

Test-Curriculum Alignment Study for New MCAS Tests in 2006: Grade 3 Reading,
Grades 5, 6, and 8 English Language Arts, and Grades 3, 5, and 7 Mathematics^{1,2}

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Curriculum-Test Alignment Study for New MCAS Tests in 2006: Grades 5, 6, and 8
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Executive Summary

According to the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999), three requirements about test content apply to programs such as the MCAS: (1) the content of the tests must be consistent or in alignment with the content specifications for the tests, (2) the tests must show content diversity over time, if the tests from a given year don't cover all of the curricula, and (3) the test items themselves must assess the learning standards to which they are referenced or linked. The first requirement is intended to insure that there are no surprises in the content emphasis of a test each year. The Massachusetts Department of Education has set policy that specifies the number of score points that should be in each content area (called "content strands"), and then the tests are constructed, or should be constructed, so that the number of score points in each content strand remains about the same from year to year and meets the expectations. From our review it is clear that the seven new tests are completely consistent or in alignment with the expectations and meet the content specifications within the 5% tolerance that is permitted by the Massachusetts Department of Education.

The second requirement above recognizes that in any given year it is usually not possible to assess all of the learning standards in the Massachusetts curriculum framework content standards. Choices of learning standards to be assessed must be made. The requirement, therefore, can be operationalized to mean that over, say, a three-year time period, all or nearly all learning standards in the Massachusetts curriculum framework content strands, and that are intended to be included in the large scale test each year (some learning standards are excluded because they are better assessed at the classroom level), will be assessed in at least one of the yearly tests. Since 2006 was the first year of administration, it is not possible to assess the second requirement in this report. Data from several years of testing are needed to assess technical requirement two. This second requirement, if met, would insure, for example, that there would be no advantage for teachers to only teach the learning standards that were assessed on a previous test, since from year to year, the selection of learning standards to be included in a test is made to insure coverage of the curriculum over a several year time-frame. While it is not possible to collect comprehensive data in 2006, our research shows that the percent of learning standards assessed in each of the seven tests in 2006 is very consistent with the results obtained from the more established tests in a single year, and this finding suggests that the Department of Education is well positioned to meet the second requirement within the three year time span.

The third requirement is that evidence is needed to show that the test items and associated scoring rubrics (for the short answer and constructed response items) are

measuring the learning standards to which they are referenced or linked. The evidence for requirement three is substantial and provided in the 2006 MCAS Technical Report produced by the test contractor. The evidence includes (1) the qualifications and training of the item writers, (2) the process the contractor uses to draft, edit, and finalize the test items, (3) the statistical evidence compiled during the piloting phase of item development, and (4) the efforts of the DOE's assessment development committees, external content expert reviewers, DOE staff themselves, and item bias and sensitivity review committees (see the 2001, 2005 and 2006 Massachusetts Technical Reports for details) to assess the validity of the test items and the related scoring rubrics. That evidence will not be repeated in this report but is readily available to interested individuals in the MCAS Technical Reports that can be found at the DOE website (www.doe.mass.edu/mcas/results).

In summary, the intent of the contractor and the DOE is to build MCAS tests each year that (1) are consistent or in alignment with the test content specifications, (2) over regular intervals of time, assess all of the learning standards in each curriculum that are intended to be included in the tests, and (3) use test items that are valid indicators of the learning standards to which they are matched. In this study, we reported on our efforts to assess the extent to which the first requirement above, which is one of the technical requirements for "curriculum-test alignment," is met by the grades 5, 6, and 8 English Language Arts and grades 3, 5, and 7 Mathematics tests administered in 2006 for the first time. These conclusions also hold true for the grade 3 Reading test, for which an "above proficient" performance level was established in 2006 to comply with NCLB requirements. Our research findings are clear: For all new tests, the actual distribution of test content was nearly perfectly consistent or in alignment with the test content specifications. This is an excellent result and speaks well of both the contractor and the DOE in their efforts to produce curriculum-test alignment. The University of Massachusetts research team also found that the contractor and the DOE took an excellent first step toward meeting requirement two by assessing relatively large percentages of the learning standards in the first year of testing, and certainly as large as our research team observed in other subject areas and grade levels with a longer history than the tests studied in this report. Only one recommendation seems necessary. The DOE and contractor need to continue to monitor that the learning standards intended for classroom assessment, are actually being assessed at the classroom level.

Curriculum-Test Alignment Study for New MCAS Tests in 2006: Grades 5, 6, and 8 English Language Arts, and Grades 3, 5, and 7 Mathematics³

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Purposes

In 2004, 2005, and 2006, the University of Massachusetts Center for Educational Assessment carried out alignment studies between the MCAS grades 4, 7, and 10 English Language Arts (ELA) and grades 4, 6, 8, and 10 Mathematics tests and the test content specifications and the curriculum frameworks (Hambleton & Zhao, 2004, 2005; Hambleton, Zhao, & Smith, 2006). The evidence is strong that the tests are (1) consistent with the test content specifications and (2) comprehensively measure the Massachusetts curriculum framework content standards.

In 2006, and to be in compliance with the No Child Left Behind legislation, the Massachusetts Department of Education (DOE) extended the MCAS testing program to include grades 5, 6, and 8 English Language Arts (ELA) and grades 3, 5, and 7 Mathematics. The Department also established a fourth performance level (above proficient) to comply with NCLB requirements. The purposes of this study were similar to the purposes of the earlier studies: (1) investigate the extent to which the MCAS tests are consistent or in alignment with the test content specifications (i.e., the test score point weights assigned to the content strands), and (2) show diversity in test content over several years, so that all learning standards in the ELA and Mathematics curricula that are intended to be included on the large-scale assessments, are actually included. The second purpose was only minimally addressed because the tests were being given for the first time in 2006. We did consider the percentage of learning standards assessed by other more established MCAS tests to see if the first year results from the new tests were comparable.

Methods

Information about the test content specifications is provided in the 2005 and 2006 Technical Reports found at the Massachusetts Department of Education's website (www.doe.mass.edu/mcas). Details on the specific learning standards (LS) included in each test and the number of score points were provided to us by the contractor and the DOE (see MDOE, 2006a, 2006b, 2006c, 2006d, 2006e, 2006f, 2006g, 2006h, 2006i). The DOE does offer specifications too for the balance of item types (multiple-choice, short answer, and constructed response) but that information is not important for curriculum-test

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alignment requirements one and two. The test item-learning standard matches (based on the procedures and findings reported in the 2001, 2005, and 2006 Technical Reports) are well-documented and so that aspect of the curriculum-test alignment study will not be repeated here. The evidence includes (1) the qualifications and training of the item writers, (2) the process the contractor uses to draft, edit, and finalize the test items, (3) the statistical evidence compiled during the piloting phase of item development, and (4) the efforts of the DOE's assessment development committee, external content expert reviewers, DOE staff themselves, and item sensitivity review committees (see the 2001, 2005 and 2006 Massachusetts Technical Manuals for details), to assess the validity of the test items and the related scoring rubrics.

For our work in preparing this report we used the 2001, 2005 and 2006 (draft) Massachusetts Technical Reports (see www.doe.mass.edu); a number of Massachusetts curriculum reports (Massachusetts Department of Education, 2006a, 2006b, 2006c, 2006d, 2006e, 2006f, 2006g, 2006h, and 2006i) and, finally, some earlier Massachusetts Department of Education reports (2000, 2001, 2004a, 2004b).

Results

The findings from our analysis of the new tests in 2006, and the grade 3 Reading test for which a fourth performance level was set, are reported in Tables 1 to 19.

Grade 3 Reading

Table 1 contains the intended score points of the test for the two curriculum strands (called the "test content targets" in this report). Table 6 provides the match between the content on the 2006 test and the target. The largest difference between the target percentage and the actual percentage for any content strand was 3.4%. This discrepancy is within the tolerance that the DOE allows the contractor and is a very reasonable tolerance level in practical test development work.

Table 13 shows that nine of the 11 learning standards were assessed, or 81.8%, on the spring 2006 test. (Learning standards 6 and 9 were not included in the calculations because they are not normally included in the tests. They are normally assessed at the classroom level.) This figure of 81.8% compares favorably with the percent of learning standards assessed on the grade 4 English Language Arts test (the test closest in the curriculum to the grade 3 reading test). These percentages ranged from 75.0% to 100% between 2001 and 2006. Grade 3 tests were not available earlier for use in this analysis.

Grades 5, 6, and 8 English Language Arts

Table 2 contains the intended score points of the assessment for the two curriculum standards at grades 5, 6, and 8. Table 7 highlights that the grade 5 test content specifications and the test itself differ by at most 4.3% in any of the content strands and so the test is within the 5% tolerance level allowed the contractor by the DOE. The language strand is underweighted by two score points. Table 8 highlights that the grade 6

test deviates from the target by 2.4%. Again, the language strand is underweighted, this time by about one score point. Table 9 shows that the grade 8 test is completely consistent for each content strand with the target.

Table 1
Approximate Distribution of Grades 3 Reading Score Points Across Content Strands

Content Strand	Target % of Total Points (n = 48)
Language	18% (9 points)
Reading and Literature	82% (39 points)
Composition	0% (0 points)

See Massachusetts Department of Education (2006h) for the information in the table.

Table 2
Approximate Distribution of Grades 5, 6, and 8 English Language Arts Score Points Across Content Strands

Content Strand	Target % of Total Points (n = 52)
Language	12% (6 points)
Reading and Literature	88% (46 points)
Composition	0% (0 points)

See Massachusetts Department of Education (2006h) for the information in the table.

Table 3
Approximate Distribution of Grade 3 Mathematics Score Points Across Content Strands

Content Strand	Target % of Total Points (n = 40)
Data Analysis, Statistics, Probability	20% (8 points)
Geometry	12.5% (5 points)
Measurement	12.5% (5 points)
Number Sense and Operations	35% (14 points)
Patterns, Relations and Algebra	20% (8 points)

See Massachusetts Department of Education (2006i) for the information in the table.

Table 4

Approximate Distribution of Grade 5 Mathematics Score Points Across Content Strands

Content Strand	Target % of Total Points (n = 54)
Data Analysis, Statistics, Probability	15% (8 points)
Geometry	13% (7 points)
Measurement	13% (7 points)
Number Sense and Operations	33% (18 points)
Patterns, Relations and Algebra	26% (14 points)

See Massachusetts Department of Education (2006i) for the information in the table.

Table 5

Approximate Distribution of Grade 7 Mathematics Score Points Across Content Strands

Content Strand	Target % of Total Points (n = 54)
Data Analysis, Statistics, Probability	20% (11 points)
Geometry	13% (7 points)
Measurement	13% (7 points)
Number Sense and Operations	26% (14 points)
Patterns, Relations and Algebra	28% (15 points)

See Massachusetts Department of Education (2006i) for the information in the table.

Table 6

Grade 3 Reading Content Strands
(Percent of Total Points/Number of Points)

Strand Standards	Target %	Actual Distribution
		2006
Language 4-6	18%	14.6% 7
Read/Lit. 8-17	82%	85.4% 41
Composition 19-22	0%	0% 0
TOTAL	100%	48

See Massachusetts Department of Education (2006h) for the information in the table.

Table 7
 Grade 5 ELA Content Strands
 (Percent of Total Points/Number of Points)

Strand Standards	Target %	Actual Distribution
		2006
Language 4-6	12%	7.7% 4
Read/Lit. 8-17	88%	92.3% 48
Composition 19-22	0%	0% 0
TOTAL	100%	52

See Massachusetts Department of Education (2006h) for the information in the table.

Table 8
 Grade 6 ELA Content Strands
 (Percent of Total Points/Number of Points)

Strand Standards	Target %	Actual Distribution
		2006
Language 4-6	18%	14.60% 5
Read/Lit. 8-17	82%	85.40% 47
Composition 19-22	0%	0% 0
TOTAL	100%	52

See Massachusetts Department of Education (2006h) for the information in the table.

Table 9
 Grade 8 ELA Content Strands
 (Percent of Total Points/Number of Points)

Strand Standards	Target %	Actual Distribution
		2006
Language 4-6	12%	11.5% 6
Read/Lit. 8-17	88%	88.5% 46
Composition 19-22	0%	0% 0
TOTAL	100%	52

See Massachusetts Department of Education (2006h) for the information in the table.

Table 10
 Grade 3 Mathematics Content Strands
 (Percent of Total Points/Number of Points)

Strand	Target %	Actual Distribution
		2006
Data Analysis, Statistics, Probability	20%	20% 8
Geometry	12.50%	15% 6
Measurement	12.50%	15% 6
Number Sense and Operations	35%	30% 12
Patterns, Relations and Algebra	20%	20% 8
TOTAL	100%	40

See Massachusetts Department of Education (2006i) for the information in the table.

Table 11
 Grade 5 Mathematics Content Strands
 (Percent of Total Points/Number of Points)

Strand	Target %	Actual Distribution
		2006
Data Analysis, Statistics, Probability	15%	14.8% 8
Geometry	13%	13% 7
Measurement	13%	13% 7
Number Sense and Operations	33%	33.3% 18
Patterns, Relations and Algebra	26%	25.9% 14
TOTAL	100%	54

See Massachusetts Department of Education (2006i) for the information in the table.

Table 12
 Grade 7 Mathematics Content Strands
 (Percent of Total Points/Number of Points)

Strand	Target %	Actual Distribution
		2006
Data Analysis, Statistics, Probability	20%	20.4% 11
Geometry	13%	13% 7
Measurement	13%	13% 7
Number Sense and Operations	26%	25.9% 14
Patterns, Relations and Algebra	28%	27.8% 15
TOTAL	100%	54

See Massachusetts Department of Education (2006i) for the information in the table.

Table 13
 Grade 3 Reading Learning Standards (13)
 (Number of Items/ Number of Points Per Assessment Each Year)

Learning Standard (LS)	Year 2006
4	6/6
5	1/1
6	X
8	13/13
9	X
10	2/2
11	
12	9/12
13	4/7
14	2/2
15	1/1
16	
17	4/4
TOTAL	42/48
<u>% of LS Assessed</u>	<u>81.8</u>

See Massachusetts Department of Education (2006h) for the information in the table.

Note: Learning standards 1, 2, 3, 7, 18, and 24 to 27 are not included in the annual MCAS assessments, and instead, they are assessed by teachers at the classroom level.

Learning standards 6 (formal and informal English) and 9 (making connections) are rarely included in the annual MCAS assessments because of their nature, but occasionally they are assessed. They are normally assessed by teachers at the classroom level. These learning standards are not included in the % of LS assessed calculation above.

Learning standards 14, 16, and 17 associated with poetry, myths and traditions, and drama, respectively, are sometimes included in the assessments and other times the genres are used in assessing other learning standards.

Tables 14, 15, and 16 show, for grades 5, 6, and 8, that the percentage of learning standards in each test is 90.1%, 81.8%, and 81.8%, respectively. (Again, learning standards 6 and 9 were excluded from the calculations. They are identified in the tables because they are taught and the testing is normally done at the classroom level.) These percent figures are comparable to the findings at other grade levels (i.e., grades 4, and 7) and so the contractor and the DOE appear to be following a good track for approaching 100% coverage over the next three years. In grade 4 ELA, the percentages across six years (2001 to 2006) varied between 75.0% and 100%; in grade 7 ELA, the percentages across six years varied between 81.3% and 100.0%.

Grades 3, 5, and 7 Mathematics

Tables 3, 4, and 5 contain the desired or target number of score points in the five content strands of the mathematics curricula at grades 3, 5, and 7. The weights are very close to each other, and consistent with the content strand targets at other grade levels (i.e., grades 4, 6, 8, and 10).

Tables 10, 11, and 12 highlight the matches between the percentage of score points in the grades 3, 5, and 7 mathematics tests, respectively, and the targets. For grade 3, the discrepancy never exceeded 5% for any content strand. For number sense and operations, the discrepancy was exactly 5% (35% in the target versus 30% actual). For other content strands the matches were close and less than 5%. For grades 5 and 8, the discrepancy was effectively 0%.

Tables 17, 18, and 19 show, for grades 3, 5, and 7, that the percentage of learning standards in each test is 66.7%, 71.4%, and 80.8%, respectively, and very much in line with the percentages observed at other grade levels (i.e., grades 4, 6, 8, and 10). By comparison, these percentages are a bit lower than the percentages noted in Reading and English Language Arts, but this does not reflect a different test construction policy but rather reflects the increased number of learning standards in the mathematics curriculum at each grade level (25 or more learning standards in mathematics at grades 3, 5, and 7, compared to 11 in Reading and English Language Arts at grades 3, 5, 6, and 8).

Table 14
 Grade 5 English Language Arts Learning Standards (13)
 (Number of Items/ Number of Points Per Assessment Each Year)

Learning Standard (LS)	Year 2006
4	3/3
5	1/1
6	X
8	8/11
9	X
10	2/2
11	1/1
12	6/9
13	9/15
14	3/3
15	5/5
16	2/2
17	
TOTAL	40/52
<u>% of LS Assessed</u>	<u>90.1</u>

See Massachusetts Department of Education (2006h) for the information in the table.

Note: Learning standards 1, 2, 3, 7, 18, and 24 to 27 are not included in the annual MCAS assessments, and instead, they are assessed by teachers at the classroom level.

Learning standards 6 (formal and informal English) and 9 (making connections) are rarely included in the annual MCAS assessments because of their nature, but occasionally they are assessed. They are normally assessed by teachers at the classroom level. These learning standards are not included in the % of LS assessed calculation above.

Learning standards 14, 16, and 17 associated with poetry, myths and traditions, and drama, respectively, are sometimes included in the assessments and other times the genres are used in assessing other learning standards.

Table 15
 Grade 6 English Language Arts Learning Standards (13)
 (Number of Items/ Number of Points Per Assessment Each Year)

Learning Standard (LS)	Year 2006
4	4/4
5	1/1
6	X
8	7/7
9	1/4
10	1/1
11	
12	5/5
13	12/18
14	2/5
15	4/4
16	3/3
17	
TOTAL	40/52
<u>% of LS Assessed</u>	<u>81.8</u>

See Massachusetts Department of Education (2006h) for the information in the table.

Note: Learning standards 1, 2, 3, 7, 18, and 24 to 27 are not included in the annual MCAS assessments, and instead, they are assessed by teachers at the classroom level.

Learning standards 6 (formal and informal English) and 9 (making connections) are rarely included in the annual MCAS assessments because of their nature, but occasionally they are assessed. They are normally assessed by teachers at the classroom level. These learning standards are not included in the % of LS assessed calculation above.

Learning standards 14, 16, and 17 associated with poetry, myths and traditions, and drama, respectively, are sometimes included in the assessments and other times the genres are used in assessing other learning standards.

Table 16
 Grade 8 English Language Arts Learning Standards (13)
 (Number of Items/ Number of Points Per Assessment Each Year)

Learning Standard (LS)	Year 2006
4	5/5
5	1/1
6	X
8	5/5
9	X
10	
11	1/4
12	6/6
13	11/17
14	3/3
15	2/2
16	
17	6/9
TOTAL	40/52
<u>% of LS Assessed</u>	<u>81.8</u>

See Massachusetts Department of Education (2006h) for the information in the table.

Note: Learning standards 1, 2, 3, 7, 18, and 24 to 27 are not included in the annual MCAS assessments, and instead, they are assessed by teachers at the classroom level.

Learning standards 6 (formal and informal English) and 9 (making connections) are rarely included in the annual MCAS assessments because of their nature, but occasionally they are assessed. They are normally assessed by teachers at the classroom level. These learning standards are not included in the % of LS assessed calculation above.

Learning standards 14, 16, and 17 associated with poetry, myths and traditions, and drama, respectively, are sometimes included in the assessments and other times the genres are used in assessing other learning standards.

Table 17
 Grade 3 Mathematics Learning Standards (33)
 (Number of Items/ Number of Points Per Assessment Each Year)

Learning Standard (LS)	Year 2006
3.D.1	1/2
3.D.2	1/1
3.D.3	4/4
3.D.4	1/1
3.G.1	
3.G.2	2/3
3.G.3	
3.G.4	1/1
3.G.5	1/1
3.G.6	1/1
3.G.7	
3.M.1	
3.M.2	1/1
3.M.3	
3.M.4	3/4
3.M.5	1/1
3.N.1	2/2
3.N.2	1/1
3.N.3	1/1
3.N.4	
3.N.5	1/1
3.N.6	
3.N.7	
3.N.8	2/2
3.N.9	2/3
3.N.10	
3.N.11	
3.N.12	1/1
3.N.13	1/1
3.P.1	3/4
3.P.2	
3.P.3	2/2
3.P.4	2/2
TOTAL	35/40
% of LS Assessed	66.7

See Massachusetts Department of Education (2006i) for the information in the table.

Table 18
 Grade 5 Mathematics Learning Standards (35)
 (Number of Items/ Number of Points Per Assessment Each Year)

Learning Standard (LS)	Year 2006
5.D.1	2/2
5.D.2	2/5
5.D.3	1/1
5.G.1	1/1
5.G.2	1/1
5.G.3	
5.G.4	
5.G.5	
5.G.6	1/4
5.G.7	1/1
5.M.1	3/6
5.M.2	1/1
5.M.3	
5.M.4	
5.M.5	
5.N.1	
5.N.2	2/2
5.N.3	1/1
5.N.4	3/3
5.N.5	1/1
5.N.6	1/1
5.N.7	2/2
5.N.8	1/1
5.N.9	1/1
5.N.10	
5.N.11	
5.N.12	1/1
5.N.13	1/4
5.N.14	1/1
5.P.1	1/1
5.P.2	
5.P.3	4/4
5.P.4	1/1
5.P.5	4/7
5.P.6	1/1
TOTAL	39/54
% of LS Assessed	71.4

See Massachusetts Department of Education (2006i) for the information in the table.

Table 19
 Grade 7 Mathematics Learning Standards (28)
 (Number of Items/ Number of Points Per Assessment Each Year)

Learning Standard (LS)	Year 2006
7.D.1	2/5
7.D.2	4/4
7.D.3	2/2
7.G.1	1/1
7.G.2	1/1
7.G.3	
7.G.4	1/1
7.G.5	X
7.G.6	1/4
7.G.7	
7.M.1	1/1
7.M.2	
7.M.3	3/6
7.N.1	5/5
7.N.2	1/1
7.N.3	1/1
7.N.4	1/1
7.N.5	1/1
7.N.6	X
7.N.7	
7.N.8	
7.N.9	2/5
7.P.1	3/3
7.P.2	3/3
7.P.3	3/6
7.P.4	1/1
7.P.5	1/1
7.P.6	1/1
TOTAL	39/54
% of LS Assessed	80.8

See Massachusetts Department of Education (2006i) for the information in the table.

Note: Learning standards 7.G.5 and 7.N.6 are part of the grade 7 mathematics curriculum but are assessed at the classroom level. 7.G.5 requires geometric equipment that is not routinely supplied for MCAS assessments, and 7.N.6 is rather subjective in nature. They are included in the list of learning standards above, but they not used in the calculations of the “% of LS Assessed.”

Conclusions

The matches between the content specifications and the actual test content appear to be excellent for the new MCAS tests and grade 3 Reading in 2006. The coverage of the learning standards for all of the tests is comparable to the tests in the same subjects at other grades. But ultimately, the goal will be to see if, over administrations, the percentage of learning standards being included in the assessments approaches 100%. The contractor and the DOE appear to have started off well, and now, if Tables 13 to 19 become part of the test development process (or tables like them), the MCAS tests will achieve the first two technical criteria described at the beginning of this report: the allocation of score points in each test is consistent or aligned with the target test content specifications, and the percentage of learning standards assessed at least once over a three year period is close to 100%.

Based on the findings from our study and findings reported in the technical reports regarding test item-learning standard match, we believe that the evidence for curriculum-test alignment is strong. Next year it will be possible to see to what extent the percentage of learning standards assessed over a three year period has increased. The percentages are already high (ranging from 81.8% to 90.1% in reading and English language arts and from 66.7% to 80.8% in mathematics). Only one recommendation seems necessary. The DOE and contractor need to continue to monitor that the learning standards intended for classroom assessment are actually being assessed at the classroom level.

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