item level results reveals patterns in the reading performance of Maine students in grades 4, 8, and 11.

The past and present committee members responsible for advising the Department on the development of the reading tests and the interpretation of reading results are listed below:

Frances Ambrose, SAD 75, Topsham
Nancie Atwell, Middlebury College
Beverly Bisbee, Academy Hill Sch., Wilton
Sarah Chipman, Dexter Reg. High
Gloria Ferland, Millinocket School Dept.
Paul Frost, Deer Isle Elementary
Debra Keyes, Deering High, Portland
Nancy Hutton, Cape Elizabeth School
Janice Kristo, Univ. of Maine
Tom Lechner, Univ. of Maine
George Lyons, Univ. of S. Maine
John Marquis, Gorham High School
Rosemary Salesi, Univ. of Maine
Susan Stires, Boothbay Reg. Elem.
Diane Todd, Chelsea Elementary
Margo Wood, Univ. of S. Maine
Nancy Andrews, DECS
Eileen Rosenbaum, DECS
Mary Robinson, DECS

Achievement Results

Comprehension

Students generally did well in selecting explicitly stated answers when they were easily located within simple syntax. A good example of this pattern is the results on a National Assessment of Educational Progress (NAEP) question which asked students to identify the clearly expressed motivations of a main character within a short story:

Percent Responding Correctly to Text-Explicit Character Motivation Question

	NAEP (1983-84)	MEA (1985-86)
Grade 4:	71	90
Grade 8:	86	90
Grade 11:	94	95

Students were generally less successful in selecting answers that were stated explicitly but were located within longer and more syntactically complex passages. For example, only 36 percent of the grade 8 students and 54 percent of grade 11 students succeeded in locating an answer within a challenging passage by Sarah Orne Jewett. In grade 4, only 57 percent of the students correctly identified details located in the middle of a long and challenging nonfiction selection. When presented with longer passages, students tended to select incorrect answers based on impressions received from the beginning of the passage. For example, when grade 4 students were asked to answer how old a character was when he began a hobby, 25 percent selected the age mentioned once in the first paragraph of the passage. The correct answer was mentioned twice within the central paragraphs of this passage.

When students were asked to select answers not explicitly stated but implied by the passage, different patterns of response emerged. Students across grade levels did best in selecting answers implied by the text when the questions referred to a character's motivations, feelings, or personality. As an example, Maine students compared favorably on a NAEP question which asked students to select the predominant character traits of one of the main characters in a folktale.

Percent Responding Correctly to Text-Implicit Question on Character Traits

	NAEP (1983-84)	MEA (1985-86)
Grade 4:	57	69
Grade 8:	80	86
Grade 11	90	91

Students across grade levels did not perform well when asked to identify the theme of a passage. This weakness was especially evident at grades 8 and 11 where most of the theme questions appeared. A grade 8 question asked

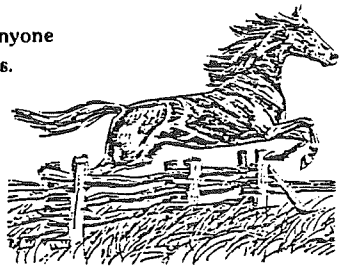
students to select the statement that best explains the lesson illustrated by a passage explaining how Antoine Parmentier and the French king tricked the people of Paris into overcoming their bias against potatoes. Fifty-three percent of the students selected the option that related to the passage in the most superficial way: Potatoes are fine for people to eat. Another 35 percent of the students selected the option that identified a character trait: Antoine Parmentier was very clever. Only 11 percent of the students selected the correct answer, the philosophical statement: People want what they cannot have. Grade 11 students did better than grade 8 students in identifying obvious themes but demonstrated difficulty with passages involving an element of satire. For example, when asked to select an alternative moral for a James Thurber fable featuring a spoiled princess's selfish motives in selecting a husband, only 56 percent of grade 11 students selected the correct response: You can't teach a spoiled princess new tricks. Twenty percent chose the entirely inappropriate response: Love is blind.

The poetry genre lends itself especially well to questions requiring students to select answers implied by the text. Poetry appeared several times at each grade level, and the results are interesting and revealing. Grade 4 students performed impressively on rhymed, narrative poetry and demonstrated potential on poetry using precise description within fairly traditional form. When asked to respond to a free verse poem based on metaphor, grade 4 performance declined dramatically as shown in the results below. Students clearly chose the least abstract responses.

Percent of Students		
		The main point the poet is expressing is that she likes
59		A. horses.
3		B. open fields.
2		C. the wind.
34	*	D. freedom.
		To the poet, being called by someone is most like
42		E. listening to the wind.
15	*	F. being fenced in.
11		G. walking in a field.
31		H. riding a horse.

A Horse Is a Horse

I would like to be
A horse wild and free
Galloping with flying mane
Over miles of wide field,
Leaping fences and walls,
With the whistle of wind-sound
So strong in my ears
That I
Can simply not
Certainly
Not possibly
Hear
When anyone
Calls.



Grade 8 students generally did better in understanding metaphor, but as in the case of grade 4 students, their performance dropped when they encountered metaphor within unconventional form and complicated syntax. Results on the following open-ended question show this trend.

What is the poet referring to when she refers to a "thin column of water"?

Whale at Twilight

The sea is enormous, but calm with evening and sunset,
rearranging its islands for the night, changing its
ocean blues,
smoothing itself against the reefs, without playfulness,
without thought.
No stars are out, only sea birds flying to distant reefs.
No vessels intrude, no lobstermen haul their pots,
only somewhere out toward the horizon a thin column
of water appears
and disappears again, and then rises once more,
tranquil as a fountain in a garden where no wind blows.

Only 24 percent of the students perceived that the poet was referring to the signs of a whale. Fifty-seven percent responded on a literal level by mentioning a feature of the ocean itself such as waves. The review of poetry questions ends positively with grade 11 results. Grade 11 students performed well in understanding and comparing two long and challenging poems.

Students across grades did not perform well on questions requiring evaluating skills. Typical evaluating questions require the reader to judge the relative value or importance of something. For example, grade 8 and 11 students were asked which of a series of statements was <u>least likely</u> to be based on a speaker's bias. Only 26 percent of grade 8 students and 36 percent of grade 11 students responded correctly. On a grade 4 question that asked students to select the <u>best</u> reason two characters had for believing a house was haunted, only 30 percent of the students responded correctly.

The weighing of evidence is an important critical thinking skill because it usually requires some logical analysis to reach a correct answer. The results of an open-ended question at grade 11 give further insight into students' difficulties in logically evaluating evidence. This question asked students to respond to a nonfiction selection that discussed the wolf's howl and included the observations and comments of three wildlife experts. The question appears below.

> Based on the information in this excerpt, which of the following men would be the BEST source of more information about the Eskimos' knowledge of the wolf's habits: 1. Durward Allen 2. Farley Mowat 3. Adolph Murie? Please explain the reason for your choice.

Farley Mowat was the logical choice because he was the only expert mentioned in connection with the Eskimos' beliefs concerning the wolf's howl. Nevertheless, although 60 percent of the students selected Farley Mowat as the most appropriate expert, only 41 percent were successful in explaining a logical reason for their choice.

Reading Management

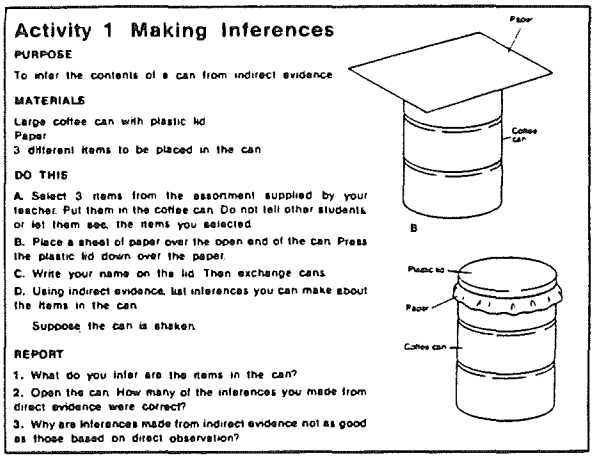
The questions within the category of reading management were designed to assess students' awareness of and ability to use a variety of strategies which good readers develop to help them comprehend what they read. Examples of these strategies include:

1. Using reader's aids such as typography, layout, illustration and various kinds of listings and guides
2. Approaching reading material with flexibility which involves selecting and, if necessary, remediating strategies to suit the purpose for reading
3. Accessing prior knowledge
4. Selecting reading materials appropriate to the purpose

Students across grade levels generally did well on multiple choice questions asking them to identify the purpose and use of text features such as bold face headings, and visual aids such as time lines, maps, etc. Seventy-three percent of grade 4 students understood that locating the answer to a question on a nonfiction science article required the strategy of referring to a map below the article. Seventy-eight percent of grade 8 students identified the bold headings in a pamphlet as the aid used to locate specific information quickly. Seventy-nine percent of grade 11 students understood the relationship between the line numbers in an excerpt from Shakespeare and the numbers in an accompanying glossary.

Results on open-ended questions asking students to explain the purpose of visual aids and formatting were mixed. Approximately 70 percent of grade 4 students were able to explain that an illustrated time line was valuable for the additional information it provided to an article on America's lighthouses. Students were not as successful on open-ended questions that asked them to explain the purpose of the format of a page. A good example of this inability to explain format is seen in the results on the grade 8 open-ended question below.

Activity 1 is divided into four sections: PURPOSE, MATERIALS, DO THIS, AND REPORT. Why did the authors of the textbook put the sections in the order they did?



Activity 1 Making Inferences

PURPOSE

To infer the contents of a can from indirect evidence

MATERIALS

Large coffee can with plastic lid
Paper
3 different items to be placed in the can

DO THIS

A. Select 3 items from the assortment supplied by your teacher. Put them in the coffee can. Do not tell other students or let them see the items you selected.

B. Place a sheet of paper over the open end of the can. Press the plastic lid down over the paper.

C. Write your name on the lid. Then exchange cans.

D. Using indirect evidence, list inferences you can make about the items in the can.

Suppose the can is shaken.

REPORT

1. What do you infer are the items in the can?
2. Open the can. How many of the inferences you made from direct evidence were correct?
3. Why are inferences made from indirect evidence not as good as those based on direct observation?

Fewer than half (48 percent) of the students were able to explain the rationale behind the ordering. Nearly a third (33 percent) of the students provided vague responses such as "It's easier to read."

The results of questions that asked students to choose appropriate strategies in approaching various types of reading tasks were also mixed. At grade four, only 44 percent selected the correct approach to reading a recipe. Similar recipe questions appeared at grades 8 and 11 with better results, 71 percent and 85 percent respectively. Both grade 8 and grade 11 students responded to a question asking them to choose the best approach to reading and answering the questions on a long, informational article. Only 56 percent of grade 8 students and 64 percent of grade 11 students chose the most effective strategy--reading the questions first.

Students did well in identifying the genre of a passage when the question did not require fine discrimination between literary types. For example, 84 percent of the grade 4 students and 93 percent of the grade 8 students correctly categorized the same selection as a short story rather than a biography, a science textbook, or a historical novel. When the question focused on less common genres such as fable, and the distractors required finer distinctions, student performance was poorer. For example, only 60 percent of grade 11 students were able to classify a James Thurber selection as a fable rather than a mystery (9 percent), a folktale (22 percent), or a legend (8 percent). Fewer than half of grade 4 students were able to classify the source of an article on the history of America's lighthouses. Only 47 percent chose the correct answer, a social studies magazine, rather than a book of short stories (11 percent), a science fiction story (17 percent), or a daily newspaper (24 percent).

Examining the incorrect distractors drawing sizable percentages away from correct answers can reveal weaknesses. For example, the fact that nearly a fourth of the grade 4 students chose a biography of the author as the best place to find the rest of one of the author's short stories suggests a significant number of grade four students are uncertain about the biography genre.

Students performed well on questions that asked where they would look to find specific types of information, if the appropriate sources were those most commonly used. All grade levels did well on card catalog questions and knew when to use a dictionary or an encyclopedia. The incorrect distractor, almanac, drew nearly 20 percent of the grade 8 students away from the correct answer on one question. Twenty-seven percent of grade 11 students selected the incorrect distractor, Reader's Guide, as an appropriate source for further information about nineteenth century England.

Students demonstrated skill in using the more familiar resource aids, card catalog, table of contents, and index (at grades 8 and 11), when the questions were targeted at basic level use. All three grade levels seemed less familiar with a glossary as the place to find definitions of difficult words. Only 19 percent of grade 4 students, 54 percent of grade 8 students and 62 percent of grade 11 students were successful on a glossary question. Both grade 8 and grade 11 students experienced difficulty on an index question that required the strategy of cross-referencing. The results were 30 percent and 48 percent respectively.

Questionnaire Results

1. Students across grade levels were asked, "What kind of a reader do you think you are?" Approximately 50 percent of the students classified themselves as good readers. Approximately 26 percent of the students classified themselves as very good readers. The number of students who viewed themselves as poor readers rose from 3 percent at grade 4 to 6 percent at grade 11.

2. When asked, "How often do you read at home for pleasure?", the percentage of students reading two or more times per week declined steadily from 66 percent at grade 4, to 56 percent at grade 8, to 50 percent at grade 11.

3. Both grade 4 students and teachers were asked how often students were given free time to read materials of their own choosing. Student and teacher responses were quite consistent with about 55 percent responding "every day."

4. Teachers across grade levels were asked how much time they devoted to discussing and demonstrating a variety of reading strategies with their students. The percentages of teachers who responded "Almost Daily" are presented below.

	Percentage of Teachers		
	Gr. 4	Gr. 8	Gr. 11
strategies for analyzing, evaluating, and criticizing what has been read	41	44	56
formulating questions in order to read with a purpose	50	38	43

5. Seventy-five percent of grade 4 principals and 51 percent of grade 8 principals rated reading as the MOST effective instructional program in their schools.

6. When asked to rate how well their English/Language Arts program served the needs of college-bound students, 87 percent of grade 11 principals rated their program as "outstanding" or "good." Only 61 percent of grade 11 principals expressed the same level of confidence in English/Language Arts programs for non college-bound students.

Interpretive Summary

In comprehension, the complexity of the reading selection seems to influence results more than the complexity of the questions. Students seem able to handle a wide range of questions from simple and literal to complex and inferential if the reading task is within students' interest or experience, and if the text of the reading is not too demanding in length and syntax. When reading selections appear to extend beyond students' interest, experience, or comfort zone regarding length or syntax, students' ability or perhaps perseverance in handling all types of questions declines.

Especially when confronted with demanding reading selections, students demonstrate a tendency to make quick and often incorrect judgments based on

conspicuous information or impressions gained by scanning the earliest portions of the text. They do not appear to return to the entire text to search and to consider the information, nor do they appear to move back and forth between the questions and the text to confirm their choices.

Students did well when the form of the question was familiar to them. For example, they were successful in answering questions such as "How do you think the character felt when...?". This type of question is common to instruction from the earliest years in school. Questions such as "Which of the following best expresses the theme of this story?" require students to generalize from the reading selection. The disappointing results on such questions suggest students are not experienced in considering how larger ideas are generated by the smaller details and nuances of the text. Students' weakness in evaluating evidence also suggests a lack of exposure to situations requiring higher order thinking skills.

Results on the open-ended comprehension questions demonstrate students are not as successful or perhaps experienced in producing answers as they are in choosing answers. Students must be much more active when asked to generate a response to an open-ended question than they are when asked to select an answer in a multiple choice format. Instructional tools such as workbooks usually present information to students and ask them to identify or locate a single right answer. Too much emphasis on workbooks probably contributes to the formation of students who are better consumers of text than producers of text.

In reading management, results on questions that assessed students' awareness of reading strategies suggest students are not accustomed to approaching a variety of reading tasks with a variety of reading strategies. In open-ended reading management questions, students' difficulty in explaining the organization of informational pages and study aids may reflect an inability to talk about the area of reading management rather than a lack of understanding.

Responses to questions asking students to select appropriate sources for specific types of information suggest students across grade levels are not familiar with the wealth of resources that exist beyond the encyclopedia. Students do not appear to be familiar enough with using the reference section of the library, magazines, and other supplemental materials in pursuing information.

Recommendations

Comprehension

1. Students need exposure to a wide variety of reading materials that span the full spectrum of difficulty. More instruction should focus on the process of moving students successfully from comfortable and familiar text to more sophisticated and challenging text.

2. Students who have wide experience as readers are better equipped to handle the thinking and questioning skills necessary to successfully generalize and to evaluate evidence. One effective way to develop students' thinking and

questioning skills is to engage students frequently in discussions of questions that require higher order thinking.

3. It may be helpful for students to think about and discuss many different kinds of questions, especially those asking them to consider implied ideas. Students need opportunities to speculate and share ideas about what particular types of questions are asking.

4. Students should be provided with more opportunities to generate their own answers to open-ended questions. They should be encouraged to explore more than one correct answer and to draw upon relevant prior knowledge when responding to reading.

5. Students need encouragement to confirm their answers by moving back and forth between the questions and the text. The adage, "a little knowledge may be a dangerous thing," seems to apply to students' tendency to rely too heavily on prior knowledge rather than an effective interaction between the reader and the text.

6. Teacher modeling of thinking, questioning, and responding strategies may encourage students to adopt these strategies into their own reading repertoire.

7. Students across grade levels, including elementary students, should hear, read, discuss, and write a variety of poems, including those relying on symbol and metaphor and using untraditional forms.

Reading Management

8. Students appear to have little experience in thinking about reading management issues. Teacher modeling and discussion of reading strategies, the rationale for format and other text features, and tapping students' reservoir of prior knowledge is needed to increase student awareness.

9. As they move into the information age, students need the ability to locate and use resources. Students need more exposure to resources other than the encyclopedia, and they would appear to benefit from more experience in evaluating and understanding which resources best serve specific purposes.

Resources for Teachers

Children's Choices: Teaching with Books Children Like. Edited by Nancy Roser and Margaret Frith. Published by the International Reading Association, 1983.

Provides suggestions for effective use of children's favorite books in the classroom--which books and poems to use, how to structure the classroom, how to encourage writing, how to stimulate children's responses to literature and more.

Costa, Arthur. "Toward a Model of Human Intellectual Functioning." Developing Minds A Resource Book for Teaching Thinking. A. Costa, Ed. Association for Supervision and Curriculum Development, 1985, pp. 62-64.

McNeil, John D. Reading Comprehension - New Directions for Classroom Practice. Palo Alto, CA: Scott, Foresman and Company, 1984.

Pearson, P.D. Reading Comprehension Instruction: Six Necessary Changes (Reading Education Report No. 54). Urbana: University of Illinois, Center for the Study of Reading, 1984.

_____. "Changing the Face of Reading Comprehension." The Reading Teacher, April 1985, pp. 724-738.

Summary of significant, recent reading research.

Raphael, T.E. "Question-Answering Strategies for Children." The Reading Teacher, November 1982, pp. 186-191.

_____. "Teaching Question Answer Relationships, Revisited." The Reading Teacher, February 1986, pp. 516-522.

SECTION V

WRITING

Writing was assessed directly by asking students to produce two writing samples in response to specific topics or prompts. In addition, half of the students were given multiple choice items measuring writing conventions.

The writing samples at all three grade levels were scored analytically in six categories by two trained readers, using a four-point scale. The scoring criteria are listed below.

1. Topic Development
2. Organization
3. Details
4. Sentences
5. Wording
6. Mechanics

Eight to ten multiple choice questions dealing with writing conventions appeared in eight of the sixteen test forms at each grade level. Every item was taken by approximately 1,000 students. Areas tested included spelling, capitalization, punctuation, agreement, and standard English usage.

Interpretive Summary of Results: Writing Samples

Writing Prompts

Students were given one class period for each composition. They were allowed to structure their own time within that period and to choose whether or not to write a rough draft. The final draft was all that was evaluated by the readers who scored the tests.

At grades 4 and 8, students were asked to write both a narrative and a persuasive piece. The narrative topic or "prompt" for both grades asked the students to write about a special day or time that they spent with a friend.

The past and present committee members responsible for advising the Department on the development of the writing tests and the interpretation of writing results are listed below:

Frances Ambrose, SAD 75, Topsham
Nancie Atwell, Middlebury College
Beverly Bisbee, Academy Hill Sch., Wilton
Sarah Chipman, Dexter Reg. High
Gloria Ferland, Millinocket School Dept.
Paul Frost, Deer Isle Elementary
Nancy Hutton, Cape Elizabeth Middle
Debra Keyes, Deering High, Portland
Janice Kristo, Univ. of Maine
Tom Lechner, Univ. of Maine
George Lyons, Univ. of S. Maine
John Marquis, Gorham High School
Rosemary Salesi, Univ. of Maine
Susan Stires, Boothbay Reg. Elem.
Diane Todd, Chelsea Elementary
Margo Wood, Univ. of S. Maine
Nancy Andrews, DECS
Eileen Rosenbaum, DECS
Mary Robinson, DECS

The persuasive prompt at grade 4 asked the students to write a letter to the director of a space center, advising him or her of what to do about a space ship and creatures who had landed nearby. Eighth graders were told that their school was considering instituting double sessions. They were asked to write a letter to their principal, providing reasons why they should be allowed to attend one session rather than the other.

Overall, the fourth graders were more successful when they were asked to write from their personal experience, in the narrative mode. They had more difficulty with the persuasive letter, particularly in generating good reasons to support their point of view. Committee members suggested that the task may have been too far removed from many of the students' experiences at that grade level. Constructing a logical, persuasive argument is a more cognitively demanding task. Another possibility for this discrepancy is that there may be less instructional emphasis on persuasive writing than on narrative writing at the fourth grade level.

Eighth graders did only slightly better on the narrative piece than on the persuasive letter. There was not as large a discrepancy between these two modes as was evident at grade 4. Although the narrative prompt was the same for fourth and eighth graders, it is not valid to compare the performance of students at both grades. The scoring guide measured the same criteria, but the standards, exemplified by the anchor or training papers, took into consideration the different developmental levels at the two grades.

One grade 11 prompt asked students to imagine that they had gone to a job referral center to apply for a job. They were asked to write an informational report, specifying the type of job they would like and providing any relevant skills and experiences that would support their request. There was confusion on the part of some students as to whether their job had to be something realistic and current or could be a hypothetical future career. However, students generally handled the task fairly well and with unexpected creativity.

The expository prompt asked the eleventh graders to explain whether they saw music as a force that would bring people together or drive them apart. This task proved to be the more demanding of the two. Although students were able to draw on their personal experiences and observations, they had a more difficult time discussing music in global terms. As with cross-grade comparisons, caution must also be used in comparing performance within a grade on the two prompts, due to the different rhetorical demands of each.

National Comparisons

Both of the persuasive prompts and the informational report had been administered nationwide as part of the National Assessment of Educational Progress (NAEP). NAEP tested the writing skills of a representative sample of nine-, thirteen-, and seventeen-year-olds in 1974, 1979, and 1984.

Although the prompts themselves were identical, several other factors were different, preventing direct comparisons between Maine students and the nation. For example, NAEP allowed students 12-15 minutes to write each composition, as opposed to 50-60 minutes for Maine students in the MEA. In addition, the scoring criteria, scoring methods, and the training of readers

were totally different. NAEP gave students one holistic score evaluating the overall effect of the piece and one primary trait score focusing on the task. The six scoring criteria selected for the Maine Educational Assessment provided more information for classroom teachers about specific strengths and weaknesses of their students.

Scoring Criteria

The same scoring criteria were used at all three grade levels, with some variations in developmental standards and increasing expectations when moving from grade 4 to grade 11. The specific standards for each grade level were communicated to the readers during training sessions by reviewing a scoring guide for that grade and reading and scoring sets of training papers. These papers had been carefully chosen from writing samples obtained during field-testing and from actual test papers. They had been prescored by a group of experts in student writing at that grade level. The table leaders at each table discussed the rationale for the scores and later monitored the scoring sessions held at their table.

Each piece was read independently by two trained readers who rated the paper in each category on a scale from 1 (low) to 4 (high). A "four" indicated above average to outstanding effort. A "three" in any category described an adequate attempt. A "two" rating generally reflected poor performance in that category: i.e., the student made some attempt, but it was unsuccessful. Finally, a "one" was used to describe very poor performance or a very brief response to the prompt.

The two readers' scores were added together to form the student's final scores, which thus ranged from 2 to 8 in each category. If the student's response was completely off the topic but the paper was otherwise readable, the student was given a 0 in topic development and then scored in the other five categories. If the two readers' scores on any of the six criteria were more than one point apart (1-3 or 2-4), the table leader read the paper and made a final determination.

Table 5-1 on the next page shows the statewide means for all three grade levels, based on the sum of the scores given by both readers. For example, a score of 5 in a category would be obtained if one reader gave the paper a 2 and the other one a 3. Because there is commonality in the meaning of ratings across categories and grades (e.g., 4 = above average; 3 = adequate; etc.), the mean scores across grades and prompts are represented in a single table.

Table 5-1 also shows the percentage of students obtaining a score of six or better in each category for each prompt (% > 5). A six would be equivalent to each scorer giving the paper a three, which would be an adequate rating.

One must be cautious in making comparisons between grades and topics for two major reasons: the prompts differed at each grade level and the standards became more rigorous as the grade level increased. For example, a mean score of 5.8 in topic development for the grade 4 narrative prompt should not be compared to a mean of 5.4 in topic development at grade 8, even though the two prompts were almost the same. The standards at grade 8 assumed a higher level of cognitive and writing development. The same holds true in comparing student performance at grade 8 to that at grade 11.

TABLE 5-1

1985-86 MEA Statewide Means and Frequencies--Grades 4, 8, and 11

Prompt One:

Scoring Category	Narrative Grade 4		Narrative Grade 8		Informational Report Grade 11	
	Mean*	%>5**	Mean	%>5	Mean	%>5
Topic Development	5.8	65	5.4	50	5.2	45
Organization	6.1	71	5.5	49	5.5	53
Details	6.2	74	5.5	50	5.4	46
Sentences	6.0	72	5.4	49	5.6	61
Wording	6.0	79	5.5	57	5.8	75
Mechanics	6.0	75	5.6	62	5.9	72
Total:	36.1		32.8		33.4	

Prompt Two:

Scoring Category	Persuasive Grade 4		Persuasive Grade 8		Expository Grade 11	
	Mean	%>5	Mean	%>5	Mean	%>5
Topic Development	5.0	42	5.0	36	4.5	40
Organization	5.1	42	5.3	44	5.0	36
Details	4.8	32	5.0	32	5.0	36
Sentences	5.5	58	5.3	53	5.3	47
Wording	5.7	71	5.7	72	5.4	54
Mechanics	5.7	65	5.8	74	5.7	62
Total:	31.7		32.1		30.9	

*Each student's score is reported as the sum of both readers' judgments and would thus range from 2 to 8 in each category. The mean is the average of all students' scores in a category.

**The percentages of students obtaining scores greater than 5 are reported here, because a rating of 5 (combined ratings of 2 and 3) means that one rater gave the paper an inadequate score. Thus, ratings of 6 and above correspond to acceptable papers.

The data for the discussion of results which follows come from the information presented in the table on the previous page. The criteria for a "four" rating is taken from the eleventh grade scoring guide, but is very similar at all grade levels.

Topic Development. The student's ability to understand the prompt and write an appropriate response was evaluated in the first category under topic development. Readers were told to read the whole paper through first, to receive a general impression, and then to go back and read it a second or even a third time to score it in all six categories. The score given in this first category is similar to a holistic score as it considers the effect produced by the entire paper.

To receive a "four," the paper needed to be fluent and fully developed, reveal a clear awareness of the audience and the task, and show at least some evidence of one or more of the following: originality, imagination, impressive style or flair, insight or humor.

Students at all grade levels generally received their lowest scores in this category, regardless of the particular prompt used. This may be partly due to the more rigorous demands of this area. More than the other areas, topic development measured the quality of the students' thinking and their ability to present this on paper.

Organization. To obtain a "four" in organization, at all grade levels, the paper needed to be carefully and logically organized from beginning to end. The writer also needed to maintain a consistent point of view and a clear focus throughout the piece.

Students overall scored somewhat higher in organization than they did on topic development, and either about the same or slightly higher in organization than in details.

Details. Students needed to include rich, interesting details that were relevant and appropriate for the purpose, audience, and focus, in order to obtain a "four" at all three grade levels.

This category, along with topic development, appeared to be the most closely dependent on the rhetorical mode of the prompt. For example, fourth graders obtained their highest mean score (6.2) on details for the narrative prompt and their lowest mean score (4.8) for details on the persuasive prompt. A similar, but less dramatic relationship was seen at the eighth grade level, with a mean of 5.5 for the narrative details and 5.0 for the persuasive.

Sentences. To obtain a "four," eighth and eleventh graders needed to produce sentences that were complete, correct, and varied in both structure and length, in a way that enhanced the style and effect of the piece. Students could have a few errors in structure, syntax, or usage if they were very minor and did not detract from the piece. The standards were not quite as rigorous for fourth graders, who still needed to exhibit sentence variety, but were given credit if they were moderately successful in using more sophisticated sentence patterns.

Of the three categories dealing with surface level features, students at all grade levels scored the lowest on sentences and the highest on mechanics, with wording appearing in the middle of the two.

Wording. This category encompassed vocabulary, word choice, and usage. A "four" paper exhibited rich, effective vocabulary and fresh, vivid language. A few usage errors (involving one word) were allowed if they did not detract from the piece. At the fourth grade level, students were rewarded if they were at least moderately successful in using more sophisticated language.

As previously stated, students overall at all three grade levels did slightly better on wording than on sentences and slightly poorer on wording than on mechanics. There was some overlap among the last three categories. For example, spelling was considered part of mechanics, but misuse of a homonym (writing "their" when "they're" was meant) was considered under wording. Sentence fragments and run-ons were considered under sentences, not as punctuation errors under mechanics.

Mechanics. At all levels, a "four" paper in mechanics was one in which there were few or no errors in: spelling, punctuation, capitalization, or paragraphing, and the handwriting was legible. However, students were expected to show evidence of some complexity to obtain a four. A mechanically perfect, but very simple paper received a "three" in mechanics at all three grade levels, as did a paper with a number of errors that "did not interfere with communication." With one exception (grade 4 narrative), the mechanics score was the highest of all six scores.

Interpretive Summary of Results: Writing Conventions

In addition to the two writing samples, half of the students at each grade level were given eight to ten multiple choice questions measuring their knowledge of various writing conventions. Students in general did quite well in most of the areas tested, with a few minor exceptions to be discussed below. This area of the test will not be administered in future years, as the writing samples provided sufficient information on each student's writing ability.

Agreement

Students generally did well on these questions measuring the agreement of subject with verb and pronoun with antecedent. The exceptions were a few questions dealing with prepositional phrases separating the subject and verb, where students tended to make the verb agree with the object of the preposition rather than the subject.

There were several interesting questions given at all three grade levels that showed similar confusion in regard to direct objects. Although the sentences in the questions below are almost identical, students across all levels did very well on the first sentence, and very poorly on the second.

Percent of Students

Gr. 4	Gr. 8	Gr. 11		
				Select the word that correctly fills the blank in the sentence.
			1.	Mrs. D'Amico asked Bill and _____ to erase the blackboard.
9	23	21		A. he
91	76	78	*	B. him
			2.	Mrs. D'Amico asked Bill and _____ to erase the blackboard.
72	76	65		A. I
26	23	34	*	B. me

Students seem to have more difficulty with nominative and objective case when first person pronouns are involved.

Standard English Usage

Students at all grades did well on choosing grammatically correct words according to standard English usage. Four out of 31 questions were the same at all three grades. Fourth graders scored very high on all questions except for the following:

Percent of Students

Gr. 4	Gr. 8	Gr. 11		
				Select the word that correctly fills the blank in the sentence.
			1.	The money was divided evenly _____ the five children.
58	26	18		A. between
41	73	81	*	B. among
			2.	I have _____ friends than I used to have.
55	75	84	*	A. fewer
44	24	15		B. less

Spelling

Most of the spelling questions required students to select the one misspelled word out of a list of four words or out of a group of sentences. The same questions were used at grades 8 and 11, with different questions at grade four. At least two-thirds of the fourth graders correctly identified

"qute," "flater," "sleept," and "flowr" as being incorrect. However, only one-fourth identified "cabel" as a misspelling for cable and one-half identified "preech" as a misspelling. Fourth graders did very well on questions where they had to select the correct homonym from a choice of two.

At the upper grades, the misspelled words "seperate," "decieve," "thier," "payed," and "fourty-fourth" stymied two-thirds of the eighth and about half of the eleventh graders. However, more than 80 percent of the eighth and eleventh graders correctly identified "Febuary" as a misspelling and more than 90 percent correctly identified "Wenesday."

Capitalization

Seven of the ten capitalization questions were the same at all three grade levels, allowing some comparisons to be made. Each question was composed of a sentence with one incorrectly capitalized word. About half the fourth graders were able to identify the incorrect word, with three-fourths or more of the older students being successful.

The question below received relatively low scores at all three grade levels. The correct option (B) was selected by 41 percent of the fourth graders, 73 percent of the eighth graders and 80 percent of the eleventh graders.

Percent of Students				
Gr. 4	Gr. 8	Gr. 11		Select the word that should NOT have a capital letter. My Grandmother gave me a Timex watch for Christmas.
7	3	1		A. My
41	73	80	*	B. Grandmother
47	21	16		C. Timex
4	3	2		D. Christmas

Punctuation

Students at all three grade levels had the least difficulty determining the correct punctuation for the end of a sentence and the most difficulty with the punctuation of quotations.

About half the students at each grade were successful in identifying the correct use of commas in a series (58 percent at grade 4), in addresses (48 percent at grade 8 and 62 percent at grade 11), and in clauses (56 percent at grade 8 and 68 percent at grade 11).

Only two questions were the same at all three grade levels. Fourth graders did almost as well as the older students on a question asking for the proper form for the closing of a letter (77 percent correct vs. 87 percent for eighth grade and 91 percent for eleventh grade).

Fourth graders surpassed the older students on one question asking them to identify the incorrectly punctuated sentence in a group of four (86 percent correct vs. 70 percent for eighth grade and 77 percent for eleventh grade). See results below.

Percent of Students				
Gr. 4	Gr. 8	Gr. 11		Select the sentence that is incorrectly punctuated.
5	11	10		A. We might have gone if you had asked us.
6	11	7		B. Block that kick!
86	70	77	*	C. Does she generally leave before the class is over!
3	8	5		D. Be sure to take your dog with you.

Questionnaire Results

1. Students and teachers across all grades were asked how often students were allowed to choose their own topics, rather than having them assigned by the teacher. The percent of students who responded that they were allowed to choose their own topics half the time or more declined slightly from 74 percent at grade 4, to 69 percent at grade 8, to 66 percent at grade 11. Eighty-four percent of the fourth grade teachers, 86 percent of the eighth grade teachers and 78 percent of the eleventh grade teachers responded that they required their students to choose their own topics at least half the time.

2. Teacher and student responses followed a similar pattern when both groups were asked about writing multiple drafts. Seventy-five percent of the fourth graders, 76 percent of the eighth graders, and 81 percent of the eleventh graders responded that they had the opportunity to write a second draft at least half the time. (Note: they were not asked <u>how often they actually wrote more than one draft</u>.) When teachers were asked how often they required their students to write their papers more than once, 90 percent at grades 4 and 8 and 85 percent at grade 11 stated that that was a requirement at least half the time.

3. Students and teachers were both asked to comment on the different types of writing assigned in the past two weeks (one week for grade 4 students). Fifty-nine percent of the eighth graders and 63 percent of the eleventh graders produced three or more different types of writing in the past two weeks. Sixty-one percent of the fourth graders wrote two or more pieces in one week. Of the teachers polled, 79 percent at grades 4 and 8 and 85 percent at grade 11 stated that their students had written three or more different types of writing in the past two weeks.

4. Students at all grade levels were asked, "How often do your teachers talk with you personally about your writing?" Thirty-nine percent of the fourth graders responded "never," with 46 percent at grade 8 and 42 percent at grade 11 responding the same way. Teachers were asked how often they required their

students to talk with them "about the contents of their paper while they are working on it." Over 80 percent at all grade levels responded that they required this at least half the time. Only 6 percent of the teachers at grades 4 and 8 and 4 percent at grade 11 responded "never" or "hardly ever."

5. Only 9 percent of grade 4 and 8 percent of grade 8 principals rated writing as the MOST effective instructional program in their schools. On a separate question, 22 percent of grade 4 principals and 38 percent of grade 8 principals saw writing as the LEAST effective program in their school.

6. Grade 11 teacher and principal responses were almost identical when they were asked to rate how well their English/Language Arts program served the needs of their students. Eighty-six percent of the teachers and 87 percent of the principals rated their program "outstanding" or "good" for college-bound students. However, only 60 percent of the teachers and 61 percent of the principals gave the same rating to their programs for non college-bound students.

8. Principals at all grades were asked, "What percentage of your teachers of writing use the 'process model' approach ?" The percentages appear below.

	Gr. 4	Gr. 8	Gr. 11
A. 0%	5	8	5
B. 1% - 25%	34	35	31
C. 26% - 50%	25	21	18
D. 51% - 75%	15	12	20
E. 76% - 100%	22	24	26

The responses at all three grade levels followed a very similar pattern. If the last two percentages at each grade level are combined, the data indicate that 37 percent of the principals filling out the fourth grade questionnaire, 36 percent at eighth grade and 46 percent at eleventh grade responded that half or more of their writing teachers were using the "process model" approach to the teaching of writing.

Recommendations

1. Recognizing the impact that writing has on reading and reading has on writing, students need to hear, read, and discuss a wide range of written materials. Students at all grade levels would benefit from more oral sharing and reading of well-written expository material, such as non-fiction trade books. Sharing sessions should include the work of their peers, as well as that of professional writers.

2. Students need many opportunities to produce a wide variety of writing, from simple lists to formal research reports. They need to write for a variety of audiences and purposes, in natural, real-life situations.

3. Teachers themselves need to be writers. They need to model and share their own writing with their students, to help them see the role that writing can play in learning.

4. Students need to learn to use vivid and precise language to express themselves. This does not mean a lot of flowery adjectives or ultra-sophisticated language that bears no relation to the purpose and audience of the piece.

5. Writing mechanics (i.e., spelling, punctuation, capitalization, grammatical usage) need to be taught in a meaningful context. Research has shown that grammar drills and exercises, in isolation, do not lead to improvement in writing.

6. Writing should be an important component of every class. It is an effective instructional tool in all content areas. The teaching of writing should not be considered the sole responsibility of the English teacher.

Resources for Teachers

Practical Strategies

* Elementary ** Secondary *** General

Barr, Mary, Pat D'Arcy, and Mary Healy. What's Going on: Language/Learning Episodes in British and American Classrooms, Grades 4-12. Montclair, New Jersey: Boynton/Cook Publishers, 1982. ***

An account of 13 teachers'/researchers' work with students in a variety of language-rich learning contexts. Accent is on how teachers can become sensitive partners in their students' learning processes.

Gordon, Naomi, ed. Classroom Experiences: The Writing Process in Action. Exeter, New Hampshire: Heinemann Educational Books, 1984. *

This book recounts how seven teachers successfully explored the process approach to writing in their classrooms and school systems.

Graves, Donald H. Writing: Teachers and Children at Work. Portsmouth, New Hampshire: Heinemann, 1983. *

An essential book for the teachers of writing, it shows how both teaching and writing are related to learning.

Hansen, Jane, Tom Newkirk, and Donald Graves, eds. Breaking Ground: Teachers Relate Reading and Writing in the Elementary School. Portsmouth, New Hampshire: Heinemann, 1985. *

Process approaches to writing can be useful in the teaching of reading. As writing and thinking improve as children become involved in explaining their own writing processes from topic selection to finished draft, reading instruction should bear similar fruit.

Landrum, Roger. A Day Dream I Had at Night: Teaching Children to Make Their Own Readers. New York: Virgil Books, 1974. *

Sponsored by the New York City Teachers and Writers Collaborative, this book reports how instructors helped youngsters explore their various ethnic backgrounds to produce their own texts, which became the basis of language lessons.

Macrorie, Ken. Writing To Be Read. 3rd edition. Upper Montclair, New Jersey: Boynton/Cook Publishers, 1984. **

This third edition reaffirms Macrorie's continuing commitment to young writers. A new introductory section stresses the powerful effect of reading one's writing aloud.

_____. Telling Writing. 3rd edition. Upper Montclair, New Jersey: Boynton/Cook Publishers, Hayden Book Company, 1980. **

The third edition is proof that the Macrorie method works. A completely rewritten chapter on writing responses makes a distinction between a written response to a work and a critique of it.

Moffett, James and Betty Jane Wagner. Student-Centered Language Arts and Reading K-13. Boston: Houghton-Mifflin, 1976. ***

In this curriculum which embodies his theory of discourse, Moffett stresses the importance of student interaction in the writing/learning process. The curriculum explains the kind and sequence of writing assignments that will move students along his developmental continuum.

Murray, Donald. A Writer Teaches Writing. 2nd edition. Boston: Houghton Mifflin, 1986. **

An essential book for the teacher of writing, it gives English teachers an effective method of teaching composition based on the experience of professional writers.

_____. Write to Learn. Upper Montclair, New Jersey: Boynton/Cook Publishers, 1982. **

Newkirk, Thomas and Nancie Atwell, eds. Understanding Writing: Ways of Observing, Learning and Teaching, K-8. Chelmsford, Massachusetts: Northeast Regional Exchange, Inc., 1982. *

The articles in this book stress the role of and results of researchers examining writing as it occurred in natural settings.

Newkirk, Thomas. To Compose: Teaching Writing in the High School. Portsmouth, New Hampshire: Heinemann, 1985. **

A series of useful articles about writing instruction at the secondary level.

Tchudi, Stephen N. Teaching Writing in the Content Areas: Elementary, Middle School/Junior High, Senior High School. 3 vols. Urbana, Illinois: National Council of Teachers of English, 1983. ***

Turbill, Jan, ed. No Better Way to Teach Writing. Portsmouth, New Hampshire: Heinemann Educational Books, Inc., 1982. *

A report of the impressive results achieved by teachers in the St. George Writing Project, a year-long Australian experiment using the conferencing approach to the teaching of writing.

Ziegler, Alan. The Writing Workshop. Vol. 1. Urbana, Illinois: National Council of Teachers of English, 1981. **

An explanation of how to turn any classroom into a writing workshop, it also discusses the teacher's relationship with student writers.

Expanding Your Thinking

Britton, James, et. al. The Development of Writing Abilities. London: Macmillan Education, 1975.

In this book, Britton and others report the results of a research project designed to test his writing categories: expressive, transactional, and poetic. Both the function and audience of school-writing are discussed. The analysis of over 2,000 samples of students' work provides insight into youngsters' development of different types of discourse.

Burris, Nancy, Charles Temple, and Ruth Nathan. The Beginnings of Writing. Boston: Allyn and Bacon, Inc., 1982.

A comprehensive text of early writing development with numerous teaching strategies to support beginning writers (K-2).

Calkins, Lucy McCormick. The Art of Teaching Writing. Portsmouth, New Hampshire: Heinemann Educational Books, 1986.

Calkins responds to the challenges that confront teachers of writing, answers inevitable questions, and invites teachers to explore new frontiers in the teaching of writing.

_____. Lessons from a Child: On the Teaching and Learning of Writing. Exeter, New Hampshire: Heinemann Educational Books, 1983.

In this story of one child's growth as a writer, Calkins explains how teachers can work with children, helping them to teach themselves and each other.

Daniels, Harvey and Steven Zemelman. A Writing Project: Training Teachers of Composition from Kindergarten to College. Portsmouth, New Hampshire: Heinemann, 1985.

The directors of an examplary writing project describe fully the actual activities in a typical project, including the rationale, a step-by-step guide to workshop activities, and a review of the research confirming the effectiveness of such writing projects.

Elbow, Peter. Writing Without Teachers. New York: Oxford University Press, 1973.

The original "writing workshop" book, this presents an analysis of the importance of peer evaluation.

_____. Writing With Power. New York: Oxford University Press, 1981.

Hartwell, Patrick. "Grammar, Grammars, and the Teaching of Grammar." College English 47 (February, 1985): 105-127.

Each of five "grammars" is presented and discussed at length. The major conclusion drawn is that one learns to control the language of print by manipulating languge in meaningful contexts, not by learning about language in isolation.

Henderson, Edmund. Teaching Spelling. Boston: Houghton Mifflin, 1985.
The book takes a developmental approach to teaching children to spell. It attempts to show what it is that children must learn about words in order to master English spellings, and how teachers can direct children's learning over the primary and middle school years.

Kirby, Dan and Tom Liner. Inside Out: Developmental Strategies for Teaching Writing. Upper Montclair, New Jersey: Boynton/Cook Publishers, 1981.
Provides an abundance of practical suggestions for writing assignments, classroom management and teaching methods.

Moffett, James. Teaching the Universe of Discourse. New York: Houghton Mifflin Company, 1968.
In this extremely important theoretical study, Moffett argues for a developmental model of writing growth that moves from recording through reporting, then generalizing, and finally theorizing, and involves a consideration of the relationship of the writer and his/her audience.

_____. Active Voice: A Writing Program Across the Curriculum. Montclair, New Jersey: Boynton/Cook Publishers, Inc., 1981.
Suggests writing assignments with related readings for elementary to college level students.

Shaughnessy, Mina P. Errors and Expectations. New York: Oxford University Press, 1977.
A compassionate study of the basic writer, Shaughnessy's book is "must" reading for the teacher interested in remedial instruction.

Smith, Frank. Writing and the Writer. New York: Holt, Rinehart, and Winston, 1982.
The purpose of the book is to explore the relationship between the writer and what the writer happens to be writing. The general topic might be termed the psychology of the writing act.

This bibliography was excerpted from a larger work compiled by the New York State Department of Education, the Bureau of Curriculum Development, 1986.

SECTION VI

MATHEMATICS

The development of the mathematics portion of the MEA tests was guided by a content-by-process matrix. That is, every test question belonged to a content category and a process category. The process categories were computation, concepts, and application. The content categories are listed below.

A. Numbers and Numeration

1. Numeration
2. Number Concepts
3. Operations - Whole Numbers
4. Operations - Fractions
5. Operations - Decimals
6. Operations - Integers
7. Percent
8. Properties

B. Variables and Relationships

1. Equations and Inequalities
2. Functions/Coordinate Systems

C. Geometry

1. Plane and Solid Shapes
2. Congruence and Similarity
3. Properties of Triangles
4. Properties of Quadrilaterals
5. Constructions
6. Sections of Solids
7. Perimeter, Area, and Volume
8. Rotations and Symmetry
9. Other Theorems and Relations

D. Measurement

1. Appropriate Units
2. Unit Equivalents
3. Instrument Reading
4. Linear Measurement
5. Nonstandard Units

E. Problem Solving

1. Understanding the Problem
2. Estimation/Reasonableness
3. Relevant Information
4. Strategies and Processes

F. Other Topics

1. Probability
2. Statistics
3. Graphs, Tables, Charts
4. Logic
5. Operations w/Calculators

The committee members responsible for advising the Department on the development of the mathematics tests and the interpretation of mathematics results are listed below:

Jack Brown, Bangor High School
Verne Byers, UMF
Craig Dickinson, Asa Adams Sch., Orono
Jean Doughty, Brunswick School Dept.
Sarah Easler, Brewer Middle School
Maria Kauffman, Gardiner Reg. Jr. High
Lee Pederson, Vinalhaven
Sara-Jane Poli, Biddeford Sch. Dept
Lois Reynolds, Yarmouth High School
Neil Tame, Oxford Hills High
James Ward, Bowdoin College
Jacqueline P. Mitchell, DECS
Timothy Crockett, DECS

Interpretive Summary of Results

The review of assessment data raised several important issues. First, the test results indicate that students need increased exposure to real problem solving situations in mathematics. Second, it appears that students lack conceptual understanding of many mathematical principles and could benefit from increased experience with manipulatives and hands on learning activities. Third, results on questions dealing with numeration concepts of fractional numbers and computations with fractions suggest that instructional sequences in these areas need to be re-evaluated. Last, it appears that most areas of mathematics are taught in isolation from each other; many mathematical concepts are interrelated and opportunities to interrelate them should be maximized.

Numbers and Numerations

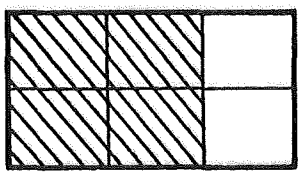
Grade 4 test questions dealing with whole-number numeration yielded mixed results. Students were quite successful at translating from words to numerals and from numerals to words, identifying the largest of a set of numbers, and identifying the digit in the "tens" place. However, when asked to relate numbers written in expanded notation to the corresponding numerals, performance was poor. This suggests that students have memorized rules for recognizing place values in a numeral but need greater conceptual understanding of place value.

Approximately three-quarters of the eighth and eleventh graders were able to round a four-digit numeral to the nearest hundred. Such performance may be reasonable for eighth graders, but one would have expected some improvement by grade 11. Only two-thirds of the grade 11 students were able to identify a whole number on a measurement scale with non-unitary gradations (e.g. numbered by 2's, 5's, etc.). This difficulty, whether it results from carelessness or a real lack of comprehension, also stands in the way of success on items requiring students to read the scales on instruments.

The students appear to do as well as they should at whole-number computation. Continued growth and proficiency is evident across grade levels. By grade 11, students are quite successful at computing with whole numbers using all operations. Given student success in this area, it is possible that less time could be devoted to the skill of computing with whole numbers in isolation without jeopardizing student competency.

Comprehension of common fractions is lacking at all three grade levels. Furthermore, students are not particularly proficient at computing with fractions. The results depicted below, although demonstrating considerable growth across the grades, suggests the lack of understanding of fractional parts at grades 4 and 8. Without better comprehension of fractions, it is understandable that these students have difficulty with simple computation exercises. Twenty-four percent of the fourth graders and 56 percent of the eighth graders succeeded at adding one-half and one-fourth. Over half of the fourth graders and one-third of the eighth graders selected two-sixths as their response to this question. Clearly, students frequently attempt to mechanically apply an algorithm (poorly remembered) without understanding, even when such problems are easily solved in one's head if one understands fractional parts.

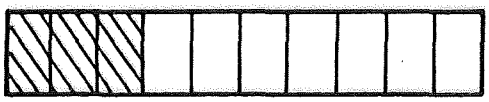
What fractional part of the rectangle below is shaded?



Percent of Students			
Gr. 4	Gr. 8	Gr. 11	
18	66	84	*A. 2/3
39	13	5	B. 2/4
38	20	8	C. 4/2
4	1	1	D. 3/2

(Note: Fractions were depicted with numerators and denominators vertically aligned in actual test)

Students have similar problems with decimal numerals. The question results shown below demonstrate this.



Percent of Students		
Gr. 8	Gr. 11	
25	13	A. 3.7
17	11	B. 3.0
2	1	C. .7
56	75	*D. .3

What decimal represents the shaded portion of the of the large rectangle above?

On another question dealing with numeration and decimal fractions, grade 8 students did far better (78 percent correct). This problem involved the identification of a decimal numeral on a number line. It is possible that decimals are taught using number lines almost exclusively instead of shaded parts. Consequently, the concept of a decimal as a fractional part is not taught effectively. Greater variety in the pictorial representations of different kinds of fractions would be desirable in instruction. Student performance was also poor on questions asking them to relate very simple common fractions to their decimal counterparts.

The lack of comprehension of percentages is much the same. Percentages greater than one hundred are not understood by many students. On computation exercises, only 21 percent of the eighth graders and 59 percent of the eleventh graders could compute eight percent of a number. Over half of the eighth graders mistakenly divided to answer this question. This suggests that

students might benefit from learning to apply proportional reasoning in solving percentage problems. It is apparent that eighth graders have had little experience by November with percentages. Performance was a little better on an exercise placed in a real context - finding the sales tax on a $72 purchase with a tax rate of 5 percent. Eighty-six percent of the eleventh graders succeeded at this task.

Efforts to teach the terminology for the various properties of operations (commutative, associative, etc.) have been de-emphasized. Test results, however, indicate that avoidance of the terminology may have led to avoidance of the teaching of the properties themselves. Far more than 28 percent of the eighth graders should succeed on the task shown below.

Percent of students Gr. 8	Which of the following is a <u>true</u> statement?
20	A. 1568 ÷ 47 = 47 ÷ 1568
20	B. 2738 x 0 = 2738
31	C. (938 - 27) + 481 = 938 - (27 + 481)
28	*D. 183 x (142 + 19) = (183 x 142) + (183 x 19)

On routine applications (i.e., typical textbook word problems), the performance of Maine students at all three grade levels was generally acceptable. Of course, performance was poorer on multistep problems than on one-step problems. Notable weaknesses are in the area of consumer math as exhibited by questions dealing with making change and comparison shopping. For example, one exercise required the fourth graders to add the prices of three items and then determine the change one would receive from $5. One-third of those students answered correctly; another one-third stopped after the initial step and gave the total amount spent as the answer to the question. A slightly more complicated problem (change from $20) was administered at grades 8 and 11. Fifty-four percent of the eighth graders and 73 percent of the eleventh graders were successful.

Typical textbook word problems do not constitute real problem solving. Consequently, nonroutine applications were also included in the test. Several of these were included as open-ended (non-multiple-choice) exercises. Two such questions and their results are depicted below.

The problems below are most effectively solved by the use of a diagram. The data show two things in particular. First, few students tended to use the diagram to solve these problems. Second, if a diagram was used, the answer was more likely to be correct.

		with diagram	without diagram	no response
Jim, Kay and Len all live along the same road. Jim lives 12 miles from Kay. Len's house is 8 miles from Jim's house and closer to Jim' than to Kay's house. How far apart do Len and Kay live? (Gr. 8 item)	correct	14%	42%	
	not correct	5%	34%	5%

Sam, Pat and Chris are all running in a race. Sam is 800 meters away from Chris. Pat is 1100 meters away from Sam and closer to Sam than to Chris. How far apart are Pat and Chris? (Gr. 11 item)		with diagram	without diagram	no response
	correct	28%	36%	
	not correct	5%	27%	4%

Another nonroutine problem administered at grade 11 indicated that a rope climber could climb five meters every minute; but at the end of every minute, he slipped down four meters. The students were asked how many minutes it took the climber to first reach the top of a 15-meter rope. Only 15 percent of the students gave the correct response, 11 minutes. Fifty-nine percent of the students answered "15 minutes." This poor result might be due, in part, to a lack of understanding the problem. Related to this is the possibility that students are more used to problems that require only quick computations. Such students might carelessly divide 15 meters by the net gain per minute of one meter, thus obtaining 15 as an answer.

Variables and Relationships

Most grade 8 students would have very little experience with algebra, particularly by November when the testing was conducted. Nevertheless, a few test questions administered at this grade level did involve some simple algebraic skills. Approximately half of the eighth graders could solve a simple linear equation for x and compute the value of a simple expression by substituting for x and y and simplifying. Approximately 80 percent of the eleventh graders succeeded at these very simple algebraic tasks. In light of the fact that 74 percent of the eleventh graders in Maine had completed Algebra I and 5 percent were currently enrolled, performance in algebra at grade 11 was disappointing. Areas of weakness include linear equations, slopes, and combining fractions and factoring. Only 50 percent of the eleventh graders could solve the equation, $3x + 5 - 14 = x + 2$, which was presented as an open-ended question.

Two nonroutine problems were best solved by using algebraic equations. The results on these grade 11 questions are shown below.

Right now, Bob has $9 in the bank and Carol has $23 in the bank. From now on, each will save $1 every week. How much money will Bob have saved when he has half as much as Carol?

	table	equation	other/ no work shown	no response
correct	20%	6%	19%	8%
not correct	2%	2%	43%	

Donna's brother is 4 years younger than she is. The sum of their ages is 1/2 the age of their father, who is 40 years old. How old is Donna?

	table	equation	other/ no work shown	no response
correct	2%	32%	26%	4%
not correct	0%	4%	34%	

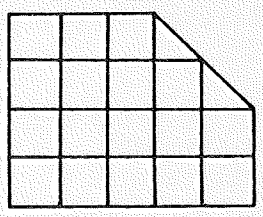
Clearly, the students who knew how to apply one of two strategies (using a table or using an equation) were more likely to succeed on these exercises. While students should be taught that many strategies can be used to solve a problem, they should also be exposed to a variety of problems so that they can learn to choose particular strategies that might be more efficient in particular situations.

Geometry

While students at all grade levels are fairly adept at identifying basic, regular geometric figures, their ability to apply geometric properties is lacking. Two-thirds of the eighth graders identified the figure that was "not a parallelogram," 23 percent of the students felt that the square that was depicted was "not a parallelogram." Also, many grade 8 students confused the radius and diameter of a circle.

Eighth and eleventh grade performance on questions dealing with various properties of triangles and rectangles was poor. Only 10 percent of the eighth graders and half of the eleventh graders could determine the measure of an acute angle in a right triangle given the measure of the other acute angle. Fewer than half of the eleventh graders could find the length of the hypotenuse of a right triangle given the lengths of the two legs. The triangle was also a 3-4-5 right triangle so the students could use the properties of this type of triangle as well as the Pythagorean Theorem to solve the problem. Just over half of the eighth grade students and just over two-thirds of the eleventh grade students could use the proportionality of corresponding sides of similar triangles to determine the length of an unknown side.

Student performance on questions addressing perimeter, area, and volume was disappointing. Grade 4 students should have done better on the question depicted below. On a similar, but somewhat more difficult question, grade 8 students performed similarly. Large numbers simply counted the regions into which the figure was divided, ignoring the fact that some were only partial unit squares.



What is the area of the figure above?

Percent of Students Gr. 4	
16	A. 17
40	*B. 18
36	C. 19
7	D. 20

The lack of understanding of the concepts of perimeter and area is undoubtedly related to the poor performance that was exhibited on questions requiring students to compute these quantities. Perhaps the confusion between perimeter

and area, illustrated by the question below, is reinforced by teaching the two simultaneously. An appropriate time to teach perimeter might be during the study of addition facts and/or measurement.

Percent of Students			Mr. Simmons put a wire fence all the way around his rectangular garden. The garden is nine feet long and five feet wide. How many feet of fencing did he use?
Gr. 4	Gr. 8	Gr. 11	
60	18	5	A. 14 feet
7	3	1	B. 23 feet
18	44	56	*C. 28 feet
16	34	35	D. 45 feet

Measurement

Grade 4 performance on appropriate unit questions was generally acceptable, and on monetary equivalents outstanding. An area of weakness for the students at this grade was identified by problems involving time. Given a starting and ending time, just over half of the students could determine that 20 minutes had elapsed. The same number could determine when a factory worker finished work if he started at 10 p.m. and worked eight hours.

At grades 8 and 11, performance was disappointing in knowledge of unit equivalents and converting units within a system. However, more than nine-tenths of the eleventh grade students succeeded at determining miles per gallon in one-step problems dealing with that concept. On the negative side, just over half of the eleventh graders could determine the time a roast should be put in the oven, given the desired finish time, the weight of the meat, and the cooking time per pound.

Students across the grades were generally successful at reading instruments, with the exception of a thermometer graduated in two-degree intervals as mentioned under "Numeration" earlier in this section. Fourth graders outperformed eighth and eleventh graders in estimating the length in centimeters of a toothbrush. Probably fourth graders have had more recent hands-on experience with metrics than most older students. Only half of the eighth graders could determine the distance between two towns given a scale drawing which included a simple scale and the actual map distance in inches.

Problem-Solving Skills

A variety of approaches to assessing understanding of story problems yielded mixed results. Students were more consistent across the grade levels at identifying missing or extraneous information in stated story problems, with one-half to two-thirds of the students succeeding on most of the multiple-choice questions addressing these skills. Estimation and reasonableness skills appear to be adequate when measured in isolation. However, students do not seem to apply these skills in situations calling for them. For example, in a grade 8 question which asked students how many buses would be needed to bus 1128 soldiers if each bus held 36 soldiers, 33 percent of the students answered 31 1/3 and 15 percent answered .031. Forty percent

correctly responded "32." When asked how many pieces of rope 2 3/4 feet long one could get out of a 12-foot rope, only one quarter of the eighth graders chose the correct answer "4." Almost half picked "none of the above," apparently looking for the exact result of the computation.

Questions at different grade levels presented students with problems and asked them to identify the most appropriate operations, equations, diagrams, or tables to use in solving them. While results on these questions were quite varied, they lead to the same conclusion found with nonroutine problems: students need more exposure to a greater variety of problems and solution strategies if they are to become better problem solvers.

Probability and Statistics

The results on probability questions using spinners suggest that students have little experience with probability. By grade 8, most students (70 percent) could correctly relate probability to area rather than number of unequal regions on a spinner, but more advanced concepts of probability are clearly not understood -- e.g., probability as a fraction, probability of an event NOT occurring. Some classic problems dealing with combinations (e.g. handshake problems) were asked in open-ended form at each grade level. When diagrams or tables were used, students tended to be successful, but few students used these strategies. Large numbers of students performed quick computations.

Most of the older students (78 percent at grade 8 and 87 percent at grade 11) can compute the simple average of a few two-digit numbers, but few really understand the concept of an average as a measure of central tendency.

Questions involving tables, charts, and graphs showed that students across the grades can read data from these devices, but there is room for improvement when it comes to understanding and interpreting them.

Questionnaire Findings

Of great concern to the Advisory Committee was the data regarding math teacher scarcity in the state of Maine. Almost one-half of the current grade 8 math teachers intend to leave their job in the next five years. Most of these teachers will be retiring but nearly one-fifth of them will be leaving the field of education. One-third of Maine's current high school math teachers will also be leaving in the next five years. One-half of those leaving will be moving into a field outside of education. Eighty-two percent of the high school principals and 60 percent of the grade 8 principals in Maine report difficulty in finding qualified math teachers. At the elementary level, the teacher shortage will not be quite as severe. Three-fourths of Maine's current grade 4 teachers expect that they will still be teaching in five years.

The second area of concern highlighted by the questionnaire findings is the lack of small group work in math classes. Small group discussions can be invaluable in the development of problem solving skills such as new approaches and strategies to problems. Seventy percent of the eleventh graders indicated that they worked in small groups "never" or "only a few times per year." Seventy-one percent of the eighth graders and 52 percent of the fourth graders responded similarly.

Last, questionnaire findings indicate that high school math programs in the state of Maine may not be meeting the needs of non-college-bound students. Thirty-seven percent of the grade 11 teachers felt their program was less than good in its ability to meet the needs of non-college-bound students while 87 percent of the teachers indicated that their program was "good" or "outstanding" in its ability to meet the needs of college-bound-students. Principals responded similarly to the same question.

Recommendations

Numbers and Numeration

1. Due to the need for estimation as a problem-solving skill, more emphasis needs to be placed on the skill of rounding.

2. Students do very well on the computation of whole numbers. It is the opinion of the advisory committee that teachers devote large amounts of time and effort to the instruction of computational skills. It is recommended that the time spent on computational skills might be lessened without any detrimental effects to student mastery of the skills. This would allow for the additional time needed to address areas of concern such as problem-solving skills.

3. Students have difficulty computing with fractions. It is apparent from the data that this is due to a lack of conceptual understanding of fractions. This might be improved with increased use of manipulatives such as paper folding and felt board activities. Since most students cannot successfully apply the algorithms for computing fractions until later in their schooling, perhaps the teaching of these formal algorithms should be delayed until the majority have grasped the concept.

4. Students do not perceive decimals as fractions, nor do they perceive the relationships among percentages, decimals, and fractions. Instead of thinking of and teaching about the three as separate, compartmentalized entities, they should be taught together and interrelated as much as possible.

5. Although it has been suggested that the terminology used to describe the properties of operations (e.g., commutative, distributive, associative) be de-emphasized, understanding the concepts is still essential. Students need to be taught the concepts behind these terms.

6. Student performance on routine applications of the operations was acceptable. However, as evidenced by performance on nonroutine problems, success with textbook word problems is not analogous to successful problem solving. Students need more experience in applying various appropriate strategies to the same problem.

Variables and Relations

7. Performance on algebra questions suggests that the timing and sequence of algebra courses should be examined. Many students lack conceptual

understanding of algebraic principles. It may be possible that the content of beginning algebra courses has become diluted because students enroll in the courses before they are ready. If students are to be enrolled in algebra at grade 8, they should be tested for readiness and the instruction they receive should be formal. Also, beginning algebra is often taught as a course separate from all other previous math experiences. Algebra and algebraic concepts (e.g. number sentences and missing addends) should be integrated into all levels and areas of math instruction.

Geometry

8. Practical experiences with geometric principles seem to be lacking. As with algebra, geometry is taught in isolation from other math courses. Geometric principles should be taught as part of all forms and levels of math instruction.

Measurement

9. Measurement also needs to be taught as a part of other math activities. When students learn about borrowing, for example, that knowledge should also be applied to unit conversions. Poor performance on questions testing conceptual understanding of measurement indicates that students would benefit from greater use of manipulatives and from real-life applications of measurement.

Problem-Solving Skills

10. Students need to be encouraged to apply estimation and reasonableness skills in any problem-solving situation.

11. Students need a greater exposure to real problems. Routine textbook problems involve only the "plugging in" of a memorized formula or strategy and do not encourage the growth of thinking skills.

12. Promote alternative strategies and approaches to solving the same problem. Unique approaches and good strategies should be rewarded as much as correct answers. It is often more valuable to look for five ways to solve the same problem than to solve five different problems.

13. Real-world problems are rarely solved by one person working alone. Students should have frequent opportunities to work in small groups and discuss strategies and approaches to solving problems.

14. Reading ability should not affect problem-solving ability. Poor readers can still be good problem solvers. Problem-solving skills should be taught daily and within context to students of all abilities.

Probability and Statistics

15. The emergence of the information age requires that students be able to both understand and interpret graphs and statistics. More emphasis should be placed on these areas.

The findings and recommendations of the MEA Mathematics Committee all point to several key problems in areas of mathematics instruction. First, emphasis on problem solving through the use of real-life problems and the development of alternative approaches and strategies to problems must increase. Second, there should be an increased use of manipulatives and hands-on experiences to increase conceptual understanding. Third, various aspects of math must be interrelated rather than taught in isolation from one another. If any of the above changes in math instruction are to occur, it is necessary that the changes and the teachers' implementation of those changes be supported by administrators. Above all else, it is imperative that an adequate supply of qualified math teachers be found to staff the Maine schools.

SECTION VII

SCIENCE

Questions in the science portion of the MEA tests were divided into four major reporting categories with finer distinctions within each category. The categories are listed below.

I. Scientific Inquiry

- A. Awareness of Science and Scientific Processes
- B. Design of Experiments
- C. Observing and Measuring
- D. Interpreting and Translating Data
- E. Drawing Conclusions and Inferences, Predicting and Estimating

II. Life Sciences

- A. Characteristics of Life
- B. Animal Life
- C. Plant Life
- D. Ecology and Environment

III. Earth and Space Sciences

- A. Astronomy
- B. Climate and Weather
- C. Geology
- D. Oceanography

IV. Physical Sciences

- A. Mechanics
- B. Waves and Optics
- C. Electricity and Magnetism
- D. Atomic/Nuclear (Modern) Physics
- E. Nature and Structure of Matter
- F. Physical and Chemical Changes in Matter

Interpretive Summary of Results

Generally, the committee was encouraged by grade 4 results and discouraged with grade 8 and 11 results. They were more satisfied with students' knowledge of life sciences than their knowledge in other areas. The committee was concerned with the lack of students' ability to generalize, synthesize, and organize.

Scientific Inquiry

Over half of the grade 4 students indicated that they feel scientists deal only with facts and need laboratories to do experiments. These results are consistent with results obtained in the 1983-84 Maine Assessment of Educational Progress (MAEP). In the earlier assessment, a very similar question was

The committee members responsible for advising the Department on the development of the science tests and the interpretation of science results are listed below:

Michael Brody, Univ. of Maine
Janice Dodge, Mallett School, Farmington
Lawrence Greenleaf, Belfast Area High
Stephen Godomsky, Jr., UMF
George Jacobs, Lewiston High School
Philip J. Marcoux, Georges Valley High
Robert Morrison, Scarborough High
Lois Thomas, Hamlin School, Randolph
Patricia Warren, Brunswick Jr. High
Timothy Crockett, DECS
Thomas Keller, DECS
Douglas Stafford, DECS

administered to the older students who performed somewhat better than the fourth graders, but who still showed that misperceptions about the nature of science are retained by many as they progress through the grades.

On a more difficult question asking the students to identify the best way to determine the strength of a piece of string, grade 4 students did well. Two-thirds of the students picked one of the two best answers - one involving an empirical test (the correct response chosen by 44 percent of the students), and the other (incorrect response chosen by 24 percent of the students) indicating that one should find out the material of which the string is made. Older students rely too often on authority when faced with such problems, rather than empirically determining answers. When asked to determine the best way to find out if the boys or the girls in a school were tallest, there was little growth across the grade levels, and over one quarter of the eleventh graders chose "look it up in an encyclopedia" or "check the school records" - nonempirical and ineffective approaches.

Grade 4 performance on some simple exercises involving sorting and sequencing was good. At grades 8 and 11, performance was poor on a more difficult exercise involving the sequencing of pictures of a particular setting with many factors changing over time. Only 57 percent of the grade 8 students and 67 percent of the grade 11 students answered this question correctly.

Students are generally weak in their understanding of concepts of measurement. Many believe that when something is measured repeatedly, the measurements should be exactly the same. This may be tied to the perception many students have that science is always exact or precise. At grade 11, just over half of the students could determine the amount of liquid in a graduated cylinder that would result from the combining of liquids from two cylinders; the initial readings were shown in the problem. Fewer than half of the grade 11 students recognized the use of "centimeters squared." By grade 11, students should have had some dimensional analysis.

Students across the grades are strong at direct reading of information from a graph. Even on tasks involving interpolation and extrapolation using a line graph, grade 11 students did well. Students at this level did not perform as well at recognizing the shape of a curve that would correspond to data given in tabular form and clearly representing a linear relationship.

The results on the grade 4 question shown below are impressive, suggesting that many grade 4 students are quite capable of making interpretations. Grade 8 and 11 students should have performed better on a different graph interpretation question. Forty-nine percent of the eighth graders and 34 percent of the eleventh graders were incapable of identifying the best conclusion from the graph that showed a curvilinear relationship between crop yield and rainfall.

A doctor kept records of breathing rates of people when they were resting. He made the chart below.

BREATHING RATES

Person	Breaths in a minute
Baby boys	36
7-yr.-old girls	25
7-yr.-old boys	25
10-yr.-old boys	20
Mothers	16

Percent of Students Gr. 4	The chart suggests that
11	A. boys breathe faster than girls.
3	B. girls breathe faster than boys.
5	C. older people breathe faster than younger people.
81	D. younger people breathe faster than older people.

Life Sciences

Human biology is an area of strength in life sciences. Most students in the upper grades, 64 percent at grade 8 and 73 percent at grade 11, were able to recognize a diagram of similar cells as being tissue. Students at all levels did well on questions dealing with the functions of organs and other human body parts. Eighty-two percent of the fourth graders identified a reason for the low occurrence of measles today.

Major weaknesses pertain to the areas of nutrition and plants. Only 54 percent of the grade 4 students recognized the value of citrus fruits. Only 60 percent of the students at grades 4 and 8 and 65 percent at grade 11 were able to identify a balanced meal. More than one-half of the eighth graders and one third of the eleventh graders were unable to identify a source of protein. At all levels there was very little understanding exhibited of the functions of the various parts of plants and the process of photosynthesis. Also, student knowledge of natural selection and the nature of cancer was limited.

Questions in the category of ecology generally required the synthesizing of ideas and related to the interaction of living things with each other as well as with the environment. Performance on many of these questions was poor, suggesting that ideas may be taught piecemeal or in isolation. Performance on questions dealing with causes of pollution was also poor.

Earth/Space Sciences

Grade 4 students did well on questions dealing with the basic facts of astronomy and meteorology. Performance of students at the upper two grade levels on more difficult questions in these areas was poor. In astronomy, knowledge of relative distances in space and the relative motions of bodies are areas of weakness. In meteorology, many eighth and eleventh graders fail to

understand concepts they encounter every day in the newspaper or television weather reports - concepts such as relative humidity and weather prediction.

Geology questions dealing with changes in the earth's surface generally resulted in satisfactory performace. However, at all levels, knowledge of U.S. energy sources was lacking. While some of these questions tested specific facts, these facts are particularly important in conjunction with broader social or political issues. They pertain to the availability and relative use of various energy sources in the United States.

In the field of oceanography, fewer than one-half of the students at grades 8 and 11 could identify the causes of different types of ocean waves. Only 60 percent of the eighth graders and 68 percent of the eleventh graders were able to explain the causes of tides.

On questions that tended to relate several concepts, performance was poor. Oceanography questions that required students to relate biological facts to marine environments exemplified this weakness. Also, on an oceanography question and an ecology question, very large numbers of students in the upper grades failed to recognize the importance of the sun as an energy source.

Physical Science

The results on physical science questions indicated that the expected growth across grade levels was not present. Grade 4 students have an adequate knowledge of physical science which might be attributed as much to actual real-life experience as to instruction, but the older students have not transferred this knowledge into an understanding of concepts appropriate at their levels. Grade 4 performance was higher than that at grade 8 and 11 on a question requiring the knowledge that large and small objects can fall at the same rate. On a question asking students to identify a simple electrical circuit that would work, older students did better, but the growth through the grades was not impressive.

While almost three-fifths of the fourth graders could identify a change in which a new substance is formed, only a third of the eleventh graders sucessfully identified the physical change in a list of commonly witnessed changes.

Students undoubtedly know the law of conservation of matter, yet many students at grades 8 and 11 were unable to apply that law. Student responses to questions involving the dissolving of a substance and changing of the state of a substance indicated that many students believe that matter could either disappear or be created or destroyed.

Eleventh grade students did well on an question that tested their understanding of the kinetic theory and how it relates to the different states of matter. Performance was poor, however, in questions that required application of the kinetic theory (e.g., gas laws, heat transfer). Also, students lack understanding of the kinds of matter (elements, compounds, etc.).

Questionnaire Findings

1. Older students perceive their knowledge of science as being less useful in their daily lives than younger students. Sixty-seven percent of the fourth graders believed science would be "very useful" to them. In response to the statement, "My knowledge of science will be valuable to me in my day-to-day life," 40 percent of the grade 8 students and 42 percent of the grade 11 students agreed.

2. Fifty-eight percent of grade 4 teachers spend less than 25 minutes per day on science instruction.

3. Approximately one-third of grade 4 teachers use audio-visuals at least once a week to teach science.

4. According to 42 percent of the grade 4 students, their teachers have them reading or answering questions in a workbook or worksheet "almost every day" during science class.

5. Ninety-five percent of the teachers at grade 11 and 66 percent at grade 8 have their students doing lab work at least several times per month.

6. Sixty-eight percent of grade 11 teachers believe that lack of interest is a serious problem in science instruction. Perhaps this lack of interest is related to the fact that 67 percent of the grade 11 teachers believe there is a mismatch between students' reading abilities and the science materials used.

7. Almost one-half of the grade 4 principals believed that science was the least effective instructional program in their schools.

8. Eighty-seven percent of the grade 11 teachers rated the science programs in their schools as "outstanding" or "good" in terms of how well they meet the needs of college-bound students. Only 53 percent of grade 11 teachers rated their programs as "outstanding" or "good" in meeting the needs of non-college-bound students.

9. Eighty-four percent of high school principals report having difficulties hiring qualified science teachers.

10. Thirty-six percent of the grade 11 and 42 percent of the grade 8 science teachers expect to be leaving their districts in the next five years. Approximately one-half of those teachers plan to leave the field of education altogether.

Recommendations

1. There needs to be an increase in the amount of instructional time devoted to science at the elementary grades. By grade 4, a minimum of 150 minutes per week should be devoted to science instruction.

2. A portion of a district's available staff development time should be devoted to training elementary teachers in science methodology and content.

3. Better and increased coordination of K-12 science programs is needed. Teachers of different grade levels need to be given time to communicate with each other to insure that students are receiving instruction in all areas of science and that use of available facilities and materials is optimized.

4. Particularly at the secondary level, a conscious effort must be made to integrate science into all subject areas. Opportunities and time to take advantage of the opportunities should be made available to teachers to become more aware of the curriculum in other subject areas and to use that knowledge to plan interdisciplinary approaches.

5. There needs to be an increased emphasis on skills in generalizing, synthesizing, and organizing and decreased emphasis on rote memorizing of facts. At the same time, science teachers must make a conscious effort to emphasize the concrete before the abstract.

6. Secondary schools must strive to make their science curriculum more effective for the non-college-bound student. Appropriate courses in chemistry and physics need to be offered to these students. Since the mismatch between student reading level and science textbooks is so extreme, science teachers should either be trained to teach reading in their subject area or courses without textbooks need to be offered.

7. In light of the gender gap in science scores at grade 11, efforts must be made to encourage women to consider science careers. The State Department of Education should provide information to schools on current programs and literature available on career education. Schools should offer inservice activities for teachers and counselors to increase staff awareness of available careers in science, and girls should be informed of and encouraged to pursue those careers. Guidance staff needs to be acutely aware of the gender gap when scheduling and counseling students on course selection. Also, attention must be paid to scheduling difficulties to discern if part of the problem is the inability of students to enroll in both science and, for example, French IV. If such scheduling difficulties exist, research suggests that the boys will take science and the girls will take the foreign language.

SECTION VIII

SOCIAL STUDIES AND HUMANITIES

Interpretive Summary of Results: Social Studies

The content outline used as a basis for test construction in social studies follows:

I. Physical Enviornment

- A. Place Geography
- B. Climate and Terrain
- C. Population Density/Clustering
- D. Man's Adaptation to the Environment

II. History

- A. World History
- B. U.S. History - before 1800
- C. U.S. History - 1800 to 1900
- D. U.S. History - 1900 to present

III. Political Science

- A. Types of Government
- B. Roles and Responsibilites of Levels and Branches of U.S. Government
- C. Characteristics of Economic Systems
- D. Political Processes in U.S. Government
- E. Citizenship

IV. Economics

- A. Concepts and Principles
- B. Personal Economics

V. Process Skills

- A. Maps and Globes
- B. Charts, Graphs, and Tables
- C. Using Reference Materials
- D. Problem Solving Strategies

VI. Sociology and Anthropology

- A. Similarities and Differences Among People
- B. Current Social Issues

The major categories listed above are the school level reporting categories. Individual student scores are not reported in social studies because only matrix sampled questions were used to assess this area. The questions developed for use in the social studies component of the MEA cover a range of cognitive process levels.

The committee members responsible for advising the Department on the development of the social studies and humanities tests and the interpretation of the social studies and humanities results are listed below:

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Katherine Camire, Old Orchard Beach High
Curtis Derrick, SAD 70
Jeffrey Jewett, Lawrence High, Fairfield
Rosemary Malachowski, Wilson School, Cumberland
Anne Pooler, University of Maine
Donna Reiter, Wiscasset Jr. High
Scott Woodward, Jewett Sch, Bucksport
Margaret Varney, Brunswick Jr. High
Scott Grant, DECS
Horace P. Maxcy, DECS
Mary Robinson, DECS
Valerie Seaberg, DECS

Physical Environment

The questions on physical environment dealt with topics such as place geography, climate and terrain, population density and clustering, and environmental issues. Maine fourth graders did well on this section overall, while the eighth and eleventh graders generally performed poorly on place geography questions and questions requiring a knowledge of global issues. At the upper grades, students demonstrated a strong understanding of current environmental issues, especially issues concerning the state of Maine.

A deficiency that is discernible in this section and throughout the social studies and humanities results was students' lack of global awareness. Many questions throughout the test challenged students' knowledge of world regions, history and cultures. Student performance on such questions was consistently low across the grades. For example, in physical environment, only 42 percent of the eighth graders and 45 percent of the eleventh graders could identify a country located in Asia from a list of countries currently in the news. The results on this question are particularly disturbing because of the percentage of students selecting each of the other possible options. One-fifth of both the eighth and the eleventh graders chose Poland as the country located in Asia, while another fifth of the students at each grade selected Ethiopia. Both of these countries have had a great deal of coverage in the media throughout the past year, yet many students demonstrated that they are not aware of the continents in which they are located and/or could not arrive at the correct answer through a process of elimination.

Student performance at the upper two grades on questions dealing with environmental issues in Maine was very good. Eighty-five percent of the eighth graders and over 90 percent of the eleventh graders could identify the main reason for laws that prohibit the dumping of fill in lake shore areas. Apparently, Maine students are very aware of issues that may directly effect them but they seem to have considerably less knowledge of those issues that are further removed from their personal frame of reference.

At the fourth grade level, students appear to have similar tendencies. One question asked students to identify the United States region in which Maine is located. Seventy-eight percent of the children correctly chose the northeast region. However, only half of the children could select from a list of states one which is located in the south. There were some "non-Maine" questions for which the results at this grade level were good. Over three-quarters of the students knew that the ocean covered the greatest portion of the earth's surface, and could select a country in which the climate would be hot and dry year round.

History

The history category covered both world history and United States history at all three grade levels. The proportion of questions in these categories varied based on the grade level and state course requirements.

Analysis of results in this section of the test indicates that there is a widely varied history curricula within each grade level. This is most evident at the elementary level, where questions dealing with early forms of communication and transportation, and questions where students had to place

major historical events in order of occurrence, had mixed results. At grade 8, it was clear that students were knowledgeable about specific periods of history such as the colonial period. However, their performance of questions dealing with United States history after the Revolution declined sharply. It may be that students in the fifth, sixth, and seventh grades are not exposed to a common history curriculum after the colonial period is covered. Results were greatly mixed on questions concerning the pioneer movement to the west, the Civil War, and major twentieth century people and events.

At grade 11, students were tested in two distinct areas: United States history and world history. The questions in the world history section ranged from ancient history (pre-1500s) through the twentieth century. Among other things, students were required to recognize major contributions of past civilizations, characterisics of specific periods of history, important people and events throughout history, and how major events affected people's lives. Results in this section were generally low with few of the questions having more than 50 percent of the students answering them correctly.

On the whole, eleventh grade results were higher in U.S. history than in world history. The U.S. history questions were divided between two categories, pre-Reconstruction and post-Reconstruction. Results on the former set of questions were the better of the two. Eighty-three percent of the students could identify the major reason for the Puritan's migration to the new world, and 82 percent knew that slaves had no legal rights prior to the passing of the 13th Amendment. Results on questions dealing with the post-Reconstruction period were less encouraging. Fewer than half of the students could identify the concept of manifest destiny, while only 57 percent could associate Franklin Roosevelt with the New Deal.

It is very likely that more students have taken American history than have taken world history. However, the overall results of the eleventh grade history test are still disturbing since such weak performance on post-Reconstruction American history indicates that most students are still quite unfamiliar with much of our country's history by the end of the eleventh grade.

Political Science

The questions in this category tested students' knowledge of national and international political science as well as citizenship issues. Political processes and the structure and organization of our government were included under national political science. International political science covered systems of government and students' knowledge of world governing agencies. Individual rights, duties, and responsibilities were dealt with in the citizenship questions.

Student performance was generally good at the fourth grade level, but the knowledge did not increase to the degree expected. Three-quarters of the younger students knew the main function of a judge during a trial, and 92 percent knew the purpose of holding elections. At grade 8, students did well on questions dealing with citizenship and legal rights. However, they did poorly on questions requiring knowledge of the roles and responsibilities of levels and branches of U.S. government, and questions on political and electoral processes. Grade 11 results were the least encouraging. Only 64

percent of the students knew the definition of a democracy, and a mere 34 percent were able to identify the State Department as the governmental department most concerned with foreign affairs. Again, only 34 percent of the students knew about the standard procedures involved in passing a bill through the House and the Senate. Sixty-one percent could identify the purpose of the U.S. Constitution. On the same question, a third of the students confused the purpose of the Constitution with that of the Declaration of Independence. It would appear that many students are deficient in their understanding of the fundamental concepts of political science in this country.

Economics

Questions in the economics category dealt with economic systems and economic terminology, as well as concepts of supply and demand, effects of industrial growth, personal economics, and consumer behavior.

Performance was quite good across the grades. Fourth graders were able to identify the meaning of economic terms such as tax and profit. They also did well on questions on supply and demand, and questions that dealt with methods of earning and managing money. Approximately one-half of the eighth graders could apply the concept of supply and demand to a given situation, identify the major advantage of mass production, and recognize the probable outcome of competition between two sellers. While these results are not particularly strong, the percentages of correct responses for eleventh graders on those items were almost twice as great as those for eighth graders.

Process Skills

The process skills category was divided into four subdomains. These were maps and globes; charts, tables, and graphs; references materials; and problem-solving strategies.

Students at all three grade levels did well on questions requiring them to use maps and globes, and identify and use a variety of reference materials. Performance was also good on questions requiring them to read information found in charts, tables, and graphs. Unfortunately, percentages correct dropped dramatically on questions requiring them to interpret or draw conclusions from that same information. Results on questions asked at the eighth and eleventh grades dealing with problem-solving strategies were good.

Sociology and Anthropology

The questions in this category dealt primarily with similarities and differences among peoples, social organization, and social change. At the upper two grades, this section also included questions on current social issues.

Results on questions in this category were generally good across the grades. Fourth graders did well on questions asking them to identify basic needs, cultural universals, roles of community helpers, and probable reasons for certain social behaviors and conflicts. Eighth and eleventh graders were asked about similiar topics in a more sophisticated manner, and again results were high. Additionally, at the upper grades, students were given questions dealing with current social issues such as nuclear arms, changing roles for men

and women in society, and societal attitudes concerning immigrants and refugees. Results on such questions dropped slightly, but most were still above the 50 percent range.

Undoubtedly, many students do not take sociology or anthropology courses per se, but they seem to have acquired at least a superficial knowledge of these subjects across the grades. There is an obvious difference in results on questions dealing with social behavior, change, and organization in our own culture versus the cultures of other peoples. Results were consistently higher on questions that dealt with issues more familiar to the students' own experiences.

Interpretive Summary of Results: Humanities

The MEA humanities test is based on the following objectives framework:

Humanities Area	Forms, Elements, and Techniques	Meaning and Purpose	Social/Historical Perspectives
Literature			
Visual Arts			
Performing Arts			
Language			
Religion/Philosophy			

Each row and each column of the matrix above constitutes a reporting category for school level results. Individual results are not reported for humanities, because humanities is assessed with matrix-sampled questions only.

As in other content areas, the questions throughout the humanities matrix cover a wide range of cognitive processes. Additionally, questions falling within each column represent progressively more involved understandings of the different areas within the humanities. "Forms, Elements, and Techniques" includes questions dealing with the recognition of various forms of literature, types or styles of art, and characteristics of different languages, religions, and philosophies. Questions that associate tools or materials with an art form, or identify features or methods used in the construction of a literary or art form, are also placed in this category. Questions under "Meaning and Purpose" deal with the interpretation of literature, specific works of art, and philosophical phrases. Also included are questions about the purposes of various forms of literature, art, and religious practices; and questions requiring students to compare and contrast types of literature, different works of art, differing forms of communication, and varying philosophical viewpoints. "Social and Historical Perspectives" questions associate various aspects of the humanities with place or time in history or cultural origin. For example, they require that students associate famous authors/artists with their works, and place a variety of languages, religions and philosophies or

philosophers within the appropriate social reference or historical time frame. Various social and historical aspects of history and social change on the humanities are also considered.

Literature

The questions in this category measure students' recognition of the forms and elements of literature as well as a variety of literary techniques; students' ability to understand and interpret literature; and their ability to associate literary genre (legends, folktales, etc.) and specific authors and works with historical time periods.

Results on questions testing eighth and eleventh graders' knowledge of literary terminology and techniques showed little growth between the grades. For example, only 41 percent of the eighth graders and 40 percent of the eleventh graders could correctly identify the use of metaphor in a poem. At the fourth grade level, 53 percent of the students were able to identify a passage as an example of a fable, and 48 percent correctly identified the elements of a legend.

Student performance across the grades was good on questions asking for a literal explanation of a passage or poem. Performance was much poorer on questions requiring interpretation of the same pieces. Moreover, students frequently chose answer options that gave literal interpretations of the intended meaning of a passage or phrase instead of the correct interpretation that had to be inferred. In other words, they tended to select the literal answer regardless of the type of question being asked.

Students, for the most part, appear to be unfamiliar with famous authors and their works (or the genre with which the author is most closely associated). Only 41 percent of the grade 4 students associated Hans Christian Anderson with a list of his most famous fairy tales. At the eighth grade level, only 26 percent of the students knew that Charles Dickens was not an American author. Results across the grades improved when students were asked about famous Maine writers and their works. Seventy percent of the fourth graders correctly identified E.B. White as the author of a classic children's story, while at the eleventh grade, 70 percent of the students knew that Robert Frost is best known for his poetry. While Maine students' apparent familiarity with local writers is encouraging, it seems that most students have had a very limited exposure to famous or classic authors and their works.

Visual Arts

Questions in the visual arts category required students to recognize the primary colors, visual perspective, different artistic styles, the mood, theme, or outstanding technical feature of a piece, and the original purpose of various art forms. Students were also tested on their ability to associate works of art or architecture with particular time periods or cultures.

Results in this category show that students have a basic knowledge of the forms, elements, and techniques of art. Additionally, there was good growth across the grades on questions comparing several works of art and questions requiring the interpretation of a piece. This is illustrated by the results below.

Percentage of Students Selecting Each Option

Grade 4	Grade 8		Which statement best describes the MAIN IDEA shown in the painting?
27	63	*	A. There is a violent, uneasy feeling about the picture.
47	26		B. The house is in a bad rain storm.
4	2		C. The tree that bends will make it through the storm.
2	1		D. Birds are being blown in a storm.
20	8		E. I don't know.

When students were asked to identify art styles and forms as being representative of certain cultures and time periods, performance was poor. An example of this phenomenon is provided by the results on a question asking for the country form which a statuette came. Only 5 percent of the fourth graders, 24 percent of the eighth graders, and 31 percent of the eleventh graders correctly identified Mexico.

While many fourth graders have probably not been exposed to Mexican or Latin American studies and the art styles characteristic of those regions, one might expect that eighth and eleventh graders could better discriminate between the styles of Australian, Egyptian, Chinese, and Mexican art. By the time students reach the seventh grade, they have probably completed social studies units on a majority of the countries listed above. Possibly, very limited attention has been paid to art forms characteristic of different cultures.

Performing Arts

The performing arts category included questions about musical instruments, forms, and symbols, and characteristics of various art forms such as drama and dance. Students also were asked to associate particular artists with art forms.

Student performance in this area was quite strong overall. There seems to be a good recognition of the various forms of performing arts and an understanding of the terminology to those forms across the grades. Fourth graders did very well on questions about musical instruments and families of instruments. Eighty-eight percent correctly identified the instument in a picture, and 71 percent could identify the family of instruments in which a given instrument belongs. Across the grades, most students were able to identify instruments common to certain styles of music, recognize classical composers, and identify appropriate settings and characterizations from dramatic excerpts.

Performance faltered on questions tracing the origins of various art forms, and only 40 percent of the eighth graders and 49 percent of the eleventh graders recognized famous American composers of the 20th century.

Language

In the language category, students were asked to associate words with the language from which they were derived, identify words with similar origins, and recognize specialized forms of communication such as jargon. There were also questions dealing with the predominance of particular languages, the impact of language(s) on interrelationships among cultures, and the relationship between language and social assimilation.

Results on questions in the language category were mixed. Eighth and eleventh graders were able to identify the origin of English words that are derived from other languages, and they recognized various forms of communication. However, they did very poorly on questions dealing with the impact of language on interrelationships among peoples and the reasons for a worldwide predominance of certain languages.

Across the grades, students recognized that French is the second most frequently spoken language in Maine, but they also believe the same to be true for the United States as a whole. Apparently, many students are not aware of the major impact of the Hispanic population on the culture of many parts of this country. Not only do students lack awareness of other countries' history and culture, but they seem to be lacking in their understanding of differences across their own country when compared to their immediate environment.

Religion

Questions in the religion category tested students' general awareness of major religions and their historical impacts on society without expounding upon the beliefs of any one religion. Although the study of specific religions is not a responsiblity of the public schools, a basic knowledge of worldwide religions plays an important role in understanding the culture and history of many peoples.

Students seem to have an extremely limited knowledge of the origins, characteristics, and impacts of major religions. Only 28 percent of the eighth graders and 24 percent of the eleventh graders could identify the Middle East as the area where most American religions have their earliest roots. Interestingly, the majority of the students at both grade levels stated that most religions practiced in America first originated in Europe. Presumably, they are aware of the vast influence European culture has had on our country, and they based their response on that knowledge. Results across the grades were very low on an question addressing the major similarity between Judaism and Christianity. Less than 10 percent of the eighth and eleventh graders could name the religion that currently has the most followers in the world. Apparently, students have a major misconception of the influence and roles of religions throughout the world.

Philosophy

Questions in the philosophy category required students to identify famous philosophers and to place specific philosophies within the cultural/historical time period with which they are most closely associated; recognize the fundamentals of several major philosophical tenets; and interpret the underlying philosophical meaning of several pharses.

Student performance in philosophy was surprisingly good considering that there probably is not a great deal of formal instruction in this area. While many students were unable to define specific philosophies and recognition of famous philosophers was low, results across the grades improved on questions identifying the philosophical reasoning behind specific behavior, and the comparison and contrasting of philosophical views. Forty-seven percent of the eighth graders and 67 percent of the eleventh graders were able to correctly interpret a given philosophical phrase. Although the aforementioned results are not very high, they may indicate that students have the capability to deal with philosophical concepts and that more formal instruction could prove worthwhile.

Questionnaire Findings

1. There is an apparent lack of enthusiasm for social studies across the three grade levels. Fifty-two percent of the fourth graders and 56 percent of the eighth and eleventh graders stated that social studies was their least favorite or one of their least favorite subjects compared to other subjects they study in school.

2. Over half of the students at each grade level named television as their primary source of news information.

3. At little over 50 percent of the eighth and eleventh graders report that more than half of what they learn in social studies comes directly from their textbook. The percentages decrease slightly at grade four.

4. Eighty-two percent of the high school social studies teachers believe that the social studies program in their school more than adequately serve their college-bound students; another 64 percent believe that the same program more than adequately serves the needs of students who are not college-bound.

5. Sixty-eight percent of the high school principals believe that the social studies program in their school more than adequately serves their college-bound students. (Principals rated the adequacy of their science and mathematics programs significantly higher.)

6. Fifty-five percent of the high school principals have taught at least one full year of social studies.

7. Only 8 percent of the high school principals view their social studies program as the most effective program in their school, while another 35 percent see their social studies program as least effective.

8. High school principals report the least amount of difficulty in securing qualified teachers for social studies positions as compared to other subject areas.

9. Principals of buildings that house grades 4 and/or 8 report that their school system has provided the least amount of inservice opportunites for teachers of social studies when compared to reading, writing, mathematics, and science.

10. Principals across all three grades stated that less time is spent on social studies instruction compared to other subjects.

Recommendations

The following recommendations regarding instruction in social studies and the humanities were derived from the discussions of assessment results by the social studies and humanities advisory committees:

1. Instruction in social studies and humanities must foster greater global awareness in students.

2. Instruction should enable students to recognize interrelationships of concepts across the social studies disciplines.

3. Humanities instruction should be incorporated with instruction in other content areas, particularly social studies.

4. Instruction should focus more on developing higher order thinking skills with an emphasis on developing greater problem-solving abilities.

5. Requirements for social studies should be increased, particularly in the area of political science.

6. Social studies instruction should incorporate a variety of teaching techniques.

7. School systems should provide increased in-service training for teachers of social studies to further develop skills in a variety of teaching techniques.

8. Teachers of social studies and humanities should work toward improving attitudes about the role and value of social studies and the humanities.