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ABSTRACT

The National Assessment of Educational Progress (NAEP), a congressionally mandated national assessment program, can provide valuable data to educational policy makers in Massachusetts and other New England states concerning the status of their educational reform initiatives and performance standards. The three purposes of this paper are: (1) to describe the NAEP and its goals and structure, (2) to present some of the results of the 1992 Mathematics NAEP Assessment as an example of the utility of this national assessment program, and (3) to highlight ways in which background data collected by the NAEP can be helpful in interpreting assessment results and monitoring educational reform. Massachusetts and other New England states aspire to have performance standards that approximate national and international standards of excellence. The NAEP provides an excellent database to influence the standard-setting process, and therefore should be of considerable interest to policy makers who are serious about setting meaningful performance standards and monitoring the quality of educational progress. Includes 10 tables. (Contains 5 references.) (Author)

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Abstract

The National Assessment of Educational Progress (NAEP), a congressionally mandated national assessment program, can provide valuable data to educational policy makers in Massachusetts and other New England states about the status of their educational reform initiatives and their performance standards. The three purposes of this paper are to describe NAEP and its goals and structure, to present some of the results of the 1992 Mathematics NAEP Assessment as an example of the utility of this national assessment program, and to highlight ways in which background data collected by NAEP can be helpful in interpreting assessment results and monitoring educational reform.

Massachusetts and other New England states aspire to have performance standards that approximate national and international standards of excellence. NAEP provides an excellent data base to influence the standard-setting process, and therefore should be of considerable interest to policy-makers who are serious about setting meaningful performance standards and monitoring the quality of educational progress.

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Major educational reform is under way in Massachusetts as it is in many other places in the United States. Academic performance standards, curriculum revisions, reorganization of schools, teacher certification and recertification, improved school record keeping, school and district evaluation, and student discipline are all part of the Massachusetts Educational Reform Act of 1993 to improve the quality of K-12 education.

At the center of the educational reform movement in Massachusetts and other states are performance standards. Students in Massachusetts will be carefully monitored to assess their progress in relation to high educational performance standards in six core subject areas: mathematics, science and technology, history and social science, English, foreign languages, and the arts. According to MTA Today (see the October 29, 1993 issue, p. 14), "The law also directs that the standards set high expectations of student performance and take into consideration the work and recommendations of national organizations, and be set at a level comparable to those in the most educational advanced nations of the world." Clearly the

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[1]Laboratory of Psychometric and Evaluative Research Report No. 261. Amherst, MA: University of Massachusetts, School of Education.

[2]To appear in the New England Journal of Public Policy.

Educational Reform Act of 1993 is demanding high standards of performance for students in Massachusetts.

This raises the question of how performance standards in Massachusetts will be set. How will it be possible to incorporate national and international perspectives into the standard-setting process? Such perspectives may not be well-known by those policy-makers and educators chosen to set the performance standards. One problem that might arise is that the standards could be set too high (perhaps because of misinformation or poor judgment) and therefore be unreasonable, and send the wrong message to parents, students, policy-makers, and educators alike. There is some evidence that this was done on the 1990 initiative to set national performance standards in mathematics (Stufflebeam, Jaeger, & Scriven, 1991).

Unreasonable or inappropriate performance standards are a legitimate concern, as the setting of performance standards for students is a judgmental process and mistakes can easily be made. For example, policy-makers in their desire to meet public expectations may set totally unrealistic standards. Lack of familiarity with the curricula, the testing process, or how performance assessments are administered and scored, could all have their effects on the process. If the standards are set too low, which is also possible, then Massachusetts will achieve its educational goals but not meet national and world-class standards. If the standards are set too high in some subjects and grade levels and lower in others, progress across the six

major subject areas and grade levels will be difficult to compare, and the results will be extremely difficult if not impossible to interpret meaningfully by policy-makers and the public alike.

What is to be done? How should performance standards be set? One answer may be found in the National Assessment of Educational Progress (NAEP) and the trial state assessment program. Every two years NAEP, which is a national assessment program sponsored by the U.S. Department of Education, produces national and state (since 1990) achievement results that can provide an external frame of reference for Massachusetts educational policy-makers for interpreting educational progress. Besides being interesting and generally informative to the nation's policy-makers and educators, the national results provide a basis for judging content, performance standards, and other aspects of the educational process in Massachusetts. Such comparisons can be valuable to policy-makers in establishing performance standards for Massachusetts students and schools.

In 1992, 114 public schools at grade 4 and 97 public schools at grade 8 from Massachusetts participated in the NAEP Mathematics Assessment. Altogether, over 5000 students from Massachusetts were involved. Over 250,000 students from all parts of the country participated in the 1992 NAEP Mathematics Assessment. How were the performance standards set for interpreting mathematics performance? How did Massachusetts students in grades 4 and 8 perform compared to other northeastern

states and the nation? The purposes of this paper are three-fold: First, NAEP and its goals and structure will be described. Second, some of the recent results of Massachusetts students on the 1992 Mathematics Assessment will be highlighted to provide a flavor of the results found in the 204 page report prepared by the Educational Testing Service (ETS) and the National Center for Education Statistics (NCES). And third, a basis for interpreting the Massachusetts assessment results in terms of demographic, school, and non-school variables will be provided. This will be done through comparisons of mathematics achievement results for different demographic groups in Massachusetts, and comparisons among curricula, instructional approaches, teacher credentials, and home environments in Massachusetts, the Northeast, and the Nation.

All of the statistical results reported in this paper were published previously in the NAEP Mathematics State Report for Massachusetts (National Center for Education Statistics, 1993) though their presentation is different and more comprehensive in the NAEP reports. Our intention in this paper is to draw attention to the important work of ETS and NCES in the NAEP Project and thereby encourage more policy-makers in Massachusetts to utilize the NAEP reports. Though this paper will address the Massachusetts mathematics results, reports are available for other New England states in mathematics and in several other subject areas (though state comparative results are not always available).

What is NAEP?

Since the late 1960s, the United States government (through the National Center for Education Statistics of the Department of Education) has been congressionally mandated to assess American education. The National Assessment of Educational Progress (NAEP) was established to measure the scholastic achievement of our nation's students. NAEP monitors student achievement by periodically testing representative samples of 4th, 8th, and 12th graders in a number of subject areas, including reading, math, science, social studies, writing, art, computer literacy, and others. In 1990, over 250,000 students were involved in the assessment of mathematics achievement at the national level. Students in 41 states participated at the state level also, providing state level information.

The measurements provide profiles of strengths and weaknesses in students' understanding overall, covering home, school, and classroom contexts for learning. (No individual student scores are available.) Exactly what and how to assess these areas is decided through a consensus process involving many people committed to the improvement of American education. Individuals, from curriculum specialists, teachers, public officials, and business leaders to concerned citizens and parents, are included in this process in order to represent a broad range of thinking and ideas. Fourteen experts were invited to the first National Assessment meeting in 1969. Today, thousands of people from all over the U.S. are involved. In the

current fiscal year, about 30 million dollars will be spent on NAEP-related activities including both national and international assessments.

There have been many changes in the reporting of NAEP information since the early years. Up until 1984, the primary mode of reporting was at the individual item level. The average performance of various groups (nation, male, female, Hispanic, Black, etc.) on each item in the assessment was reported. In 1984, there was a change in score reporting to describe performance of various groups of interest on a score scale somewhat similar to that of the Scholastic Aptitude Test (SAT) except that scores ranged from 0 to 500 (as compared to 200 to 800 on the SAT). Thus, because of a reporting scale, it became possible to look at the distribution of performance of various groups of students to indicate how students perform in relation to others. At arbitrarily chosen points along the scale called anchor levels (i.e. 200, 250, 300, and 350), the knowledge and skills of students were described and then the percent of students in various groups who obtained that score or better were reported (Beaton & Allen, 1992).

Some policy makers were still unhappy with this reporting because such reporting did not address the question of whether or not the level of student performance was adequate. Such a view was expressed by the National Assessment Governing Board, which is the agency responsible for handling NAEP policy issues. In 1988, the National Assessment Governing Board (NAGB) was formed

by Congress to decide upon "appropriate achievement goals" for each grade and subject area. These "achievement levels" or standards as they are commonly called, dictate what students should know and be able to do at "Basic," "Proficient," and "Advanced" levels of performance, not only what they do know (see, for example, Hambleton, 1994). Some saw this shift in reporting as controversial because it went beyond merely measuring performance to dictating what skills and information were most important for students to know. At any rate, this is the path NAEP has taken in recent years in an attempt to ensure that American students are obtaining the skills that are needed to function in a rapidly changing world.

Despite these changes, however, four main objectives have remained intact since the formation of NAEP in 1969:

How can an appropriate set of objectives be developed?

What should the specifications be for the construction of new tests?

In what ways should the results of the National Assessment be reported?

How can these results be made meaningful to policy-makers?

Clearly, these four goals are all geared toward providing comprehensive and dependable information on the progress of education in the United States. NAEP has also recently begun to provide this information at the state level. In 1988, a trial state assessment was decided upon in order to enable comparisons of representative samples of students from each participating

jurisdiction with each other and the nation. The first trial state assessment was conducted in 1990. Thirty-seven states and three territories participated. Massachusetts was not included in the 1990 trial state assessment. The second trial state assessment took place in 1992. This provided the states that participated in both assessments with information about their individual educational growth (or lack thereof) in addition to how they compared with other states. Massachusetts did participate in the 1992 assessment, though they were excluded from analyses which focused on changes in mathematics achievement between 1990 and 1992.

Up until 1988, Congress prohibited the reporting of NAEP results at the student, school, district, and state levels. However, in 1988, the new legislation permitted on a trial basis only the reporting of results on the 1990 and 1992 (and now the 1994 assessment) at the state level. In 1990, the focus was on 8th grade mathematics. In 1992, focus was on 4th and 8th grade mathematics, and 4th grade reading. Recent evaluations suggest that policy-makers have been very pleased with the availability of state level data. The performance standards have received mixed reviews.

Data provided at the state level will provide policy-makers and the public with more tangible results. The conclusions are not meant to create a "horse-race" between the states by any means. Hopefully, the information will be used to learn from the example of successful regions in order to improve American

education as a whole. After all, it won't be long until our nation's educational system will be judged not only by the standards that NAGB decides upon, but on international comparisons as well. Currently, the United States is participating fully in the Third International Mathematics and Science Study in which 4th, 8th, and 12th grade students from over 60 countries will participate (though not necessarily at all three grade levels). The results from this assessment will provide the United States with an international perspective on mathematics and science achievement in 1995 and then again in 1999. These results will be "linked" to the NAEP scales so that, in theory, individual states can also look at their progress within an international perspective. Such a perspective is called for in the Massachusetts Educational Reform Act of 1993.

Setting National Performance Standards on NAEP

NAEP reports educational performance on a 500 point scale with scores ranging from 0 to 500. The average score for a combined nationally representative sample of 4th, 8th and 12th grade students in 1990 was set at 250. For the purposes of reporting scores at each grade level, the National Assessment Governing Board (NAGB) convened a panel of teachers, non-teacher educators, and non-educators to set performance standards (called achievement levels by NAGB) for 4th, 8th, and 12th grade students. Three performance standards were set at each grade level to divide the distribution of achievement scores for the nation and each participating state into four performance

categories: Below Basic, Basic, Proficient, and Advanced. The policy definitions of these achievement categories are as follows:

Basic. This level, below Proficient, denotes partial mastery of the knowledge and skills that are fundamental for proficient work at each grade.

Proficient. This central level represents solid academic performance for each grade tested. Students reaching this level have demonstrated competency over challenging subject matter and are well prepared for the next level of schooling.

Advanced. This higher level signifies superior performance beyond proficient grade-level mastery at each grade.

The 46 panelists (24 at grade 4 and 22 at grade 8) worked with the policy definitions, a national framework of important mathematics skills, and the item pool itself, over a five day period to eventually set the following performance standards:

Grade	Level	Percent Score	NAEP Scaled Score
4	Basic	39	211
	Proficient	65	248
	Advanced	84	280
8	Basic	48	256
	Proficient	71	294
	Advanced	87	331

The details of the standard setting process, which probably are the most elaborate and carefully developed in the history of performance standards, are described in NAEP 1992: Mathematics State Report for Massachusetts (Mullis, Dossey, Owen, & Phillips, 1993). In fact, the standard-setting procedure implemented might well become the model for performance standard-setting in Massachusetts.

How well did Massachusetts students perform in mathematics, and how well did Massachusetts students perform compared to the Northeast and the Nation? These questions will be answered next.

1992 NAEP Mathematics Results

Table 1 provides the grade 4 and 8 results for Massachusetts students, along with the results for other northeastern states, and the nation as a whole. For the purposes of this study, northeastern states include Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.

Insert Table 1 about here.

One important observation is that Massachusetts students at both grade levels performed above students in other northeastern states and the nation. For example, 70% of grade 4 students in Massachusetts performed at a Basic level or above, compared to 64% of grade 4 students in other northeastern states, and 59% of

grade 4 students in the nation. It is encouraging to see these results, while at the same time, it is noted that 30% of the grade 4 students in Massachusetts were performing at a Below Basic level. This means for example, that these students were not able to perform successfully on at least 39% of the grade 4 NAEP mathematics items. Are these results acceptable in Massachusetts? Almost certainly not, given the goals of the educational reform plan in Massachusetts. The situation at grade 8 is slightly worse. Here, 68% of grade 8 students in Massachusetts performed at a Basic level or above, and correspondingly, 32% of Massachusetts students performed at a Below Basic level. Though results in Massachusetts were better than other northeastern states and the nation, they surely are not good enough when about 1 in 3 grade 8 students are not able to achieve a level of Basic in mathematics.

The results at the advanced level are quite interesting. Massachusetts students performed about as well as students in other northeastern states and the nation. But the disappointing aspect of these results is that only about 3% of grade 4 and 8 students were identified as Advanced in mathematics. Policy-makers will need to decide what results are acceptable, but the number will almost certainly exceed 3%. What these results show is that Massachusetts is doing about as well as other states in producing Advanced level performance in mathematics but that the percent of students achieving this level is low. The task now is for policy makers to study the results in Table 1, and determine

what the sources of the problems may be and then set goals, and implement plans for doing better. The next time the mathematics assessment is conducted, evidence of any progress should be available. Many states (37) have already had an opportunity to monitor growth over a two-year period, since they participated in the 1990 NAEP Mathematics Assessment. In fact, most states improved in 1992 over their 1990 performance, and the students nationwide showed useful gains at both grades 4 and 8.

Table 2 contains some interesting information about the demographic description of Massachusetts students. In this table, data are reported for grades 4 and 8. Massachusetts students are compared to students in the Northeast, and the Nation, and are organized by race/ethnicity, type of community, and parents' education. Such information can be helpful in interpreting the achievement results. In race/ethnicity, Massachusetts has a higher percentage of white students than the Northeast or the nation, about 10% more. The Hispanic component is about the same. In terms of type of community, Massachusetts students are comparable to the Northeast and the nation and both tend to contain more students from Advantaged Urban and Disadvantaged Urban than the national sample. Parents of students from Massachusetts and the Northeast tend to have more education than the country as a whole. There was a rather large percentage of data in the category which was unaccounted for in grade 4. Children of this age simply may not yet be aware of their parents' educational backgrounds.

Next the relationship of achievement results to race/ethnicity, type of community, and parents' education will be considered.

Insert Table 2 about here.

Race/Ethnicity

Table 3 contains some of the results comparing White, Black, and Hispanic students from Massachusetts. (Comparisons are also available among race/ethnic groups in Massachusetts, the Northeast, and the Nation but they will not be reported here.) Clearly, there are major differences in performances. One of the most revealing statistics is the fact that 74% of the grade 4 Black students and 65% of the grade 8 Black students in the state are performing at a Below Basic level. The results for Hispanic students are somewhat better for students at grade 4 (58%) and slightly worse for those in grade 8 (70%). Both groups are well below the mathematics performance of the White students. Monitoring such results over the next the couple of assessments will be a valuable way to evaluate educational reform in Massachusetts.

Insert Tables 3, 4, and 5 about here.

Type of Community

What role does type of community play in the results? Table 4 contains some information on this question. The Advantaged Urban category includes students living both in urban and suburban areas where the majority of the students' parents had professional or managerial careers. In these groups, only a few percent of the students are Below Basic, and 1 out of 10 students are operating at the Advanced level. The Disadvantaged Urban category also represents students in urban and suburban areas, but where high proportions of the parents were on welfare or not regularly employed. This group has five times more Below Basic students than the Advantaged Urban group, and less than 1 of 100 students in the Advanced level. Tables like Table 4 show the strong correlations between type of community and mathematics achievement results.

Parents' Education

The results in Table 5 address the question of the relationship between parents' education and achievement results. The results show high positive correlations at both grades 4 and 8. The percent of students who are Below Basic is at least three times higher among children with parents who did not graduate high school compared to those whose parents graduated college.

Further Interpretations of NAEP Mathematics Results in Massachusetts

What factors are affecting mathematics achievement? Such questions cannot be answered conclusively with correlational data such as compiled by NAEP. But factors correlated with

mathematics achievement can be valuable and can point to possible explanations. NAEP routinely collects questionnaire data along with test results. These questionnaires address such information as what students are actually taught in mathematics (this includes curriculum coverage, mathematics homework, and instructional emphasis), how mathematics instruction is delivered (this includes resources in the classroom, amount of small group work, using mathematical objects, mathematics material), the emphasis on calculators and computers, who is teaching fourth and eighth grade mathematics (this includes the educational backgrounds of teachers), and conditions beyond school that facilitate mathematics learning and teaching. Data highlighting the relationships among these factors and mathematics achievement results are reported for Massachusetts, the Northeast, and the Nation in NCES (1993). Reports on several of these factors will be considered next.

Content Emphasis

Table 6 permits the comparison of eighth grade mathematics curriculum emphasis in Massachusetts compared to the Northeast and the Nation. Probably the most striking information in the table is that Massachusetts teachers give less emphasis to measurement and geometry than teachers in other states do (see the information under the "Low Emphasis" column). For example, 25% of Massachusetts teachers indicated that they gave low emphasis to geometry, whereas, the figure was 10% in other Northeastern states and 11% in the Nation. Tables like Table 6

provide both comparative information on curriculum emphases as well as average proficiency scores.

Insert Tables 6 and 7 about here.

Assignment of Problems From Textbooks

One of the goals of the educational reform movement is to break out of the conventional use of textbooks for assigning problems to students. Table 7 shows comparative results at grades 4 and 8. At grade 4, Massachusetts teachers are less likely to assign problems from textbooks than their counterparts around the country, 58% of Massachusetts teachers do, compared to 73% of teachers in the Northeast, and 75% of teachers in the nation. At the grade 8 level though, Massachusetts teachers are comparable to teachers across the country. Results like these combined with other information in the NAEP reports pertaining to instructional approaches will be valuable to policy-makers in better understanding how Massachusetts teachers handle mathematics instruction.

Calculator Use

The National Council of Teachers of Mathematics (NCTM) Standards are quite clear about the relevance of calculators in mathematics instruction. Also, the College Board now allows the use of calculators on the SAT. These two acts should be significant in expanding the uses of calculators in mathematics instruction. Table 8 includes some interesting results on this

question. In fourth grade, Massachusetts approaches the use of calculators like most other states. About 20% of the students use calculators at least once a week, and about 50% never use or hardly use a calculator at all. At the eighth grade, the results are very different and it appears that Massachusetts is falling behind. Forty-six percent of the students in Massachusetts never use or hardly ever use calculators. In other Northeastern states and the nation, the percent is exactly half, or 23%. At least with respect to the NCTM Standards, Massachusetts is out-of-step. It is worth mentioning though, that despite this lower use of calculators, Massachusetts students' average proficiency scores remain higher than the Northeast and the nation.

Insert Tables 8 and 9 about here.

Teacher In-Service Training

With all of the educational reforms taking place, more emphasis is being placed on teacher qualifications and in-service training. Some information on the latter is contained in Table 9. These results suggest that at the grade 4 level, amount of in-service training for Massachusetts teachers is comparable to other northeastern states and the nation. However, at the 8th grade level, Massachusetts teachers are receiving rather less training. For example, 47% of teachers across the nation are receiving 16 or more hours of in-service education per year, compared to 26% of teachers in Massachusetts. Now it may be that

Massachusetts teachers are generally better qualified than their counterparts, but this matter should be of some interest to policy-makers and educators in Massachusetts. An explanation is in order.

School Absenteeism

There are many home factors that impact on school performance too. Via a self-report form completed by students, some information on the relevance of home factors on school achievement can be studied. Among the variables reported on in the NAEP studies are amount of reading materials in the home, hours of television watched per day, student perceptions of mathematics, and student absenteeism. Table 10 provides some results on the last area. Clearly, school attendance is strongly related to mathematics proficiency. Perhaps this is why student attendance is a focus in school reform. Results like those in Table 10 can be used to buttress policy-makers' concern about school attendance and efforts to improve the situation.

Insert Table 10 about here.

Conclusions

Programs such as NAEP have the potential for providing Massachusetts policy-makers with valuable data for judging educational achievement. The national standards were set high with the intention of being "world class". NAEP assessments are also consistent with the content framework developed by national

mathematics educators and are consistent with the National Council of Teachers of Mathematics Standards which were developed several years ago and are being used around the country to reshape mathematics instruction in grades K through 12. As such then, the NAEP results reported by NCES (1993) provide a meaningful national framework for judging mathematics achievement over time. Massachusetts performance standards might be judged too. If state results suggest more progress is being made than is suggested by NAEP results, then it may be that our curriculum and performance standards are not in step (i.e., too low) and need to be revised. Of course, if state results suggest lower performance than is suggested by NAEP results, then the state standards (content and/or performance) may simply be too high. NAEP results are only part of the story for judging educational progress in Massachusetts, but they can be quite important. To date, these NAEP results would appear to have been underutilized by Massachusetts policy-makers and educators.

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Table 1

Fourth Grade and Eighth Grade
Public School Mathematics Achievement

Achievement Level	Region	Grade 4 Percentage	Grade 8 Percentage
At or Above Advanced Level	Massachusetts	3	3
	Northeast	3	5
	Nation	2	3
At or Above Proficient Level	Massachusetts	24	28
	Northeast	23	25
	Nation	18	23
At or Above Basic Level	Massachusetts	70	68
	Northeast	64	59
	Nation	59	61
Below Basic Level	Massachusetts	30	32
	Northeast	36	41
	Nation	41	39

Table 2

Profile of Public School Students in Massachusetts, the Northeast Region, and the Nation

Region	Subgroups	Grade 4 Percentage	Grade 8 Percentage
	Race/Ethnicity		
Massachusetts	White	79	83
	Black	7	5
	Hispanic	8	8
Northeast	White	71	67
	Black	17	19
	Hispanic	8	10
Nation	White	69	69
	Black	17	16
	Hispanic	10	10
	Type of Community		
Massachusetts	Advantaged Urban	16	7
	Disadvantaged Urban	14	23
	Extreme Rural	1	1
	Other	68	69
Northeast	Advantaged Urban	20	12
	Disadvantaged Urban	16	12
	Extreme Rural	4	7
	Other	60	69
Nation	Advantaged Urban	9	8
	Disadvantaged Urban	10	9
	Extreme Rural	13	10
	Other	67	72

Continued, next page.

Table 2--Continued:

Region	Subgroups	Grade 4 Percentage	Grade 8 Percentage
	Parents' Education		
Massachusetts	Graduated College	46	48
	Some education after high school	7	17
	Graduated high school	11	21
	Did not finish high school	2	7
	I don't know	33	7
Northeast	Graduated College	44	38
	Some education after high school	6	18
	Graduated high school	11	26
	Did not finish high school	4	8
	I don't know	35	10
Nation	Graduated College	40	40
	Some education after high school	7	18
	Graduated high school	13	25
	Did not finish high school	4	8
	I don't know	36	9

Table 3

Fourth Grade and Eighth Grade Public School Mathematics Achievement by Race/Ethnicity

Grade	Race/ Ethnicity	- At or Above - Advanced	Proficient	Basic	Below Basic
4	White	3%	28%	77%	23%
	Black	0	2	26	74
	Hispanic	1	9	42	58
8	White	4	31	74	26
	Black	1	8	35	65
	Hispanic	0	5	30	70

Table 4

Fourth Grade and Eighth Grade Public School
Mathematics Achievement by Type of Community

Grade	Type of Community	- At or Above - Advanced	Proficient	Basic	Below Basic
4	Advantaged Urban	8%	41%	88%	12%
	Disadvantaged Urban	1	6	36	64
	Other	3	25	75	25
8	Advantaged Urban	14	62	92	8
	Disadvantaged Urban	0	7	38	62
	Other	3	31	75	25

Table 5

Fourth Grade and Eighth Grade Public School Mathematics Achievement by Parents' Education

Grade	Parents' Education	- At or Above - Advanced	Proficient	Basic	Below Basic
4	Graduated College	5%	34%	79%	21%
	Some Education After High School	3	27	77	23
	Graduated High School	1	16	62	38
	Did not Finish High School	0	4	29	71
8	Graduated College	6	41	80	20
	Some Education After High School	1	24	72	28
	Graduated High School	1	15	58	42
	Did not Finish High School	0	5	40	60

Table 6

Teachers' Reports on the Emphasis Given to Specific Grade 8 Mathematics Content Areas

Content Area	Region	High Emphasis	Average Proficiency	Low Emphasis	Average Proficiency
Numbers and Operations	Massachusetts	77%	274	4%	302
	Northeast	79%	272	4%	***
	Nation	76%	269	4%	283
Measurement	Massachusetts	14%	278	23%	280
	Northeast	22%	263	16%	277
	Nation	16%	255	15%	281
Geometry	Massachusetts	19%	271	25%	263
	Northeast	21%	265	10%	256
	Nation	18%	263	11%	264
Data Analysis, Statistics, and Probability	Massachusetts	8%	280	51%	272
	Northeast	17%	273	27%	266
	Nation	11%	273	30%	268
Algebra and Functions	Massachusetts	47%	286	15%	247
	Northeast	38%	293	22%	241
	Nation	46%	282	13%	241

***Sample size is too small to produce a reliable estimate (fewer than 62 students).

Table 7

Teachers' Reports on the Frequency of Use of Problems From Textbooks

Grade	Region	Assignment of Problems from Textbooks (almost every day)	Average Proficiency
4	Massachusetts	58% of Teachers	225
	Northeast	73% of Teachers	220
	Nation	75% of Teachers	216
8	Massachusetts	82% of Teachers	274
	Northeast	80% of Teachers	271
	Nation	82% of Teachers	271

Table 8

Teachers' Reports on the Frequency of Calculator Use

Grade	About how often do students use a calculator?	Region	%	Average Proficiency
4	At least weekly	Massachusetts	18	236
		Northeast	22	225
		Nation	18	222
	Never or hardly ever	Massachusetts	48	220
		Northeast	57	218
		Nation	48	213
8	At least weekly	Massachusetts	35	279
		Northeast	55	272
		Nation	56	274
	Never or hardly ever	Massachusetts	46	267
		Northeast	23	260
		Nation	23	263

Table 9

Teachers' Reports on Their In-Service Training[1]

Hours	Region	Grade 4 Percentage	Grade 8 Percentage
0	Massachusetts	18%	16%
	Northeast	18	11
	Nation	17	8
1 to 15	Massachusetts	61	56
	Northeast	68	51
	Nation	62	45
16 or more	Massachusetts	21	26
	Northeast	14	38
	Nation	21	47

[1]During the last year, how much time in total have you spent on in-service education in mathematics or the teaching of mathematics?

Table 10

Eighth-Grade Students' Reports on the Number of Days of School Missed Per Month and Average Proficiency

Days Missed/ Month	Region	Percentage of Students	Average Proficiency
None	Massachusetts	42%	279
	Northeast	38	271
	Nation	42	271
One or Two Days	Massachusetts	35	273
	Northeast	35	269
	Nation	34	268
Three or More Days	Massachusetts	23	259
	Northeast	27	260
	Nation	23	257

Biographies

Ronald K. Hambleton is Professor of Education and Psychology at the University of Massachusetts at Amherst and writes extensively on issues and methods associated with educational testing and assessment.

Sharon F. Cadman is a second year doctoral student at the University of Massachusetts at Amherst, holds a GRE Fellowship from the Educational Testing Service and is interested in psychometric methods and statistics.