Massachusetts Department of
ELEMENTARY & SECONDARY
EDUCATION

2009 MCAS
Technical Report

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Chapter 1. PURPOSE OF THIS REPORT AND OVERVIEW OF CHANGES IN 2009

The Massachusetts Comprehensive Assessment System (MCAS) is the Commonwealth's program for student assessment developed in accordance with the Education Reform Act of 1993. The main purposes of MCAS are to

- measure student, school, and district performance in meeting the state's learning standards as detailed in the Massachusetts curriculum frameworks;
- improve student achievement and classroom instruction by providing diagnostic feedback regarding the acquisition of skills and knowledge;
- help determine English language arts, mathematics, and science and technology/engineering competency at the grade 10 level for the awarding of high school diplomas.

The purpose of this *2009 MCAS Technical Report* is to document the technical quality and characteristics of the 2009 MCAS operational tests, and to present evidence of the validity and reliability of those tests' results. This *2009 Report* frequently references the *2007* and *2008 MCAS Technical Reports* for documentation of those elements of the MCAS program that did not change from 2008 to 2009. For all characteristics of the MCAS program that were modified in 2009, complete technical data and details are provided in this *2009 Report*. The *2007* and *2008 MCAS Technical Reports* are provided on the Department of Elementary and Secondary Education (ESE or "the Department") website at www.doe.mass.edu/mcas/tech/?section=techreports.

This *2009 Report* provides detailed information regarding test design and development, scoring, and analysis and reporting of 2009 MCAS results at the student, school, district, and state levels. This detailed information includes but is not limited to the following:

- Test administration
- Equating and scaling of tests
- Statistical and psychometric summaries
  - Item analyses
  - Reliability evidence
  - Validity evidence

In addition, the technical appendices contain detailed item-level and summary statistics related to each 2009 MCAS test and its results.

As mentioned above, the *2009 MCAS Technical Report* is designed to supplement the technical reports issued for previous MCAS administrations by providing information specific to the 2009 MCAS test administration. Previous technical reports, as well as other documents referenced in this report, provide additional background information about the MCAS program and its development and administration. Technical reports for 1998 to 2008 are available online at www.doe.mass.edu/mcas/tech/?section=techreports.

This report is primarily intended for experts in psychometrics and educational measurement. It assumes a working knowledge of measurement concepts such as reliability and validity and statistical concepts of correlation and central tendency. For some chapters, the reader is presumed to

have basic familiarity with advanced topics in measurement and statistics, such as item response theory (IRT) and factor analysis.

1.1 Overview of Program Changes Introduced in 2009

In addition to changes detailed throughout this document, the following changes were made for the 2009 MCAS administration.

1.1.1 Additional and Suspended Administrations

As of February 2009, an additional high school end-of-course science and technology/engineering testing opportunity is now offered in biology.

As of 2009, the grades 5 and 7 history and social science pilot tests and the high school (grades 10–11) U.S. history pilot test are being suspended for two years.

1.1.2 Competency Determination

Beginning with the class of 2010, to receive the Competency Determination required for high school graduation, students must

either

- earn a scaled score of at least 240 on both the grade 10 MCAS English language arts (ELA) and mathematics tests or retests

or

- earn a scaled score between 220 and 238 on both tests or retests *and* fulfill the requirements of an educational proficiency plan (EPP) (more information about EPP requirements can be found at www.doe.mass.edu/hsreform/epp)

AND

- earn a scaled score of at least 220 on one of the following high school MCAS science and technology/engineering (STE) tests:
  - Biology (administered in February and June)
  - Chemistry (administered in June)
  - Introductory physics (administered in June)
  - Technology/engineering (administered in June)

Students must also meet all local graduation requirements.

Students in the class of 2009 were required to earn a scaled score of 220 or higher on both the MCAS English language arts and mathematics tests or retests to earn a Competency Determination.

1.1.3 MCAS Test Participation Requirements

Student participation requirements for all grades and content areas in the spring 2009 MCAS tests can be found in the *Spring 2009 Principal's Administration Manual*.

Student participation requirements for the November 2008 retests in ELA and mathematics, February 2009 biology test, and March 2009 retests in ELA and mathematics can be found in the *Fall 2008/Winter 2009 Principal's Administration Manual*.

For a copy of either document, please call Student Assessment Services at 781-338-3625.

1.1.4 Scorer Training Modifications

In 2009, there was a slight change in the materials approved during the benchmarking meetings for the grades 4, 7, and 10 ELA composition tests.

A new set of response exemplars, called a mixed anchor set, was added to the body of responses typically used to train ELA composition scorers (e.g., topic development anchor, conventions anchor, mixed training set, qualifying sets, decision sets, etc.). The mixed anchor set consisted of 10 responses, each with a solid and clear topic development score and a solid and clear conventions score. These responses were approved by all benchmarking meeting participants, and were referred to throughout the training/scoring process as true examples of each of the two score points. This change allowed scorers to better understand how two distinct scores from two separate scoring scales are applied to the same response.

Further details about the purpose, selection, and use of each type of student response set (anchor, training, and qualifying) are available in the *2007 MCAS Technical Report*.

Chapter 2. TEST DEVELOPMENT AND DESIGN

2.1 Standard MCAS Test Development and Design

The 2009 MCAS administration included operational tests in the following grades and content areas:

- Grade 3: English language arts, mathematics
- Grade 4: English language arts (including one writing prompt), mathematics
- Grade 5: English language arts, mathematics, science and technology/engineering
- Grade 6: English language arts, mathematics
- Grade 7: English language arts (including one writing prompt), mathematics
- Grade 8: English language arts, mathematics, science and technology/engineering
- Grade 10: English language arts (including one writing prompt), mathematics
- High school (grades 9–11): end-of-course science and technology/engineering (biology, chemistry, introductory physics, technology/engineering)

Since passing the grade 10 English language arts and mathematics tests is one requirement for receiving a high school diploma, retest opportunities in those tests were offered for students in grade 10 and above who had not previously passed one or both tests. Retests in English language arts and mathematics were offered in November 2008 and March 2009. Students in the class of 2010 must also pass one science and technology/engineering test to graduate. Students may take one of the four high school STE tests starting at grade 9. If a student does not pass a specific STE test, he/she may take that content area over again or may take the STE test in the content area that he/she is currently studying. Retesting opportunities are offered during February in biology and during the high school STE June administration period.

The *2007 MCAS Technical Report* provides detailed information about the development and design of the English language arts, mathematics, and STE tests, about the types and design of items on MCAS tests, and about how MCAS tests are developed and constructed. The *2008 MCAS Technical Report* explains subsequent changes to the STE tests.

Appendix A provides information regarding the extent to which equating item sets for each content area and grade combination matched their corresponding common item sets in item types, number of possible score points, reporting category point distribution, difficulty, and discrimination.

Section 2.1.1.1 describes changes in test specifications for the science and technology/engineering tests from 2008 to 2009.

The curriculum frameworks for all content areas can be found at www.doe.mass.edu/frameworks.

2.1.1 Changes in 2009 Test Specifications

2.1.1.1 *Science and Technology/Engineering*

The high school chemistry test increased its matrix slots by eight multiple-choice (MC) items and decreased the number of forms used. No change was made to the number of open-response (OR) items. Table 2-1 shows the changes to the 2009 high school chemistry test.

Table 2-1. 2009 MCAS: Changes to High School Chemistry Test

Year	Number of Forms	Common Items		Matrix Items	
		MC	OR	MC	OR
2008	6	40	5	12	2
2009	5	40	5	20	2

2.1.1.2 *Other Changes in 2009 Test Specifications*

In 2009, in grades 3–8 the number of items released to the public was reduced from the entire common section of the test to a portion of the common section. Table 2-2 indicates the number of multiple-choice (MC), open-response (OR), writing prompt (WP), and short-answer (SA) items that were released in 2009 by grade and content area.

Table 2-2. 2009 MCAS: Number of Released Items by Grade and Content Area

Grade	English Language Arts			Mathematics			Science and Technology/Engineering	
	MC	OR	WP	MC	SA	OR	MC	OR
3	12	1		12	2	2		
4	15	2	1	14	2	2		
5	15	2		13	2	2	17	2
6	16	2		13	2	2		
7	15	2	1	13	2	2		
8	15	2		13	2	2	17	2
10*	36	4	1	32	4	6	40	5

*All common grade 10 English language arts and mathematics items were released.
All common high school biology and introductory physics items were released; common high school chemistry and technology/engineering items were not released.

The release of fewer common items will make it possible to shorten the test in subsequent test administrations.

2.2 MCAS Alternate Assessment (MCAS-Alt) Test Development and Design

Students with significant disabilities whose individualized education program (IEP) or 504 teams determine that they cannot participate in standard MCAS tests, even with accommodations, instead take the MCAS Alternate Assessment (MCAS-Alt). The MCAS-Alt assesses the same Massachusetts curriculum framework content areas and learning standards as the standard MCAS tests. Evidence of student performance is submitted in an MCAS-Alt portfolio.

For information about portfolio requirements, including examples of portfolio evidence and details regarding which strands are required in the content areas of English language arts, mathematics, and science and technology/engineering, please refer to the *2007 MCAS Technical Report*. Information regarding Competency Portfolios at grade 10 and beyond is also found in the *2007 Report*.

Chapter 3. TEST ADMINISTRATION AND PARTICIPATION

3.1 2009 MCAS Test Administration Participation

The standard MCAS tests were administered during three periods in the spring of 2009:

- March–April
  - Grades 3–8 and 10 English language arts (ELA)
- May
  - Grades 3–8 and 10 mathematics
  - Grades 5 and 8 science and technology/engineering
- June
  - High school (grades 9–11) end-of-course science and technology/engineering
    - Biology
    - Chemistry
    - Introductory physics
    - Technology/engineering

The 2009 MCAS administration also included retest opportunities in English language arts and mathematics for students in grades 10 and above who had not previously passed one or both tests. Retests were offered in November 2008 and March 2009.

An additional high school (grades 9–11) end-of-course science and technology/engineering test in biology was administered in February 2009, as both a standard test and a retest.

MCAS-Alt portfolios were required to be submitted no later than April 13, 2009.

The grades 5 and 7 history and social science pilot tests and the high school (grades 10–11) U.S. history pilot test were suspended in 2009.

Table 3-1 shows the complete 2008–2009 MCAS test administration schedule.

3.2 Test Administration Policies and Student Participation Requirements

Details about test administration policies and student participation requirements, including requirements for students with disabilities and limited English proficiency, can be found in sections 3.1 and 3.2 of the *2007 MCAS Technical Report*.

Table 3-1. 2008–09 MCAS:
Test Administration Schedule

Test Grade and Content Area	Test Administration Date(s)	Deadline for Return of Materials to Contractor
Retest Administration Windows		
November 5–13, 2008		
ELA Composition Retest	November 5	November 18
ELA Reading Comprehension Retest *Sessions 1 and 2* *Session 3*	 *November 6* *November 7*	
Mathematics Retest *Session 1* *Session 2*	 *November 12* *November 13*	
March 2–6, 2009		
ELA Composition Retest	March 2	
ELA Reading Comprehension Retest *Sessions 1 and 2* *Session 3*	 *March 3* *March 4*	
Mathematics Retest *Session 1* *Session 2*	 *March 5* *March 6*	March 10
March–April 2009 Test Administration Window		
Grades 3–8 ELA Reading Comprehension	March 30–April 14	April 15
Grades 4, 7, and 10 ELA Composition	March 31	
Grade 10 ELA Reading Comprehension *Sessions 1 and 2* *Session 3*	 *April 1* *April 2*	
Grades 4, 7, and 10 ELA Composition Make-Up	April 7	
May 2009 Test Administration Window		
Grades 3–8 Mathematics	May 11–28	May 29
Grades 5 and 8 Science and Technology/Engineering		
Grade 10 Mathematics *Session 1* *Session 2*	 *May 19* *May 20*	
High School (Grades 9–11) End-of-Course Science and Technology/Engineering Test Administration Windows		
February 2-3, 2009		
Biology	February 2-3	February 6
June 4-5, 2009		
Biology	June 4–5	June 10
Chemistry		
Introductory Physics		
Technology/Engineering		

Chapter 4. SCORING PROCEDURES AND METHODOLOGY

4.1 Scoring of Standard Test Items

Specific information regarding how student responses are scored is provided in the *2007 MCAS Technical Report,* including the following:

- The physical handling of student test booklets and student responses
- The iScore scoring software
- The scoring of constructed-response items
  - Scoring staff
  - Scorer training
  - Scoring methodology and procedures
  - Reports generated during scoring

In 2009, scoring locations varied slightly from the previous year; the 2009 sites are listed in section 4.1.3. Additionally, the format of the compilation report generated during scoring changed; a sample report is included in this document as Appendix B.

4.1.1 Scoring Specifications

Detailed information regarding scoring specifications is available in sections 4.1.2.2 through 4.1.2.7 of the *2007 MCAS Technical Report.*

4.1.2 Interrater Consistency Tables

An item was either single-scored, in which each student response was scored only once, or double-blind scored, in which each student response was independently read and scored by two separate readers. The percentages of double-blind scores for each score point range, grade, and content area is shown in Table 4-1.

Table 4-1. 2009 MCAS: Percentages of Double-Blind Scores for Each Score Point Range

Grade and Content Area	Score Point Range			
ELA Composition	0-2	0-4	1-4	1-6
Grade 4			100%	100%
Grade 7			100%	100%
Grade 10			100%	100%
ELA Reading				
Grade 3	10%	10%		
Grade 4-8	10%	10%		
Grade 10	100%	100%		
Mathematics				
Grade 3-8	10%	10%		
Grade 10	100%	100%		
Science and Technology/Engineering				
Grade 5	10%	10%		
Grade 8	10%	10%		
Grade 9-11 (HS)	100%	100%		

Interrater consistency tables showing the percentages of agreement on double-scored 0-4, 1-4, and 1-6 point constructed-response items are provided in Appendix C.

4.1.3 2009 Scoring Locations

The iScore database, its operation, and its administrative controls are all based in Dover, New Hampshire, but the iScore system monitored all scoring activities across all of the 2009 MCAS scoring sites:

- Troy, New York
  - Grade 7 English language arts composition
  - High school (grades 9–11) biology
- Longmont, Colorado
  - Grades 4–10 English language arts reading comprehension
  - Grades 3–5 and 7–10 mathematics
  - High school (grades 9–11) introductory physics
- Dover, New Hampshire
  - Grade 3 English language arts reading comprehension
  - High school (grades 9–11) chemistry
  - High school (grades 9–11) technology/engineering
- Louisville, Kentucky
  - Grades 4 and 10 English language arts composition
  - Grade 6 mathematics
  - Grades 5 and 8 science and technology/engineering

Reader accuracy, reliability, and consistency were measured across all scoring locations in the same way, using the same standards. Telephone calls, faxes, e-mails, secure websites and iScore applications and reports were used to ensure constant communication and coordination between all scoring sites and scoring shifts. The Scoring Manager, Scoring Content Managers, and Scoring Chief Readers were able to confirm consistent reader and leadership training by live monitoring of the training sessions via iLinc, an interactive, computer based communication system.

MCAS readers at the scoring locations listed above were recruited and obtained primarily through a national contract with Kelly Services, a temporary employment agency. All MCAS readers had to successfully complete at least two years of college; readers of responses to any of the grade 10/high school responses were required to submit documentation they possessed a four-year college degree or better.

Teachers, tutors, and administrators (principals, guidance counselors, etc.) currently under contract or employed by or in Massachusetts schools, or anyone under 18 years of age, were not eligible to score MCAS responses.

MCAS readers were a diverse group of individuals with a wide range of backgrounds, ages, and experiences. Most scorers were quite experienced, having scored student responses for a number of other testing programs, and many have previously scored MCAS and MEPA-R/W responses.

Table 4-2 is a summary of reader background across all scoring shifts at all scoring locations.

Table 4-2. 2009 MCAS: Summary of Reader Background Across Scoring Shifts and Scoring Locations

Education	N	%
Less than 48 college credits	0	0.0
Associate Degree/More than 48 college credits	156	8.3
Bachelor's degree	1125	60.0
Masters Degree/Doctorate	595	31.7
Teaching Experience		
No teaching certificate or experience	936	49.9
Teaching certificate or experience	786	41.9
College Instructor	154	8.2
Scoring Experience		
No previous experience as reader	740	39.5
1-3 years experience	888	47.3
3+ years experience	248	13.2

4.2 Scoring of MCAS-Alt Portfolios

Details regarding the scoring of MCAS-Alt portfolios are provided in the *2007* and *2008 MCAS Technical Reports*. The 2009 procedures generally followed those of 2008.

Following is a list of slight changes to the 2009 assessment which are further detailed in the corresponding sections of this chapter:

- Rubric for the level of complexity scoring dimension
- Number of portfolios submitted and approved for a Competency Determination
- Composition of the project leadership team (PLT)
- Number of portfolios considered during selection of training materials
- Number of applications to become MCAS-Alt portfolio scorers

4.2.1 Interrater Consistency Tables

MCAS-Alt interrater consistency tables for 2009 are provided in Appendix C.

4.2.2 Change to Rubric

The Level of Complexity rubric was modified to specify that work receiving a score point of 1 was unmatched to the curriculum framework learning standard required for assessment.

In previous years, a portfolio with evidence unmatched to the curriculum framework learning standards was not scored. For 2009, the project leadership team recommended that a Level of Complexity score of 1 be assigned, in order to differentiate an unmatched submission from a portfolio where the entire strand was missing. To reflect this new application of a score point of 1, the rubric was made more specific in that area.

Each strand was given a score in Level of Complexity ranging from 1 to 5 based on the scoring rubric shown in Table 4-3.

Table 4-3. 2009 MCAS: Rubric for Level of Complexity Score in Each Content Area

Score Point				
1	2	3	4	5
Portfolio reflects little or no basis in, or is unmatched to, curriculum framework learning standards required for assessment.	Student primarily addresses social, motor, and communication "access skills" during instruction based on curriculum framework learning standards in this strand.	Student addresses curriculum framework learning standards that have been modified below grade level expectations (i.e., "entry points") in this strand.	Student addresses a narrow sample of curriculum framework learning standards (1 or 2) at grade level expectations in this strand.	Student addresses a broad range of curriculum framework learning standards (3 or more) at grade level expectations in this strand.

4.2.3 Competency Determinations

In 2009, a total of 16 English language arts, 26 mathematics, and 30 science and technology/engineering portfolios were submitted by students in grades 10, 11, 12 and 12+ for consideration to earn a Competency Determination. Of these submissions, 8 English language arts, 10 mathematics, and 14 STE portfolios earned the Competency Determination. Please note, Table 5-25 does not include the students in grades 12 and 12+ for STE or grades 11, 12, and 12+ for English language arts and mathematics.

4.2.4 Composition of the Project Leadership Team

In 2009, the MCAS-Alt PLT included four teacher consultants, in addition to ESE and Measured Progress staff.

4.2.5 Training Materials Selection

The PLT reviewed 170 portfolios and chose approximately 45 sample strands to consider as exemplars for scorer training. While triple scoring, PLT members demonstrated exact agreement for all five scoring dimensions on 33 samples. The 20 strands in the scorer sample set were chosen from these 33 samples.

4.2.6 Applications to Score MCAS-Alt Portfolios

In 2009, the ESE received over 425 applications to become MCAS-Alt portfolio scorers. The PLT chose 212 applicants, based on their familiarity with the assessment, to attend MCAS-Alt scorer training sessions.

4.3 MCAS Equating and Scaling Procedures

4.3.1 Equating

In addition to the information provided in this report specific to the equating of the 2009 MCAS tests, information is available in the *2007 MCAS Technical Report* about the purpose of equating, chained link design, the history of MCAS equating methods, and the delta method.

The data and procedures used to equate 2009 MCAS test results include evaluations of standard errors around item parameters, as well as the test characteristic curves (TCCs) that are the basis for

MCAS equating and scaling procedures. The TCCs for the 2009 MCAS tests are provided in section 6.1.3 of this report.

4.3.1.1 *Equating Methods*

A raw score to theta equating procedure was used to equate the MCAS 2009 tests. For item calibration, the three-parameter logistic (3PL) model was used for dichotomous items, and the graded response model (GRM) for polytomous items. Item parameters are provided in Appendix D. Prior to parameter value fixing, the anchor items were evaluated for use as equating items via the delta method (Holland & Wainer, 1993).

For the 2009 MCAS administration, one to three test items were excluded from use in equating, based on delta analysis results, for the following tests:

- One test item removed
  - Grade 5 mathematics
  - Grade 6 English language arts
  - Grade 7 mathematics
  - Grade 8 mathematics
  - Grade 8 science and technology/engineering
  - High school (grades 9–11) introductory physics
  - High school (grades 9–11) technology/engineering
- Two test items removed
  - Grade 10 mathematics
- Three test items removed
  - Grade 10 English language arts

All operational high school tests (grade 10 English language arts,[1] grade 10 mathematics, and grades 9–11 biology, chemistry, introductory physics, and technology/engineering) and retests were pre-equated; however, delta analyses were performed to examine any drift of item parameter and to remove flagged equating items.

The 2009 MCAS delta analyses tables are provided in Appendix E, Tables E-1 through E-14.

4.3.1.2 *Rescore Analyses*

For the 2009 MCAS tests in English language arts, mathematics, grades 5 and 8 science and technology/engineering, and high school (grades 9–11) biology, chemistry, introductory physics, and technology/engineering, a rescore analysis was conducted to evaluate potential constructed-response equating items. For each potential equating item, approximately 200 responses from the previous year's test were randomly selected and rescored during the 2009 scoring sessions. The scores for the two years were compared; any items found to have a large difference between average scores were excluded as equating items.

[1] Although the grade 10 English language arts writing prompt was new in 2009, the item response theory parameters resulting from calibrating it were inconsistent with the observed difficulty level of the item. Consequently, parameters from the prior year's prompt, which had similar classical statistics, were applied to the current year's data.

Using Cohen's (1960) effect size rule of thumb (wherein items with effect sizes greater than 0.80 are automatically removed as equating items), a handful of items whose effect sizes slightly exceeded the negligible range—i.e., beyond 0.20 (e.g., grade 5 science and technology/engineering item no. 229060)—were added to a "watch list" and were further studied in terms of content and model fit.

Results of this rescore analysis are shown in Appendix E, Tables E-15 through E-21. As indicated in the last column of each table, no items were discarded from use as equating items on the 2009 tests as a result of the watch list evaluation or due to large differences between average scores over two years.

4.3.2 Scaling

In addition to the information provided in this report specific to the scaling of 2009 MCAS tests, information is available in the *2007 MCAS Technical Report* regarding the purpose of scaling, scaled score cutpoints for the four MCAS performance levels, and scaled score standard error calculation; a figure illustrating the scaling procedure is also included. Raw score to scaled score conversion tables for the 2009 MCAS administration are available at www.doe.mass.edu/mcas/results.html.

Chapter 5. REPORTING OF RESULTS

5.1 Standard Setting

No standard setting was necessary for the 2009 MCAS tests. Information about past standard-setting activities is available in the *2007 MCAS Technical Report*.

5.2 Standard MCAS Test Results

Results for the standard MCAS tests are reported according to four performance levels:

- *Advanced* (*Above Proficient* at grade 3)
- *Proficient*
- *Needs Improvement*
- *Warning* (*Failing* at high school)

Descriptions of these performance levels are provided in section 5.1.1.1 of the *2007 MCAS Technical Report.*

5.2.1 Performance Level Results

Statewide performance level results can be found in the document *Spring 2009 MCAS Tests: Summary of State Results* (www.doe.mass.edu/mcas/2009/results/summary.pdf).

Results for each 2009 test item, including average item score and percentage of total student responses across the state, are available on the Department's website at http://profiles.doe.mass.edu/mcas/mcasitems2.aspx?grade=03&subjectcode=ELA&linkid=2&orgcode=00000000&fycode=2009&orgtypecode=0&.

Scaled Score Distributions
Figures 5-1 through 5-38 and Tables 5-1 through 5-18 show the 2009 scaled score distributions for each grade and content area combination (for grade 3, raw score distributions are shown, since no scaled scores were calculated). Analyses were conducted only on students who attempted all sessions and who were not coded as "not tested." No scaled scores were calculated for the test results of first-year limited English proficient (LEP) students in any grade.[2]

In some cases, two or more low score points mapped onto the same scaled score, while in other cases no raw scores mapped onto a scaled score. This explains why scaled score distributions contain spikes and gaps that are not evident in raw score distributions. Additionally, on several tests the raw score distributions were negatively skewed (i.e., more students at the higher end of the performance continuum). It is important to understand that in a criterion-referenced test the assessment is designed to optimally measure student performance at the cutscores. Thus, having a skewed distribution in student performance does not mean that the assessment is not precisely measuring student performance at the cutscores.

[2] New in 2009, scaled scores were calculated for first-year LEP students who achieved Needs Improvement or higher, for diagnostic purposes only but were not included in school, district, and state aggregations.

Figure 5-1. 2009 MCAS: Raw Score Distribution—English Language Arts Grade 3

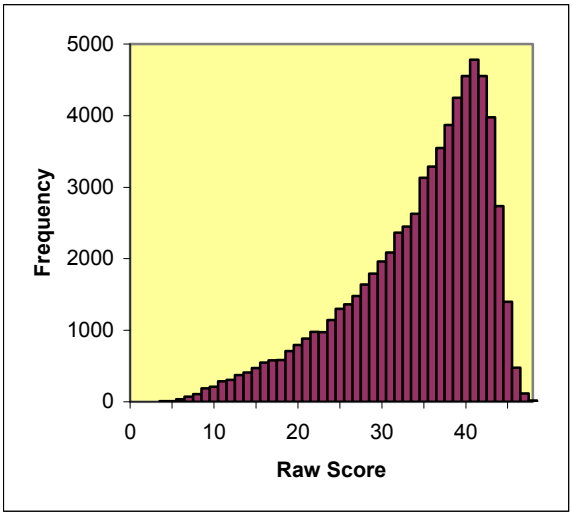


Figure 5-2. 2009 MCAS: Raw Score Distribution—Mathematics Grade 3

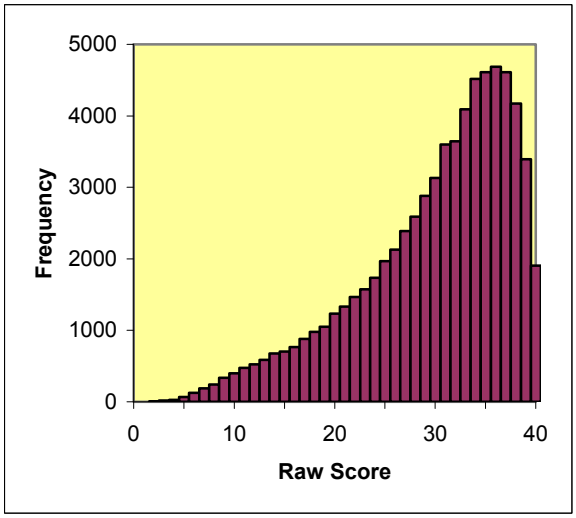


Table 5-1. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 4

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	2	0.0	0.0
204	13	0.0	0.0
206	67	0.1	0.1
208	247	0.4	0.5
210	349	0.5	1.0
212	561	0.8	1.8
214	1162	1.7	3.5
216	1837	2.7	6.1
218	2551	3.7	9.8
220	2708	3.9	13.7
222	2272	3.3	17.0
224	1323	1.9	18.9
226	1410	2.0	21.0
228	3253	4.7	25.7
230	1832	2.6	28.3
232	2005	2.9	31.2
234	4537	6.6	37.8
236	2509	3.6	41.4
238	2766	4.0	45.4
240	2930	4.2	49.7
242	3151	4.6	54.2
244	6591	9.5	63.8
246	3343	4.8	68.6
248	3150	4.6	73.1
250	2962	4.3	77.4
252	2699	3.9	81.3
254	2507	3.6	85.0
256	2298	3.3	88.3
258	0	0.0	88.3
260	1798	2.6	90.9
262	1662	2.4	93.3
264	1354	2.0	95.2
266	0	0.0	95.2
268	1051	1.5	96.8
270	856	1.2	98.0
272	0	0.0	98.0
274	598	0.9	98.9
276	0	0.0	98.9
278	410	0.6	99.5
280	369	0.5	100.0

Figure 5-3. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 4

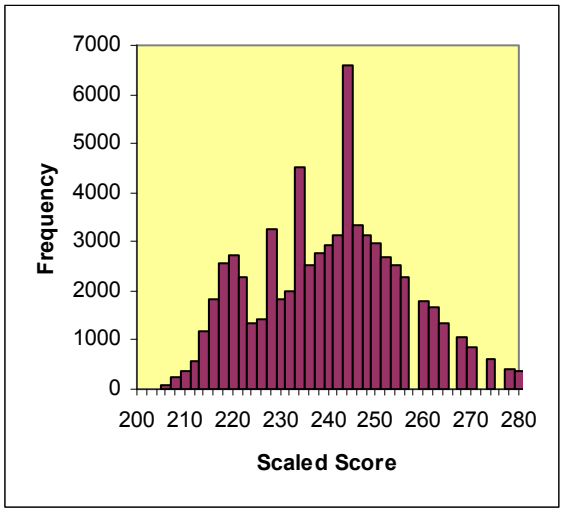


Figure 5-4. 2009 MCAS: Raw Score Distribution—English Language Arts Grade 4

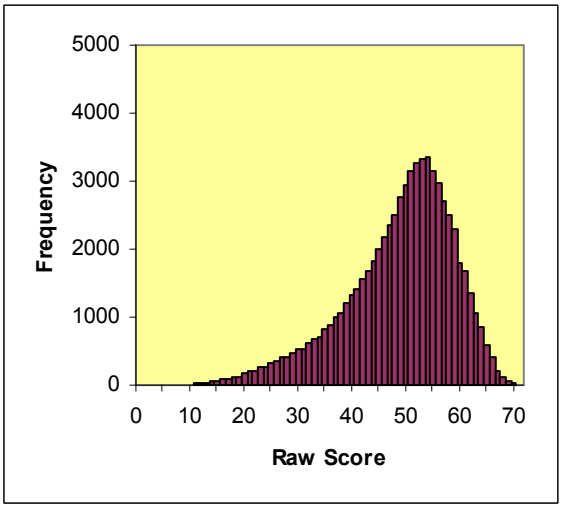


Table 5-2. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 4

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	1	0.0	0.0
202	11	0.0	0.0
204	110	0.2	0.2
206	224	0.3	0.5
208	344	0.5	1.0
210	545	0.8	1.8
212	675	1.0	2.7
214	914	1.3	4.1
216	1717	2.5	6.5
218	2220	3.2	9.7
220	2826	4.1	13.8
222	1112	1.6	15.4
224	2380	3.4	18.8
226	2762	4.0	22.8
228	1503	2.2	25.0
230	3401	4.9	29.9
232	3718	5.4	35.2
234	4145	6.0	41.2
236	2222	3.2	44.4
238	4763	6.9	51.2
240	2461	3.5	54.8
242	2579	3.7	58.5
244	2781	4.0	62.5
246	2988	4.3	66.8
248	3007	4.3	71.1
250	3081	4.4	75.5
252	0	0.0	75.5
254	3106	4.5	80.0
256	2911	4.2	84.2
258	0	0.0	84.2
260	2777	4.0	88.2
262	2619	3.8	92.0
264	2294	3.3	95.3
266	0	0.0	95.3
268	1696	2.4	97.7
270	0	0.0	97.7
272	0	0.0	97.7
274	0	0.0	97.7
276	1114	1.6	99.3
278	0	0.0	99.3
280	474	0.7	100.0

Figure 5-5. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 4

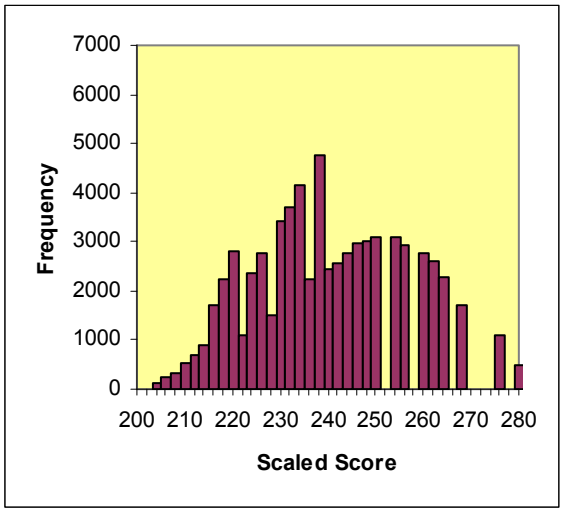


Figure 5-6. 2009 MCAS: Raw Score Distribution—Mathematics Grade 4

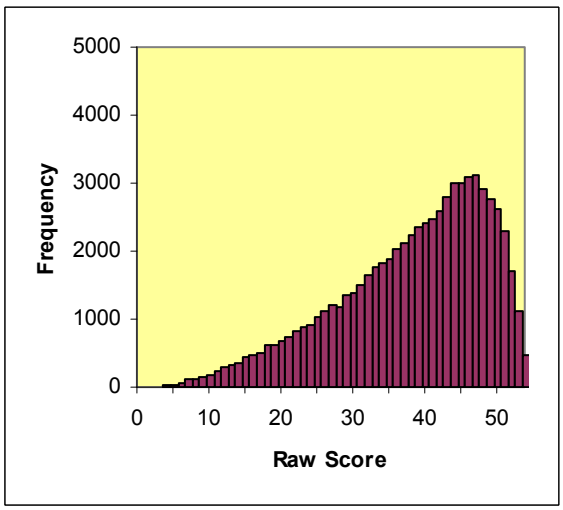


Table 5-3. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 5

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	1	0.0	0.0
202	3	0.0	0.0
204	15	0.0	0.0
206	69	0.1	0.1
208	145	0.2	0.3
210	446	0.6	1.0
212	503	0.7	1.7
214	634	0.9	2.6
216	848	1.2	3.8
218	1628	2.3	6.1
220	1478	2.1	8.2
222	1708	2.4	10.6
224	1022	1.5	12.1
226	1156	1.6	13.7
228	1263	1.8	15.5
230	3051	4.3	19.8
232	1802	2.6	22.4
234	2015	2.9	25.3
236	2190	3.1	28.4
238	5355	7.6	36.0
240	3086	4.4	40.4
242	3493	5.0	45.3
244	3845	5.5	50.8
246	4332	6.2	56.9
248	0	0.0	56.9
250	4782	6.8	63.7
252	5051	7.2	70.9
254	0	0.0	70.9
256	5003	7.1	78.0
258	4661	6.6	84.6
260	0	0.0	84.6
262	3735	5.3	89.9
264	0	0.0	89.9
266	2847	4.0	94.0
268	0	0.0	94.0
270	1968	2.8	96.8
272	0	0.0	96.8
274	0	0.0	96.8
276	1233	1.8	98.5
278	0	0.0	98.5
280	1037	1.5	100.0

Figure 5-7. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 5

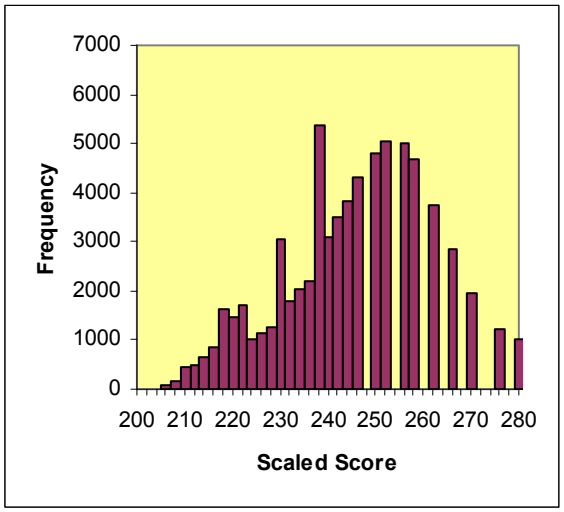


Figure 5-8. 2009 MCAS: Raw Score Distribution—English Language Arts Grade 5

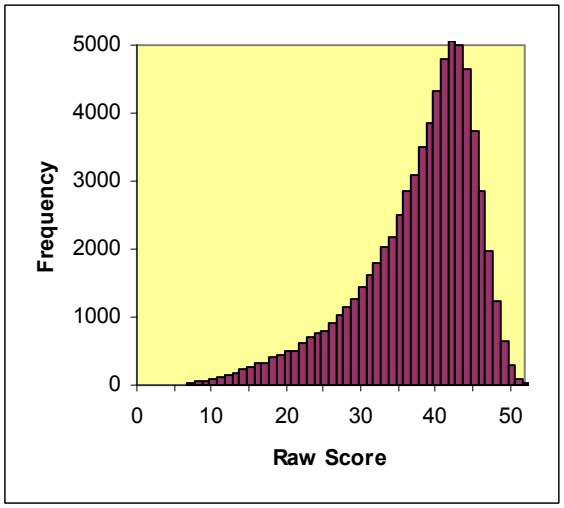


Table 5-4. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 5

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	2	0.0	0.0
202	99	0.1	0.1
204	303	0.4	0.6
206	607	0.9	1.4
208	351	0.5	1.9
210	856	1.2	3.1
212	1050	1.5	4.6
214	1717	2.4	7.1
216	2802	4.0	11.0
218	3594	5.1	16.1
220	3248	4.6	20.7
222	1249	1.8	22.5
224	1285	1.8	24.3
226	2635	3.7	28.0
228	1515	2.1	30.2
230	1571	2.2	32.4
232	1643	2.3	34.7
234	3524	5.0	39.7
236	1889	2.7	42.4
238	1987	2.8	45.2
240	2081	2.9	48.2
242	2239	3.2	51.3
244	2310	3.3	54.6
246	2428	3.4	58.1
248	2511	3.6	61.6
250	2703	3.8	65.4
252	2760	3.9	69.4
254	2782	3.9	73.3
256	0	0.0	73.3
258	2923	4.1	77.4
260	2910	4.1	81.6
262	2906	4.1	85.7
264	2798	4.0	89.6
266	2517	3.6	93.2
268	0	0.0	93.2
270	2157	3.1	96.3
272	0	0.0	96.3
274	1691	2.4	98.7
276	0	0.0	98.7
278	0	0.0	98.7
280	952	1.3	100.0

Figure 5-9. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 5

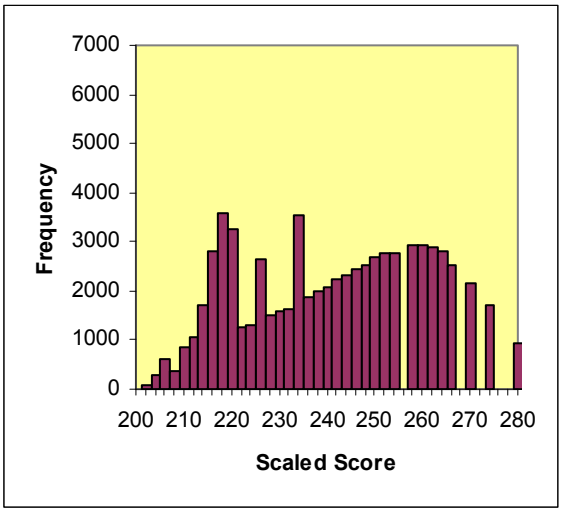


Figure 5-10. 2009 MCAS: Raw Score Distribution—Mathematics Grade 5

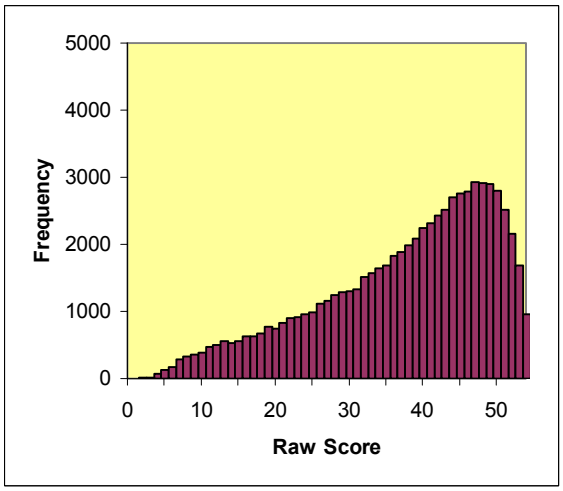


Table 5-5. 2009 MCAS: Scaled Score Distribution—Science and Technology/Engineering Grade 5

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	0	0.0	0.0
204	51	0.1	0.1
206	133	0.2	0.3
208	296	0.4	0.7
210	449	0.6	1.3
212	667	0.9	2.3
214	958	1.4	3.6
216	2170	3.1	6.7
218	3035	4.3	11.0
220	2769	3.9	14.9
222	3253	4.6	19.5
224	1839	2.6	22.1
226	2009	2.8	25.0
228	2224	3.1	28.1
230	2349	3.3	31.4
232	2506	3.5	35.0
234	5381	7.6	42.6
236	2899	4.1	46.7
238	2846	4.0	50.7
240	2937	4.2	54.9
242	2968	4.2	59.1
244	2912	4.1	63.2
246	0	0.0	63.2
248	2954	4.2	67.4
250	2941	4.2	71.6
252	2864	4.1	75.6
254	0	0.0	75.6
256	2713	3.8	79.5
258	2557	3.6	83.1
260	2396	3.4	86.5
262	2166	3.1	89.5
264	1895	2.7	92.2
266	1641	2.3	94.5
268	1344	1.9	96.4
270	0	0.0	96.4
272	967	1.4	97.8
274	709	1.0	98.8
276	0	0.0	98.8
278	457	0.6	99.5
280	379	0.5	100.0

Figure 5-11. 2009 MCAS: Scaled Score Distribution—Science and Technology/Engineering Grade 5

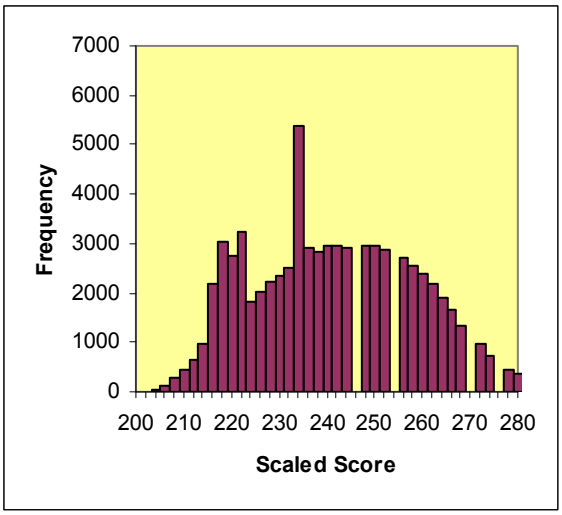


Figure 5-12. 2009 MCAS: Raw Score Distribution—Science and Technology/Engineering Grade 5

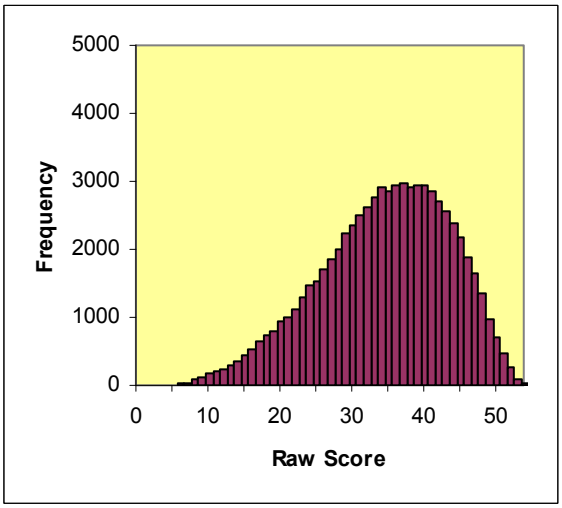


Table 5-6. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 6

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	2	0.0	0.0
204	26	0.0	0.0
206	131	0.2	0.2
208	216	0.3	0.5
210	552	0.8	1.3
212	531	0.8	2.1
214	685	1.0	3.1
216	1306	1.9	4.9
218	1718	2.5	7.4
220	1504	2.2	9.6
222	887	1.3	10.8
224	962	1.4	12.2
226	2388	3.4	15.6
228	1392	2.0	17.6
230	1583	2.3	19.9
232	1815	2.6	22.5
234	2048	2.9	25.4
236	2241	3.2	28.6
238	2532	3.6	32.3
240	2886	4.1	36.4
242	3363	4.8	41.2
244	3693	5.3	46.5
246	3913	5.6	52.1
248	4394	6.3	58.4
250	4560	6.5	65.0
252	4540	6.5	71.5
254	4380	6.3	77.8
256	0	0.0	77.8
258	4040	5.8	83.5
260	3536	5.1	88.6
262	0	0.0	88.6
264	2885	4.1	92.7
266	0	0.0	92.7
268	2206	3.2	95.9
270	0	0.0	95.9
272	1486	2.1	98.0
274	0	0.0	98.0
276	0	0.0	98.0
278	823	1.2	99.2
280	544	0.8	100.0

Figure 5-13. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 6

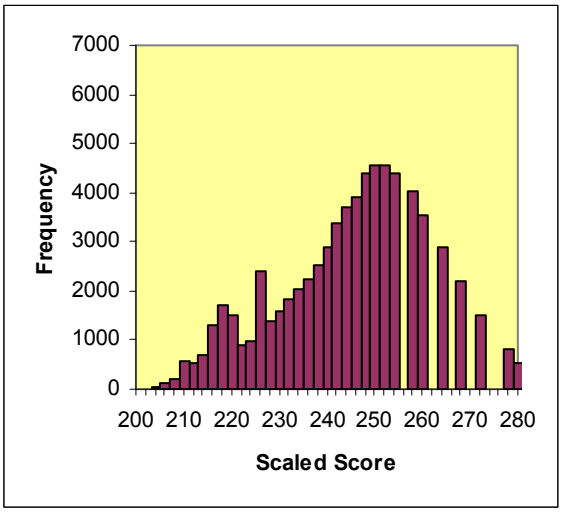


Figure 5-14. 2009 MCAS: Raw Score Distribution—English Language Arts Grade 6

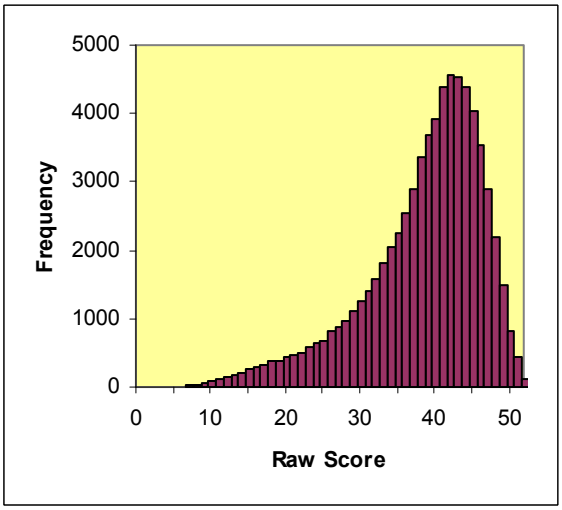


Table 5-7. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 6

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	1	0.0	0.0
202	42	0.1	0.1
204	137	0.2	0.3
206	295	0.4	0.7
208	244	0.3	1.0
210	611	0.9	1.9
212	798	1.1	3.0
214	1587	2.3	5.3
216	2936	4.2	9.5
218	3850	5.5	15.0
220	3397	4.9	19.9
222	1268	1.8	21.7
224	1341	1.9	23.6
226	2902	4.2	27.8
228	1524	2.2	29.9
230	1620	2.3	32.3
232	1627	2.3	34.6
234	1740	2.5	37.1
236	1757	2.5	39.6
238	1921	2.7	42.3
240	1906	2.7	45.1
242	4081	5.8	50.9
244	2257	3.2	54.1
246	2236	3.2	57.3
248	2453	3.5	60.8
250	2525	3.6	64.4
252	2555	3.7	68.1
254	2723	3.9	72.0
256	0	0.0	72.0
258	2674	3.8	75.8
260	2801	4.0	79.8
262	3005	4.3	84.1
264	2892	4.1	88.3
266	2737	3.9	92.2
268	2459	3.5	95.7
270	0	0.0	95.7
272	0	0.0	95.7
274	1923	2.8	98.4
276	0	0.0	98.4
278	0	0.0	98.4
280	1084	1.6	100.0

Figure 5-15. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 6

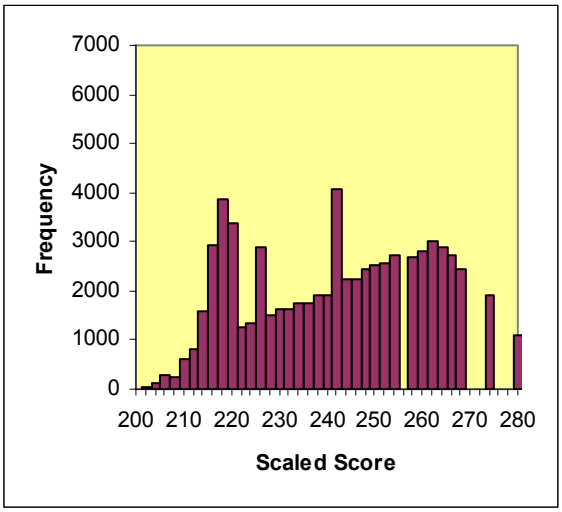


Figure 5-16. 2009 MCAS: Raw Score Distribution—Mathematics Grade 6

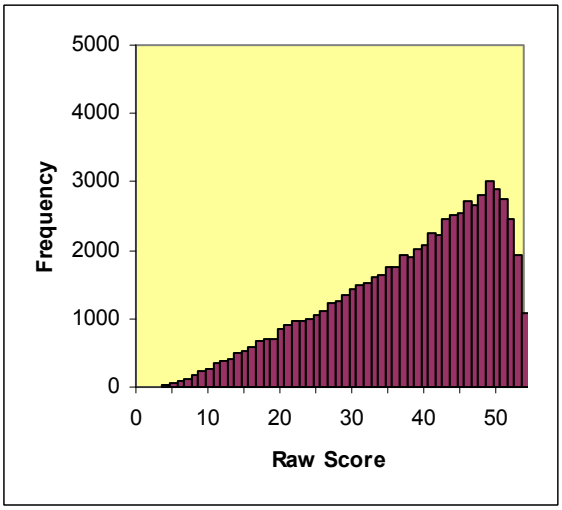


Table 5-8. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 7

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	2	0.0	0.0
204	2	0.0	0.0
206	28	0.0	0.0
208	83	0.1	0.2
210	233	0.3	0.5
212	378	0.5	1.0
214	517	0.7	1.8
216	1179	1.7	3.4
218	1224	1.7	5.2
220	1660	2.4	7.5
222	691	1.0	8.5
224	1631	2.3	10.8
226	946	1.3	12.2
228	1029	1.5	13.6
230	2395	3.4	17.0
232	1335	1.9	18.9
234	1462	2.1	21.0
236	3449	4.9	25.9
238	2081	3.0	28.9
240	2129	3.0	31.9
242	5106	7.2	39.1
244	5490	7.8	46.9
246	6169	8.8	55.7
248	3205	4.5	60.2
250	3231	4.6	64.8
252	6376	9.1	73.9
254	2970	4.2	78.1
256	2841	4.0	82.1
258	2637	3.7	85.9
260	2365	3.4	89.2
262	2108	3.0	92.2
264	1746	2.5	94.7
266	0	0.0	94.7
268	1349	1.9	96.6
270	1008	1.4	98.0
272	0	0.0	98.0
274	652	0.9	99.0
276	0	0.0	99.0
278	0	0.0	99.0
280	734	1.0	100.0

Figure 5-17. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 7

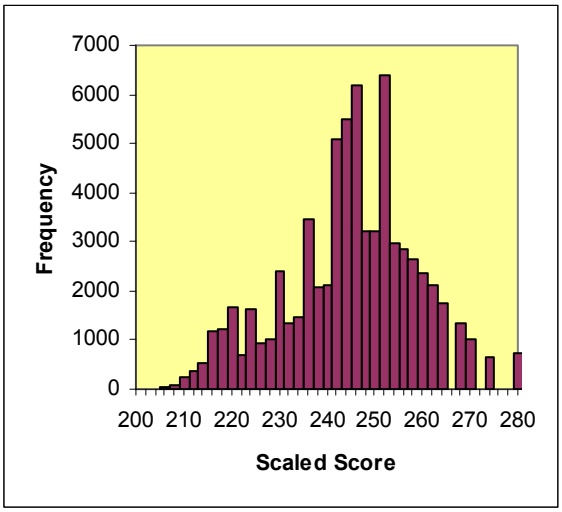


Figure 5-18. 2009 MCAS: Raw Score Distribution—English Language Arts Grade 7

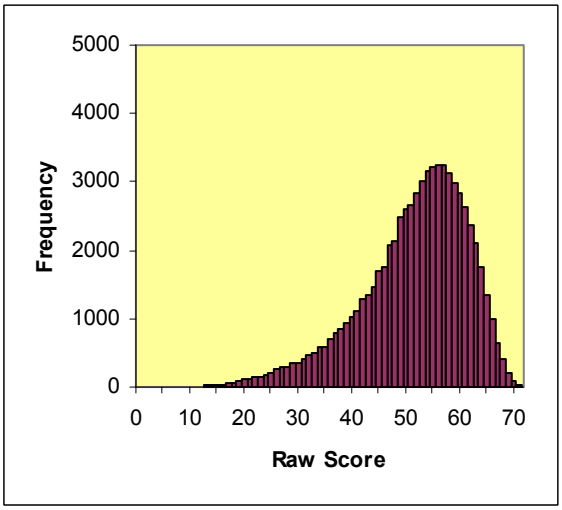


Table 5-9. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 7

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	1	0.0	0.0
202	105	0.1	0.1
204	325	0.5	0.6
206	256	0.4	1.0
208	372	0.5	1.5
210	906	1.3	2.8
212	1103	1.6	4.3
214	2620	3.7	8.0
216	3230	4.6	12.6
218	5139	7.3	19.9
220	3677	5.2	25.1
222	1281	1.8	26.9
224	1367	1.9	28.8
226	2854	4.0	32.8
228	1528	2.2	35.0
230	1659	2.3	37.3
232	1694	2.4	39.7
234	3413	4.8	44.5
236	1828	2.6	47.1
238	2002	2.8	50.0
240	1993	2.8	52.8
242	2113	3.0	55.8
244	4522	6.4	62.1
246	2354	3.3	65.5
248	2322	3.3	68.8
250	2546	3.6	72.3
252	2582	3.6	76.0
254	2777	3.9	79.9
256	2768	3.9	83.8
258	0	0.0	83.8
260	2882	4.1	87.9
262	2704	3.8	91.7
264	2550	3.6	95.3
266	0	0.0	95.3
268	2057	2.9	98.2
270	0	0.0	98.2
272	0	0.0	98.2
274	0	0.0	98.2
276	0	0.0	98.2
278	0	0.0	98.2
280	1251	1.8	100.0

Figure 5-19. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 7

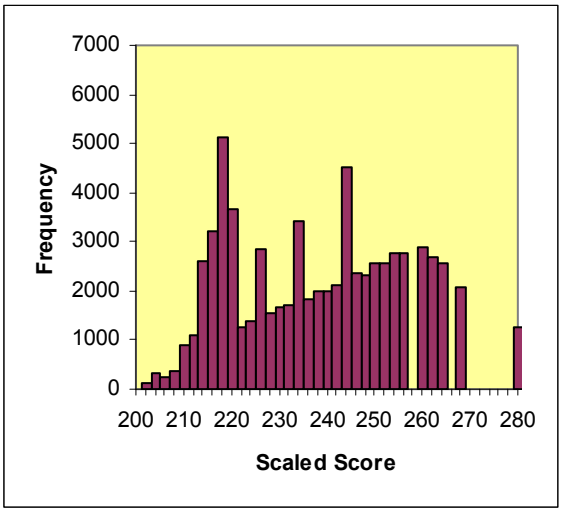


Figure 5-20. 2009 MCAS: Raw Score Distribution—Mathematics Grade 7

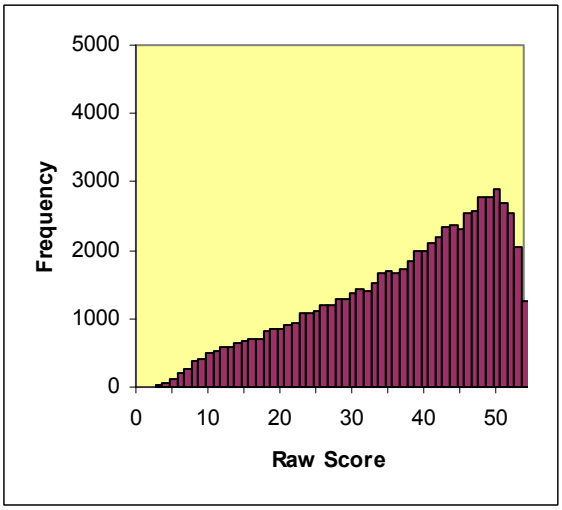


Table 5-10. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 8

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	4	0.0	0.0
204	12	0.0	0.0
206	54	0.1	0.1
208	160	0.2	0.3
210	292	0.4	0.7
212	479	0.7	1.4
214	288	0.4	1.8
216	724	1.0	2.8
218	1415	2.0	4.8
220	1115	1.5	6.3
222	629	0.9	7.2
224	709	1.0	8.2
226	753	1.0	9.2
228	860	1.2	10.4
230	1999	2.8	13.2
232	1099	1.5	14.7
234	1235	1.7	16.4
236	1255	1.7	18.2
238	1480	2.1	20.2
240	3520	4.9	25.1
242	4200	5.8	30.9
244	5216	7.2	38.2
246	6283	8.7	46.9
248	3497	4.9	51.7
250	7699	10.7	62.4
252	4213	5.8	68.3
254	4103	5.7	73.9
256	3958	5.5	79.4
258	3640	5.1	84.5
260	3276	4.5	89.0
262	0	0.0	89.0
264	2839	3.9	93.0
266	2243	3.1	96.1
268	0	0.0	96.1
270	0	0.0	96.1
272	1542	2.1	98.2
274	0	0.0	98.2
276	0	0.0	98.2
278	886	1.2	99.5
280	390	0.5	100.0

Figure 5-21. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 8

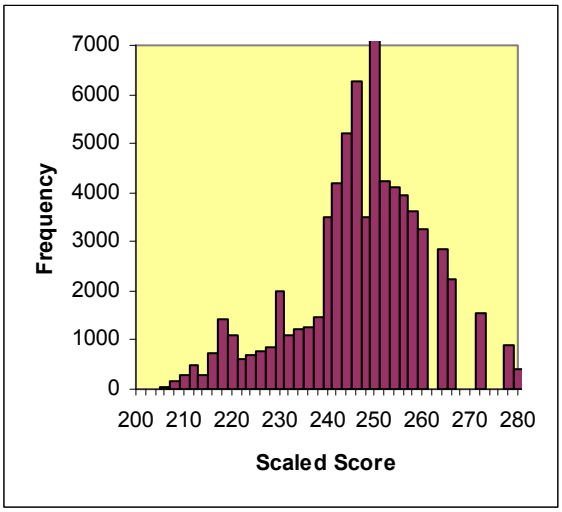


Figure 5-22. 2009 MCAS: Raw Score Distribution—English Language Arts Grade 8

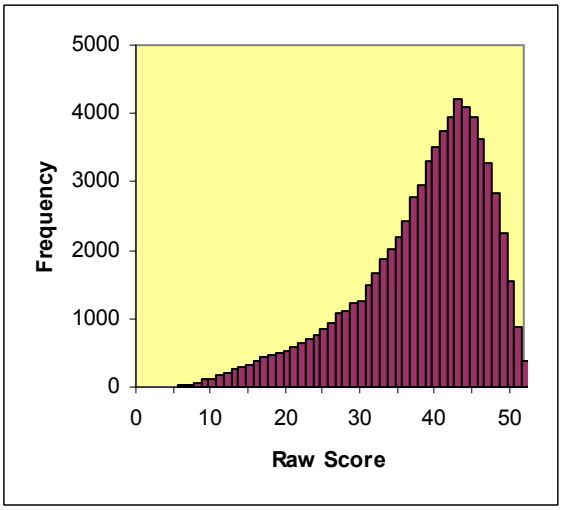


Table 5-11. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 8

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	2	0.0	0.0
202	26	0.0	0.0
204	288	0.4	0.4
206	262	0.4	0.8
208	431	0.6	1.4
210	1230	1.7	3.1
212	1597	2.2	5.3
214	2986	4.1	9.5
216	3319	4.6	14.1
218	5974	8.3	22.3
220	4131	5.7	28.1
222	1370	1.9	30.0
224	1478	2.0	32.0
226	1461	2.0	34.0
228	1539	2.1	36.2
230	1616	2.2	38.4
232	3277	4.5	43.0
234	1695	2.3	45.3
236	1711	2.4	47.7
238	1911	2.6	50.3
240	1836	2.5	52.9
242	1933	2.7	55.6
244	3956	5.5	61.0
246	2021	2.8	63.8
248	2150	3.0	66.8
250	2129	3.0	69.8
252	2240	3.1	72.9
254	2297	3.2	76.1
256	2282	3.2	79.2
258	0	0.0	79.2
260	4655	6.5	85.7
262	2232	3.1	88.8
264	2195	3.0	91.8
266	2058	2.9	94.7
268	0	0.0	94.7
270	1782	2.5	97.1
272	0	0.0	97.1
274	0	0.0	97.1
276	1331	1.8	99.0
278	0	0.0	99.0
280	734	1.0	100.0

Figure 5-23. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 8

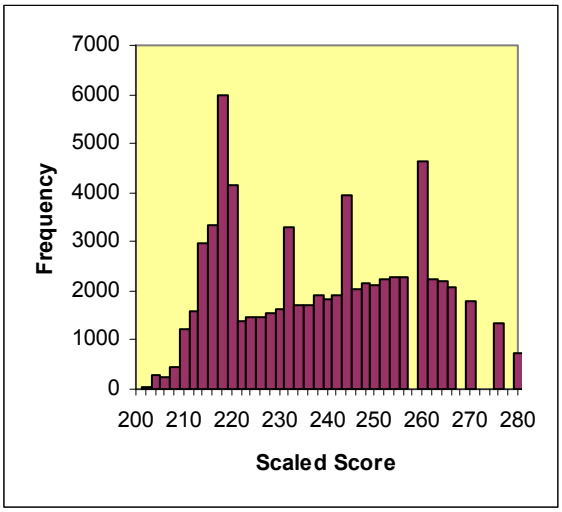


Figure 5-24. 2009 MCAS: Raw Score Distribution—Mathematics Grade 8

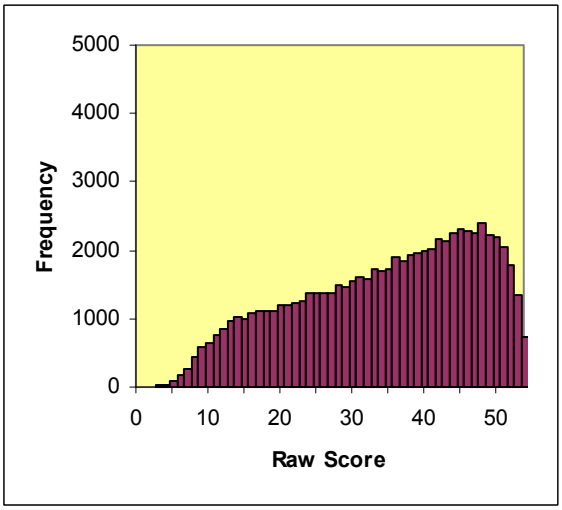


Table 5-12. 2009 MCAS: Scaled Score Distribution—Science and Technology/Engineering Grade 8

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	1	0.0	0.0
202	3	0.0	0.0
204	125	0.2	0.2
206	340	0.5	0.7
208	591	0.8	1.5
210	464	0.6	2.1
212	578	0.8	2.9
214	2441	3.4	6.3
216	3418	4.7	11.0
218	6096	8.5	19.5
220	3649	5.1	24.6
222	4067	5.6	30.2
224	2135	3.0	33.2
226	2241	3.1	36.3
228	2326	3.2	39.5
230	4899	6.8	46.3
232	2494	3.5	49.8
234	2489	3.5	53.2
236	2584	3.6	56.8
238	2544	3.5	60.3
240	5161	7.2	67.5
242	2439	3.4	70.9
244	4955	6.9	77.7
246	2330	3.2	81.0
248	2172	3.0	84.0
250	2035	2.8	86.8
252	1895	2.6	89.4
254	1742	2.4	91.9
256	1517	2.1	94.0
258	1271	1.8	95.7
260	1037	1.4	97.2
262	0	0.0	97.2
264	820	1.1	98.3
266	0	0.0	98.3
268	555	0.8	99.1
270	0	0.0	99.1
272	342	0.5	99.5
274	0	0.0	99.5
276	0	0.0	99.5
278	0	0.0	99.5
280	325	0.5	100.0

Figure 5-25. 2009 MCAS: Scaled Score Distribution—Science and Technology/Engineering Grade 8

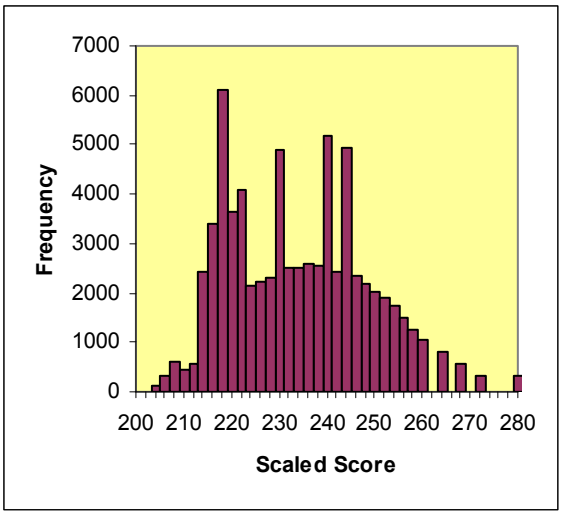


Figure 5-26. 2009 MCAS: Raw Score Distribution—Science and Technology/Engineering Grade 8

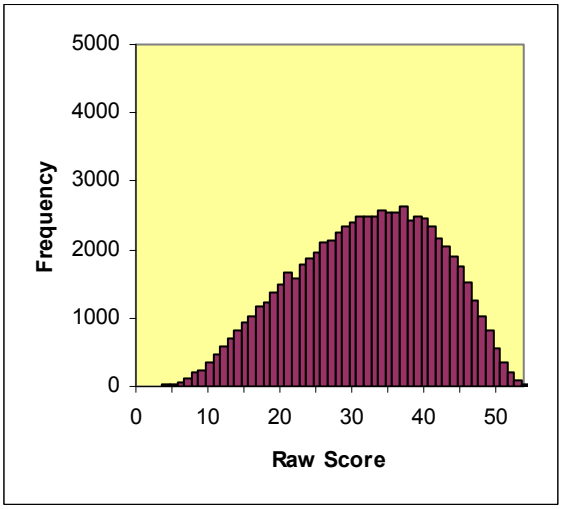


Table 5-13. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 10

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	1	0.0	0.0
202	3	0.0	0.0
204	30	0.0	0.0
206	80	0.1	0.2
208	84	0.1	0.3
210	61	0.1	0.4
212	212	0.3	0.7
214	167	0.2	0.9
216	444	0.6	1.5
218	1160	0.0	3.2
220	1222	1.7	5.0
222	402	0.6	5.5
224	859	1.2	6.8
226	467	0.7	7.4
228	1119	1.6	9.0
230	657	0.9	10.0
232	1672	2.4	12.4
234	924	1.3	13.7
236	2171	3.1	16.8
238	1313	1.9	18.7
240	3068	4.4	23.1
242	1809	2.6	25.7
244	4183	6.0	31.6
246	4908	7.0	38.7
248	2854	4.1	42.8
250	2889	4.1	46.9
252	6397	9.2	56.0
254	3377	4.8	60.9
256	3496	5.0	65.9
258	3487	5.0	70.9
260	3430	4.9	75.8
262	6421	9.2	85.0
264	2804	4.0	89.0
266	2341	3.4	92.3
268	1818	2.6	94.9
270	1401	2.0	97.0
272	0	0.0	97.0
274	1010	1.4	98.4
276	652	0.9	99.3
278	0	0.0	99.3
280	467	0.7	100.0

Figure 5-27. 2009 MCAS: Scaled Score Distribution—English Language Arts Grade 10

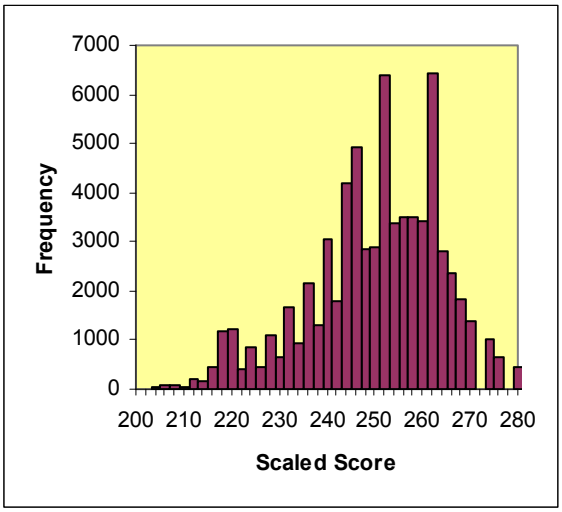


Figure 5-28. 2009 MCAS: Raw Score Distribution—English Language Arts Grade 10

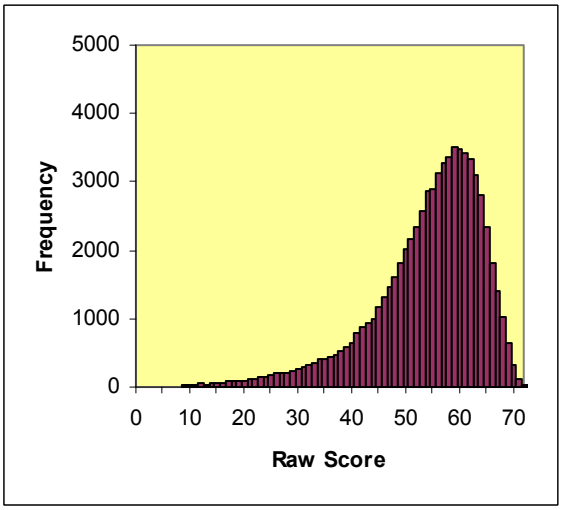


Table 5-14. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 10

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	1	0.0	0.0
202	10	0.0	0.0
204	49	0.1	0.1
206	206	0.3	0.4
208	205	0.3	0.7
210	0	0.0	0.0
212	294	0.4	1.1
214	371	0.5	1.6
216	918	1.3	2.9
218	2568	3.7	6.6
220	2715	3.9	10.5
222	1048	1.5	12.0
224	0	0.0	12.0
226	1107	1.6	13.6
228	1159	1.7	15.3
230	1239	1.8	17.1
232	1285	1.8	18.9
234	1366	2.0	20.9
236	1412	2.0	22.9
238	1419	2.0	24.9
240	1462	2.1	27.0
242	1467	2.1	29.2
244	2913	4.2	33.3
246	1500	2.2	35.5
248	1612	2.3	37.8
250	2984	4.3	42.1
252	1450	2.1	44.2
254	1520	2.2	46.4
256	2999	4.3	50.7
258	1573	2.3	52.9
260	4614	6.6	59.5
262	6312	9.1	68.6
264	6405	9.2	77.8
266	5236	7.5	85.3
268	3668	5.3	90.6
270	1776	2.6	93.1
272	1706	2.4	95.6
274	1417	0.0	95.6
276	0	0.0	95.6
278	1105	1.6	99.2
280	549	0.8	100.0

Figure 5-29. 2009 MCAS: Scaled Score Distribution—Mathematics Grade 10

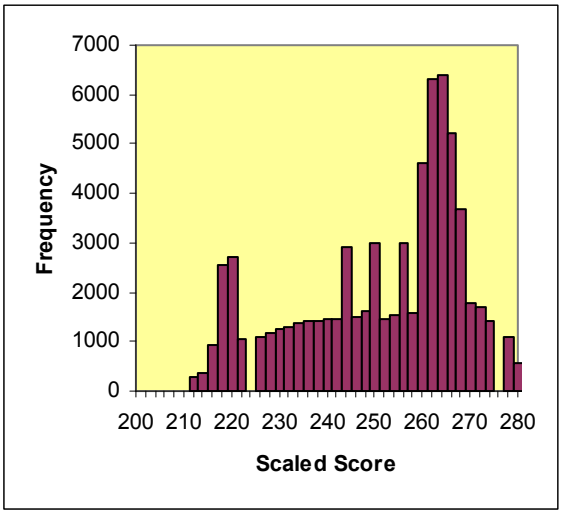


Figure 5-30. 2009 MCAS: Raw Score Distribution—Mathematics Grade 10

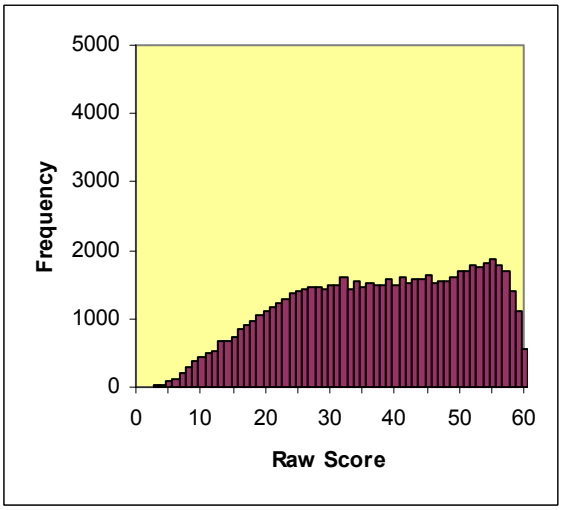


Table 5-15. 2009 MCAS: Scaled Score Distribution—High School Biology (Grades 9–11)

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	11	0.0	0.0
204	57	0.1	0.1
206	181	0.3	0.4
208	490	0.9	1.3
210	384	0.7	2.0
212	472	0.8	2.8
214	1385	2.5	5.3
216	1676	3.0	8.2
218	3957	7.0	15.3
220	2142	3.8	19.0
222	1064	1.9	20.9
224	1133	2.0	22.9
226	1173	2.1	25.0
228	1114	2.0	27.0
230	1201	2.1	29.1
232	2448	4.3	33.5
234	1237	2.2	35.6
236	1428	2.5	38.2
238	1369	2.4	40.6
240	2918	5.2	45.8
242	1486	2.6	48.4
244	3001	5.3	53.7
246	3131	5.5	59.3
248	3300	5.8	65.1
250	1649	2.9	68.0
252	3358	5.9	74.0
254	1636	2.9	76.9
256	1622	2.9	79.7
258	3066	5.4	85.2
260	1441	2.6	87.7
262	2491	4.4	92.1
264	1064	1.9	94.0
266	1600	2.8	96.9
268	597	1.1	97.9
270	470	0.8	98.7
272	330	0.6	99.3
274	0	0.0	99.3
276	210	0.4	99.7
278	101	0.2	99.9
280	66	0.1	100.0

Figure 5-31. 2009 MCAS: Scaled Score Distribution—High School Biology (Grades 9–11)

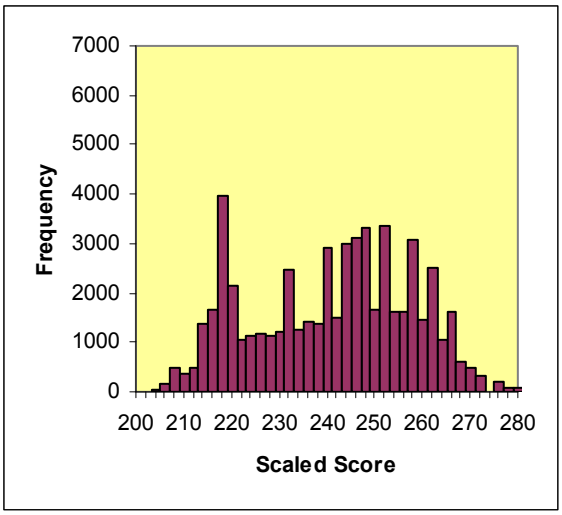


Figure 5-32. 2009 MCAS: Raw Score Distribution—High School Biology (Grades 9–11)

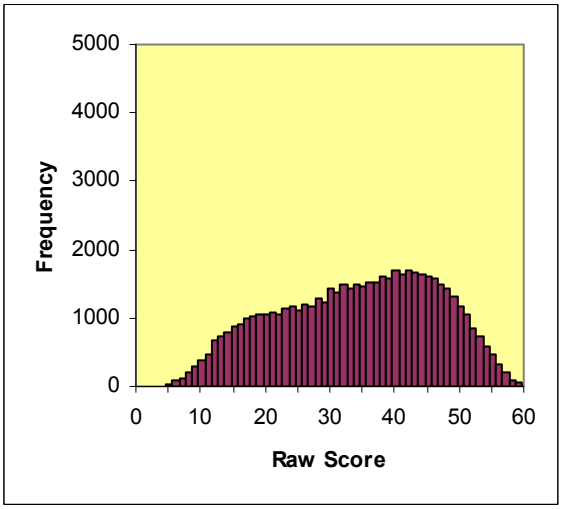


Table 5-16. 2009 MCAS Scaled Score Distribution—High School Chemistry (Grades 9–11)

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	2	0.1	0.1
204	9	0.3	0.4
206	82	3.1	3.5
208	54	2.1	5.6
210	0	0.0	5.6
212	81	3.1	8.7
214	200	7.6	16.3
216	351	13.4	29.7
218	450	0.0	29.7
220	228	8.7	55.5
222	0	0.0	55.5
224	43	1.6	57.1
226	34	1.3	58.4
228	32	1.2	59.6
230	52	2.0	61.6
232	56	2.1	63.7
234	39	1.5	65.2
236	48	1.8	67.1
238	46	1.8	68.8
240	40	1.5	70.3
242	89	3.4	73.7
244	52	2.0	75.7
246	36	1.4	77.1
248	65	2.5	79.6
250	35	1.3	80.9
252	31	1.2	82.1
254	73	2.8	84.8
256	38	1.4	86.3
258	30	1.1	87.4
260	52	2.0	89.4
262	102	3.9	93.3
264	46	1.8	95.0
266	24	0.9	96.0
268	50	1.9	97.9
270	18	0.7	98.6
272	14	0.5	99.1
274	0	0.0	99.1
276	16	0.6	99.7
278	0	0.0	99.7
280	8	0.3	100.0

Figure 5-33. 2009 MCAS: Scaled Score Distribution—High School Chemistry (Grades 9–11)

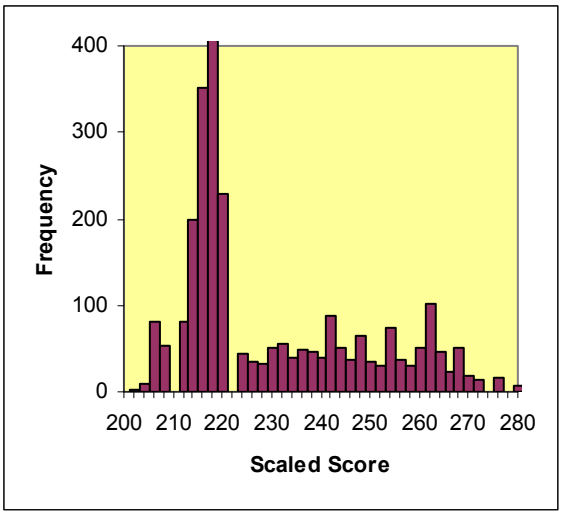


Figure 5-34. 2009 MCAS: Raw Score Distribution—High School Chemistry (Grades 9–11)

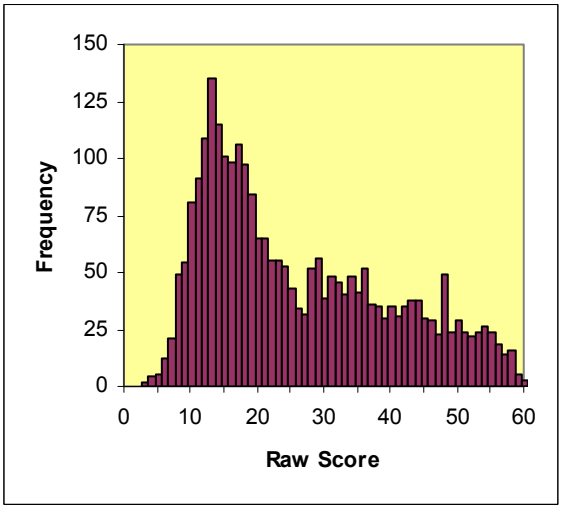


Table 5-17. 2009 MCAS: Scaled Score Distribution—High School Introductory Physics (Grades 9–11)

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	2	0.0	0.0
204	13	0.1	0.1
206	35	0.2	0.3
208	134	0.7	1.0
210	116	0.6	1.6
212	158	0.9	2.5
214	442	2.4	4.9
216	604	3.3	8.2
218	1401	7.6	15.8
220	738	4.0	19.8
222	439	2.4	22.2
224	400	2.2	24.4
226	396	2.2	26.6
228	406	2.2	28.8
230	867	4.7	33.5
232	476	2.6	36.1
234	452	2.5	38.5
236	470	2.6	41.1
238	460	2.5	43.6
240	982	5.3	48.9
242	435	2.4	51.3
244	1007	5.5	56.8
246	495	2.7	59.5
248	989	5.4	64.9
250	485	2.6	67.5
252	1011	5.5	73.0
254	448	2.4	75.5
256	880	4.8	80.2
258	425	2.3	82.6
260	787	4.3	86.8
262	653	3.6	90.4
264	314	1.7	92.1
266	529	2.9	95.0
268	214	1.2	96.2
270	368	2.0	98.2
272	0	0.0	98.2
274	133	0.7	98.9
276	106	1.6	99.5
278	0	0.0	99.5
280	99	0.5	100.0

Figure 5-35. 2009 MCAS: Scaled Score Distribution—High School Introductory Physics (Grades 9–11)

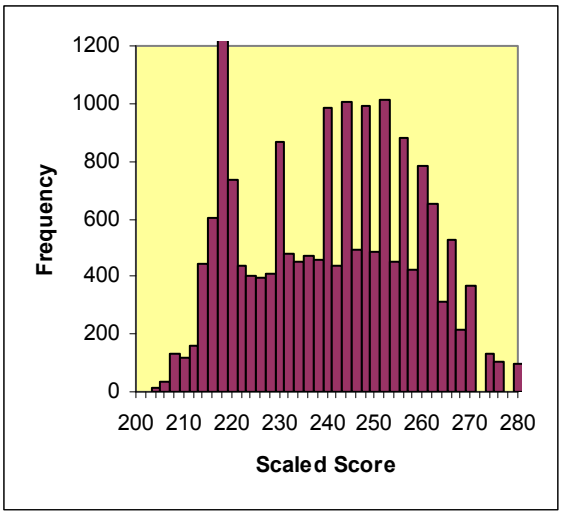


Figure 5-36. 2009 MCAS: Raw Score Distribution—High School Introductory Physics (Grades 9–11)

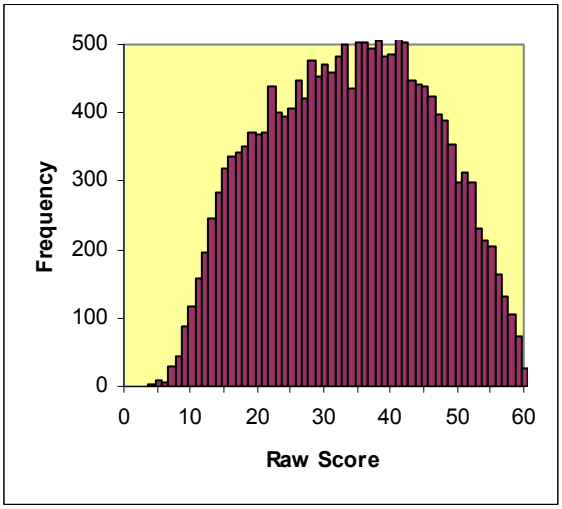


Table 5-18. 2009 MCAS: Scaled Score Distribution—High School Technology/Engineering (Grades 9–11)

Score	*Frequency*	*Percentage*	*Cumulative Percentage*
200	0	0.0	0.0
202	0	0.0	0.0
204	0	0.0	0.0
206	0	0.0	0.0
208	0	0.0	0.0
210	2	0.1	0.1
212	5	0.2	0.3
214	53	2.3	2.6
216	93	4.0	6.6
218	167	7.2	13.8
220	159	6.9	20.7
222	49	2.1	22.8
224	53	2.3	25.1
226	56	2.4	27.6
228	105	4.5	32.1
230	82	3.5	35.7
232	87	3.8	39.4
234	64	2.8	42.2
236	71	3.1	45.3
238	84	3.6	48.9
240	168	7.3	56.2
242	181	7.8	64.0
244	77	3.3	67.3
246	177	7.7	75.0
248	137	5.9	80.9
250	78	3.4	84.3
252	121	5.2	89.5
254	36	1.6	91.1
256	43	1.9	92.9
258	42	1.8	94.8
260	54	2.3	97.1
262	23	1.0	98.1
264	10	0.4	98.5
266	12	0.5	99.0
268	8	0.3	99.4
270	7	0.3	99.7
272	0	0.0	99.7
274	7	0.3	100.0
276	0	0.0	100.0
278	0	0.0	100.0
280	0	0.0	100.0

Figure 5-37. 2009 MCAS: Scaled Score Distribution—High School Technology/Engineering (Grades 9–11)

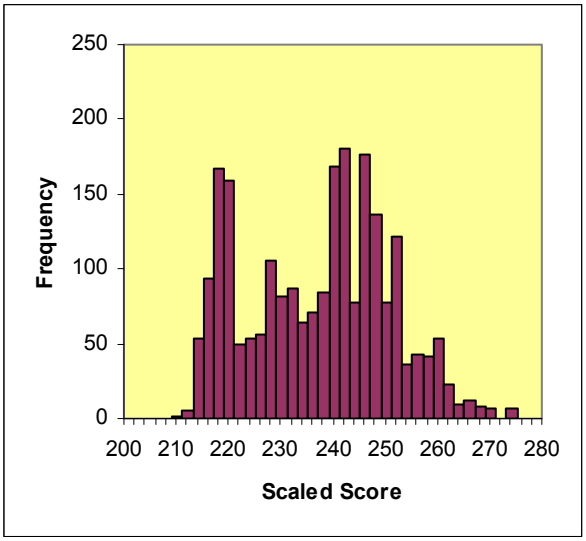
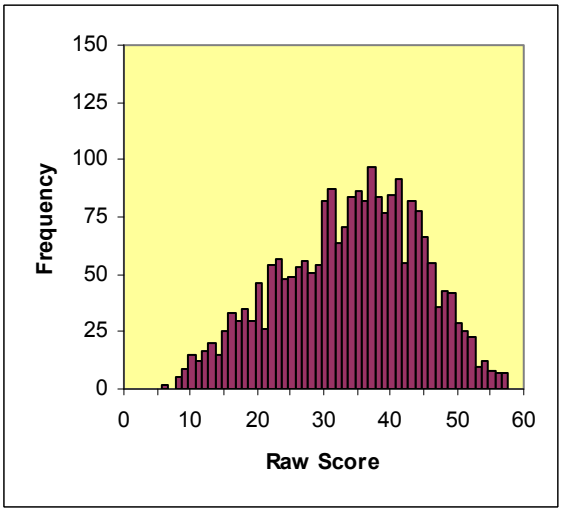


Figure 5-38. 2009 MCAS: Raw Score Distribution—High School Technology/Engineering (Grades 9–11)



5.3 MCAS-Alt Results

Results for the MCAS-Alt are reported according to the following seven performance levels:

- *Advanced* (*Above Proficient* at grade 3)
- *Proficient*
- *Needs Improvement*
- *Progressing*
- *Emerging*
- *Awareness*
- *Incomplete*

The MCAS-Alt performance levels of *Incomplete*, *Awareness*, *Emerging*, and *Progressing* are included in the *Warning*/*Failing* performance level data shown throughout this document and on MCAS reports of school and district results. Descriptions of the MCAS-Alt performance levels are provided in section 5.1.2.1 of the *2007 MCAS Technical Report.*

5.3.1 Performance Level Results

Tables 5-19 through 5-25 display the 2009 MCAS-Alt performance level results for each grade and content area.

Table 5-19. 2009 MCAS-Alt: Performance Level Results—Grade 3

Performance Level	*Content Area*			
	English Language Arts		*Mathematics*	
	Number	*Percentage**	*Number*	*Percentage**
Incomplete	87	6.97	101	8.33
Awareness	12	0.96	16	1.32
Emerging	84	6.73	71	5.86
Progressing	1,065	85.34	1,024	84.49
Needs Improvement	0	0	0	0
Proficient	0	0	0	0
Above Proficient	0	0	0	0
Total	**1,248**		**1,212**	

*Percentages may not total 100 due to rounding.

Table 5-20. 2009 MCAS-Alt: Performance Level Results—Grade 4

Performance Level	*Content Area*			
	English Language Arts		*Mathematics*	
	Number	*Percentage**	*Number*	*Percentage**
Incomplete	51	3.97	132	10.15
Awareness	7	0.54	7	0.54
Emerging	150	11.66	72	5.54
Progressing	1,077	83.75	1,089	83.77
Needs Improvement	1	0.08	0	0
Proficient	0	0	0	0
Advanced	0	0	0	0
Total	**1,286**		**1300**	

*Percentages may not total 100 due to rounding.

Table 5-21. 2009 MCAS-Alt: Performance Level Results—Grade 5

Performance Level	*Content Area*					
	English Language Arts		*Mathematics*		*Science and Technology/Engineering*	
	Number	*Percentage**	*Number*	*Percentage**	*Number*	*Percentage**
Incomplete	91	7.13	97	7.48	78	6.79
Awareness	17	1.33	17	1.31	10	0.87
Emerging	82	6.42	65	5.01	106	9.23
Progressing	1,086	85.04	1,117	86.12	953	83.01
Needs Improvement	1	0.08	1	0.08	1	0.09
Proficient	0	0	0	0	0	0
Advanced	0	0	0	0	0	0
Total	**1,277**		**1,297**		**1,148**	

*Percentages may not total 100 due to rounding.

Table 5-22. 2009 MCAS-Alt: Performance Level Results—Grade 6

Performance Level	*Content Area*			
	English Language Arts		*Mathematics*	
	Number	*Percentage**	*Number*	*Percentage**
Incomplete	73	6.19	78	6.21
Awareness	20	1.69	22	1.75
Emerging	75	6.36	57	4.54
Progressing	1,012	85.76	1,093	87.02
Needs Improvement	0	0	6	0.48
Proficient	0	0	0	0
Advanced	0	0	0	0
Total	**1,180**		**1,256**	

*Percentages may not total 100 due to rounding.

Table 5-23. 2009 MCAS-Alt: Performance Level Results—Grade 7

Performance Level	*Content Area*			
	English Language Arts		*Mathematics*	
	Number	*Percentage**	*Number*	*Percentage**
Incomplete	58	4.74	110	8.53
Awareness	7	0.57	23	1.78
Emerging	171	13.97	64	4.97
Progressing	988	80.72	1091	84.64
Needs Improvement	0	0	1	0.08
Proficient	0	0	0	0
Advanced	0	0	0	0
Total	**1,224**		**1,289**	

*Percentages may not total 100 due to rounding.

Table 5-24. 2009 MCAS-Alt: Performance Level Results—Grade 8

Performance Level	*Content Area*					
	English Language Arts		*Mathematics*		*Science and Technology/Engineering*	
	Number	*Percentage**	*Number*	*Percentage**	*Number*	*Percentage**
Incomplete	74	6.91	94	8.1	58	5.63
Awareness	14	1.31	7	0.6	8	0.78
Emerging	75	7	71	6.12	120	11.64
Progressing	908	84.78	985	84.84	843	81.77
Needs Improvement	0	0	4	0.34	2	0.19
Proficient	0	0	0	0	0	0
Advanced	0	0	0	0	0	0
Total	**1,071**		**1,161**		**1,031**	

*Percentages may not total 100 due to rounding.

Table 5-25. 2009 MCAS-Alt: Performance Level Results—Grade 10 and High School (Grades 9–11)

Performance Level	*Content Area*					
	*English Language Arts** (Grade 10 only)*		*Mathematics** (Grade 10 only)*		*Science and Technology/Engineering** (Grades 9–11)*	
	Number	*Percentage**	*Number*	*Percentage**	*Number*	*Percentage**
Incomplete	53	6.34	90	10.74	87	10.08
Awareness	11	1.32	9	1.07	22	2.55
Emerging	125	14.95	143	17.06	131	15.18
Progressing	647	77.39	595	71	615	71.26
Needs Improvement	0	0	1	0.12	8	0.93
Proficient	0	0	0	0	0	0
Advanced	0	0	0	0	0	0
Total	**836**		**838**		**863**	

*Percentages may not total 100 due to rounding.
**Does not include students in grades 11, 12 or 12+ seeking a Competency Determination

5.3.2 Scoring Dimension Results

Tables 5-26 through 5-33 display results for the 2009 MCAS-Alt in each of the following scoring dimensions:

- Level of Complexity (section 5.3.2.1)
- Demonstration of Skills and Concepts (section 5.3.2.2)
- Independence (section 5.3.2.3)
- Self-Evaluation (section 5.3.2.4)
- Generalized Performance (section 5.3.2.5)

For information on the determination of score in each dimension, see section 4.2 of the *2007 MCAS Technical Report*.

5.3.2.1 *Level of Complexity*

In 2005, 94.5 percent of all portfolio strands received a Level of Complexity score of 3, signifying that students were addressing learning standards below grade level expectations. A small number (3.3 percent) of students met the learning standards through access skills and received a score of 2. A

total of 2.2 percent of students received a score of 4 or 5, meaning they were addressing learning standards at or above grade level expectations.

Tables 5-26 through 5-32 show the distributions of Level of Complexity scores on the 2009 MCAS-Alt by strand for each grade in the content area(s) tested. Table 5-33 gives the Level of Complexity score distribution by strand for all tested grades combined.

Table 5-26. 2009 MCAS-Alt:
Statewide Score Distribution for Level of Complexity by Strand—Grade 3

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
1	22	17		17	10			
2	40	54		54	46			
3	1,161	1,153		1,153	1,131			
4	22	21		21	20			
5	0	0		0	0			

Table 5-27. 2009 MCAS-Alt:
Statewide Score Distribution for Level of Complexity by Strand—Grade 4

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
1	30	13	4	0				8
2	33	48	42	41				38
3	1,191	1,199	1,212	1,235				1,225
4	26	19	20	23				25
5	3	3	2	1				1

Table 5-28. 2009 MCAS-Alt:
Statewide Score Distribution for Level of Complexity by Strand—Grade 5

	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering* Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*
1	41	5		0			5		2	6	1	0
2	28	38		35			36		33	31	26	10
3	1,181	1,204		1,220			1,207		1,002	1,000	886	331
4	21	19		35			41		21	18	21	6
5	4	4		4			4		1	1	1	0

Table 5-29. 2009 MCAS-Alt:
Statewide Score Distribution for Level of Complexity by Strand—Grade 6

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
1	15	6		3	9			
2	35	50		38	35			
3	1,105	1,101		1,169	1,162			
4	16	16		30	32			
5	6	6		12	12			

Table 5-30. 2009 MCAS-Alt:
Statewide Score Distribution for Level of Complexity by Strand—Grade 7

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
1	21	8	9	0				2
2	28	41	36	41				39
3	1,154	1,158	1,144	1,225				1,219
4	14	11	13	17				18
5	1	0	0	4				3

Table 5-31. 2009 MCAS-Alt:
Statewide Score Distribution for Level of Complexity by Strand—Grade 8

	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering* Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*
1	15	5		3		4			2	7	11	2
2	21	28		28		27			25	26	19	15
3	1,019	1,024		1,094		1,094			907	890	637	467
4	10	11		29		26			9	10	8	2
5	3	2		4		4			1	1	2	3

Table 5-32. 2009 MCAS:
Statewide Score Distribution for Level of Complexity
by Strand—Grade 10 and High School (Grades 9–11)

	Content Area											
	English Language Arts (Grade 10 Only) Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics (Grade 10 Only)* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering (Grades 9–11)* Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Bio*	*Chem*	*Phys*	*T/E*
1	31	5	3	3	2	2	2	2	52	11	7	4
2	20	33	27	15	13	16	8	10	45	7	8	11
3	777	787	788	671	426	402	444	443	1,836	239	105	179
4	4	7	8	9	11	13	10	6	45	0	7	0
5	3	1	0	1	2	1	1	1	4	0	28	0

Table 5-33. 2009 MCAS:
Statewide Score Distribution for Level of Complexity
by Strand—All Tested Grades Combined

	Content Area															
	English Language Arts			*Mathematics*					*Science and Technology/Engineering*							
									Grades 5 and 8				**Grades 9–11**			
	Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering				Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*	*Bio*	*Chem*	*Phys*	*T/E*
1	175	59	16	10	21	6	7	12	4	13	12	2	52	11	7	4
2	205	292	105	248	94	43	44	87	58	57	45	25	45	7	8	11
3	7588	7626	3144	7748	2719	1496	1651	2887	1909	1890	1523	798	1836	239	105	179
4	113	104	41	168	63	39	51	49	30	28	29	8	45	0	7	0
5	20	16	2	26	14	5	5	5	2	2	3	3	4	0	28	0

Tables 5-34 and 5-35 show the 2009 MCAS-Alt Composite Level of Complexity score distributions for all tested grades combined, by content area and for combined content areas, respectively.

Table 5-34. 2009 MCAS-Alt: Statewide Score Distribution
for Composite Level of Complexity by
Content Area—All Tested Grades Combined
ALT = portfolios for students with significant cognitive disabilities
GL = portfolios measured against grade level learning standards
MIS = not determined due to missing data

Score Point	*Content Area*			
	English Language Arts	*Mathematics*	*Science and Technology/ Engineering*	
			Grades 5 and 8	*High School (Grades 9–11)*
ALT	7,884	8,056	2,057	813
GL	162	235	48	28
MIS	76	62	74	22

Table 5-35. 2009 MCAS-Alt: Statewide Score Distribution for Composite Level of Complexity— All Content Areas Combined

ALT = portfolios for students with significant cognitive disabilities
GL = portfolios measured against grade level learning standards
MIS = not determined due to missing data

Score Point	*Grade Level*	
	Grades 3–8 and 10	*High School (Grades 9–11) Science and Technology/Engineering*
ALT	17,997	813
GL	445	28
MIS	212	22

5.3.2.2 *Demonstration of Skills and Concepts*

Tables 5-36 through 5-42 give the statewide distributions of all 2009 MCAS-Alt scores for Demonstration of Skills and Concepts in all portfolio strands, by grade. Table 5-43 shows the statewide score distribution by strand for all tested grades combined. Note that the "M" in the score point column of the table below means "missing"; the portfolio strand contained insufficient information to determine a score.

Table 5-36. 2009 MCAS-Alt: Statewide Score Distribution for Demonstration of Skills and Concepts by Strand—Grade 3

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
M	51	49		59	64			
1	1	1		0	0			
2	5	2		5	8			
3	72	84		76	63			
4	1,094	1,092		1,069	1,062			

Table 5-37. 2009 MCAS-Alt: Statewide Score Distribution for Demonstration of Skills and Concepts by Strand—Grade 4

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
M	69	50	62	70				91
1	0	1	0	0				2
2	9	11	3	12				4
3	80	83	90	61				59
4	1,095	1,124	1,121	1,157				1,133

Table 5-38. 2009 MCAS-Alt: Statewide Score Distribution for Demonstration of Skills and Concepts by Strand—Grade 5

	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering* Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*
M	58	41		45			71		59	63	50	21
1	0	2		1			2		0	0	1	0
2	12	10		12			14		7	6	6	3
3	58	86		57			62		57	35	47	13
4	1,106	1,126		1,179			1,139		934	946	830	310

Table 5-39. 2009 MCAS-Alt: Statewide Score Distribution for Demonstration of Skills and Concepts by Strand—Grade 6

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
M	38	45		44	41			
1	3	2		0	0			
2	3	9		9	10			
3	73	85		89	88			
4	1,045	1,032		1,107	1,102			

Table 5-40. 2009 MCAS-Alt: Statewide Score Distribution for Demonstration of Skills and Concepts by Strand—Grade 7

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
M	57	61	59	70				61
1	0	1	0	0				3
2	13	10	8	14				16
3	86	85	92	117				82
4	1,041	1,053	1,034	1,086				1,117

Table 5-41. 2009 MCAS-Alt: Statewide Score Distribution for Demonstration of Skills and Concepts by Strand—Grade 8

	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering* Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*
M	42	45		53		48			39	42	35	18
1	1	1		1		0			0	0	0	0
2	11	17		12		7			11	10	5	6
3	77	89		86		81			63	54	46	34
4	922	913		1,003		1,015			829	821	580	429

Table 5-42. 2009 MCAS-Alt: Statewide Score Distribution for Demonstration of Skills and Concepts by Strand—Grade 10 and High School (Grades 9–11)

	Content Area											
	English Language Arts (Grade 10 Only) Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics (Grade 10 Only)* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering (Grades 9–11)* Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Bio*	*Chem*	*Phys*	*T/E*
M	63	63	58	87	62	37	66	41	220	14	11	27
1	0	1	1	4	2	0	1	1	8	0	0	0
2	6	11	8	7	3	5	5	2	19	2	3	3
3	50	74	63	56	34	38	31	28	153	18	8	27
4	685	679	693	542	351	352	360	388	1,530	212	126	133

Table 5-43. 2009 MCAS-Alt: Statewide Score Distribution for Demonstration of Skills and Concepts by Strand—All Tested Grades Combined

	Content Area															
	English Language Arts			*Mathematics*					*Science and Technology/Engineering*							
									Grades 5 and 8				**High School (Grades 9–11)**			
	Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering				Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*	*Bio*	*Chem*	*Phys*	*T/E*
M	378	354	179	428	167	85	137	193	98	105	85	39	220	14	11	27
1	5	9	1	6	2	0	3	6	0	0	1	0	8	0	0	0
2	59	70	19	71	21	12	19	22	18	16	11	9	19	2	3	3
3	496	586	245	542	185	119	93	169	120	89	93	47	153	18	8	27
4	6,988	7,019	2,848	7,143	2,515	1,367	1,499	2,638	1,763	1,767	1,410	739	1,530	212	126	133

5.3.2.3 *Independence*

Tables 5-44 through 5-50 show the statewide distributions of 2009 MCAS-Alt scores for Independence in all strands, by grade. Table 5-51 displays the statewide score distribution by strand for all tested grades combined.

Table 5-44. 2009 MCAS-Alt: Statewide Score Distribution for Independence by Strand—Grade 3

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
M	51	49		59	64			
1	3	5		2	6			
2	13	20		31	19			
3	107	120		97	103			
4	1,049	1,034		1,020	1,005			

Table 5-45. 2009 MCAS-Alt: Statewide Score Distribution for Independence by Strand—Grade 4

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
M	69	50	62	70				91
1	1	2	3	2				2
2	14	21	27	15				25
3	109	122	141	117				125
4	1,060	1,074	1,043	1,096				1,046

Table 5-46. 2009 MCAS-Alt: Statewide Score Distribution for Independence by Strand—Grade 5

	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering* Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*
M	58	41		45			71		59	63	50	21
1	3	1		6			5		3	5	8	2
2	19	16		28			17		13	9	10	3
3	70	109		90			114		84	80	87	17
4	1,084	1,098		1,125			1,081		898	893	779	304

Table 5-47. 2009 MCAS-Alt: Statewide Score Distribution for Independence by Strand—Grade 6

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
M	38	45		44	41			
1	6	2		9	4			
2	21	27		25	22			
3	90	104		106	89			
4	1,007	995		1,065	1,085			

Table 5-48. 2009 MCAS-Alt: Statewide Score Distribution for Independence by Strand—Grade 7

	Content Area							
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability				
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*
M	57	61	59	70				61
1	5	3	16	8				9
2	18	19	31	22				25
3	114	129	124	126				120
4	1,003	998	963	1,061				1,064

Table 5-49. 2009 MCAS-Alt: Statewide Score Distribution for Independence by Strand—Grade 8

	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering* Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*
M	42	45		53		48			39	42	35	18
1	3	3		6		3			1	1	1	0
2	20	32		21		20			24	21	25	7
3	92	105		103		99			88	83	65	49
4	896	880		972		981			790	780	540	413

Table 5-50. 2009 MCAS-Alt: Statewide Score Distribution for Independence by Strand—Grade 10 and High School (Grades 9–11)

	Content Area											
	English Language Arts (Grade 10 Only) Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			*Mathematics (Grade 10 Only)* NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					*Science and Technology/Engineering (Grades 9–11)* Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Bio*	*Chem*	*Phys*	*T/E*
M	63	63	58	87	62	37	66	41	220	14	11	27
1	4	8	4	6	3	3	2	3	10	1	0	0
2	16	19	11	17	8	16	7	7	31	5	3	6
3	88	103	127	76	42	43	55	49	227	26	10	32
4	633	635	623	510	337	333	333	360	1,442	200	124	125

Table 5-51. 2009 MCAS-Alt: Statewide Score Distribution for Independence by Strand—All Tested Grades Combined

	Content Area															
	English Language Arts			*Mathematics*					*Science and Technology/Engineering*							
									Grades 5 and 8				**High School (Grades 9–11)**			
	Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering				Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering			
Score Point	*Lang*	*Read*	*Comp*	*NmbSn*	*Pattrns*	*Geom*	*Meas*	*Data*	*Earth*	*Life*	*Phys*	*Tch/E*	*Bio*	*Chem*	*Phys*	*T/E*
M	378	354	179	428	167	85	137	193	98	105	85	39	220	14	200	27
1	25	24	23	39	13	6	7	14	4	6	9	2	10	1	11	0
2	121	154	69	159	49	36	24	57	37	30	35	10	31	5	0	6
3	670	792	392	715	234	142	169	294	172	163	152	66	227	26	3	32
4	6,732	6,714	2,629	6,849	2,427	1,314	1,414	2,470	1,688	1,673	1,319	717	1,442	200	10	125

5.3.2.4 *Self-Evaluation*

Tables 5-52 through 5-58 show the 2009 MCAS-Alt score distributions for Self-Evaluation in each content area, by grade. Table 5-59 displays the statewide score distribution by content area for all tested grades combined. Table 5-60 gives the 2009 MCAS-Alt Self-Evaluation score distribution for all content areas combined.

Table 5-52. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation by Content Area—Grade 3

Score Point	*Content Area*	
	English Language Arts	*Mathematics*
M	21	21
1	44	24
2	31	33
3	25	23
4	1,127	1,111

Table 5-53. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation by Content Area—Grade 4

Score Point	*Content Area*	
	English Language Arts	*Mathematics*
M	20	22
1	5	19
2	61	36
3	63	25
4	1,137	1,198

Table 5-54. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation by Content Area—Grade 5

Score Point	*Content Area*		
	English Language Arts	*Mathematics*	*Science and Technology/ Engineering*
M	22	22	17
1	57	21	22
2	16	19	37
3	14	18	39
4	1,168	1,217	1,033

Table 5-55. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation by Content Area—Grade 6

Score Point	*Content Area*	
	English Language Arts	*Mathematics*
M	13	19
1	26	19
2	14	20
3	15	12
4	1,112	1,186

Table 5-56. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation by Content Area—Grade 7

Score Point	*Content Area*	
	English Language Arts	*Mathematics*
M	28	41
1	7	15
2	58	10
3	38	23
4	1,093	1,200

Table 5-57. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation by Content Area—Grade 8

Score Point	*Content Area*		
	English Language Arts	*Mathematics*	*Science and Technology/ Engineering*
M	25	32	24
1	27	32	28
2	17	16	32
3	19	19	30
4	983	1,062	917

Table 5-58. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation by Content Area—Grade 10 and High School (Grades 9–11)

Score Point	*Content Area*		
	English Language Arts (Grade 10 Only)	*Mathematics (Grade 10 Only)*	*Science and Technology/ Engineering (Grades 9–11)*
M	29	28	35
1	7	5	31
2	50	22	29
3	31	31	34
4	719	752	734

Table 5-59. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation by Content Area—All Tested Grades Combined

Score Point	*Content Area*			
	English Language Arts	*Mathematics*	*Science and Technology/ Engineering*	
			Grades 5 & 8	*Grades 9–11*
M	158	185	41	35
1	173	135	50	31
2	247	156	69	29
3	205	151	69	34
4	7,339	7,726	1,950	734

Table 5-60. 2009 MCAS-Alt: Statewide Score Distribution for Self-Evaluation—All Content Areas Combined

Score Point	*Grade Level*	
	Grades 3–8, and 10	*High School (Grades 9–11) End-of-Course Science and Technology/Engineering*
M	384	35
1	358	31
2	472	29
3	425	34
4	17,015	734

5.3.2.5 *Generalized Performance*

Tables 5-61 through 5-67 show the 2009 MCAS-Alt score distributions for Generalized Performance for each content area, by grade. Table 5-68 shows the statewide score distribution by content area for all tested grades combined, and Table 5-69 displays the statewide score distribution for all content areas combined.

Table 5-61. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance by Content Area—Grade 3

Score Point	*Content Area*	
	English Language Arts	*Mathematics*
1	53	55
2	127	100
3	1,068	1,057

Table 5-62. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance by Content Area—Grade 4

Score Point	*Content Area*	
	English Language Arts	*Mathematics*
1	42	54
2	63	114
3	1,181	1,132

Table 5-63. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance by Content Area—Grade 5

Score Point	*Content Area*		
	English Language Arts	*Mathematics*	*Science and Technology/Engineering*
1	52	48	22
2	154	129	40
3	1,071	1,120	1,086

Table 5-64. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance by Content Area—Grade 6

Score Point	*Content Area*	
	English Language Arts	*Mathematics*
1	61	67
2	142	122
3	977	1,067

Table 5-65. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance by Content Area—Grade 7

Score Point	*Content Area*	
	English Language Arts	*Mathematics*
1	58	69
2	81	138
3	1,085	1,082

Table 5-66. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance by Content Area—Grade 8

Score Point	*Content Area*		
	English Language Arts	*Mathematics*	*Science and Technology/Engineering*
1	53	44	35
2	109	103	39
3	909	1,014	957

Table 5-67. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance by Content Area—Grade 10 and High School (Grades 9–11)

Score Point	*Content Area*		
	English Language Arts (Grade 10 Only)	*Mathematics (Grade 10 Only)*	*Science and Technology/Engineering (Grades 9–11)*
1	32	28	43
2	54	52	36
3	750	758	784

Table 5-68. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance by Content Area—All Tested Grades Combined

Score Point	*Content Area*			
	English Language Arts	*Mathematics*	*Science and Technology/Engineering*	
			Grades 5 and 8	*Grades 9–11*
1	351	365	57	43
2	730	758	79	36
3	7,041	7,230	2,043	784

Table 5-69. 2009 MCAS-Alt: Statewide Score Distribution for Generalized Performance—All Content Areas Combined

Score Point	*Grade Level*	
	Grades 3–8 and 10	*High School (Grades 9–11) End-of-Course Science and Technology/Engineering*
1	773	43
2	1,567	36
3	16,314	784

5.3.3 MCAS-Alt Participation Data

MCAS-Alt student portfolios were measured against one of two sets of standards—alternate achievement standards or grade level achievement standards—based on the following criteria:

- The level of complexity of the evidence in the portfolio
- Whether it was determined that the student was working at or near grade level expectations, somewhat below grade level expectations, or well below grade level expectations (pursuant to U.S. Department of Education Title I regulations)

Tables 5-70 through 5-76 display statewide participation data for the 2009 MCAS-Alt disaggregated by method of measurement (i.e., the numbers and percentages of MCAS-Alt portfolios measured on grade level standards and on alternate achievement standards).

Table 5-70. 2009 MCAS-Alt: Participation Results—Grade 3

Assessment Format and Achievement Standard Measured	*Content Area*			
	English Language Arts		*Mathematics*	
	Number	*Percentage**	*Number*	*Percentage**
Standard MCAS test, measured on grade level achievement standards	69,406	98.23	69,559	98.29
MCAS-Alt, measured on grade level achievement standards	26	0.04	26	0.04
MCAS-Alt, measured on alternate achievement standards	1,216	1.72	1,179	1.67
MCAS-Alt, achievement standards level not determined	6	0.01	7	0.01
Total	**70,654**		**70,771**	

*Percentages may not total 100 due to rounding.

Table 5-71. 2009 MCAS-Alt: Participation Results—Grade 4

Assessment Format and Achievement Standard Measured	*Content Area*			
	English Language Arts		*Mathematics*	
	Number	*Percentage**	*Number*	*Percentage**
Standard MCAS test, measured on grade level achievement standards	69,164	98.17	69,388	98.16
MCAS-Alt, measured on grade level achievement standards	33	0.05	30	0.04
MCAS-Alt, measured on alternate achievement standards	1,242	1.76	1,267	1.79
MCAS-Alt, achievement standards level not determined	11	0.02	3	0
Total	**70,450**		**70,688**	

*Percentages may not total 100 due to rounding.

Table 5-72. 2009 MCAS-Alt: Participation Results—Grade 5

Assessment Format and Achievement Standard Measured	*Content Area*					
	English Language Arts		*Mathematics*		*Science and Technology/Engineering*	
	Number	*Percentage**	*Number*	*Percentage**	*Number*	*Percentage**
Standard MCAS test, measured on grade level achievement standards	70,362	98.22	70,476	98.19	70,518	98.4
MCAS-Alt, measured on grade level achievement standards	31	0.04	48	0.07	30	0.04
MCAS-Alt, measured on alternate achievement standards	1,237	1.73	1,242	1.73	1,081	1.51
MCAS-Alt, achievement standards level not determined	9	0.01	7	0.01	37	0.05
Total	**71,639**		**71,773**		**71,666**	

*Percentages may not total 100 due to rounding.

Table 5-73. 2009 MCAS-Alt: Participation Results—Grade 6

Assessment Format and Achievement Standard Measured	*Content Area*			
	English Language Arts		*Mathematics*	
	Number	*Percentage**	*Number*	*Percentage**
Standard MCAS test, measured on grade level achievement standards	69,799	98.34	69,814	98.23
MCAS-Alt, measured on grade level achievement standards	28	0.04	49	0.07
MCAS-Alt, measured on alternate achievement standards	1,148	1.62	1,197	1.68
MCAS-Alt, achievement standards level not determined	4	0.01	10	0.01
Total	**70,979**		**71,070**	

*Percentages may not total 100 due to rounding.

Table 5-74. 2009 MCAS-Alt: Participation Results—Grade 7

Assessment Format and Achievement Standard Measured	*Content Area*			
	English Language Arts		*Mathematics*	
	Number	*Percentage**	*Number*	*Percentage**
Standard MCAS test, measured on grade level achievement standards	70,456	98.29	70,669	98.21
MCAS-Alt, measured on grade level achievement standards	16	0.02	24	0.03
MCAS-Alt, measured on alternate achievement standards	1,178	1.64	1,255	1.74
MCAS-Alt, achievement standards level not determined	30	0.04	10	0.01
Total	**71,680**		**71,958**	

*Percentages may not total 100 due to rounding.

Table 5-75. 2009 MCAS-Alt: Participation Results—Grade 8

Assessment Format and Achievement Standard Measured	*Content Area*					
	English Language Arts		*Mathematics*		*Science and Technology/Engineering*	
	Number	*Percentage**	*Number*	*Percentage**	*Number*	*Percentage**
Standard MCAS test, measured on grade level achievement standards	72,085	98.54	72,029	98.41	71,967	98.59
MCAS-Alt, measured on grade level achievement standards	16	0.02	38	0.05	18	0.02
MCAS-Alt, measured on alternate achievement standards	1,051	1.44	1,114	1.52	976	1.34
MCAS-Alt, achievement standards level not determined	4	0.01	9	0.01	37	0.05
Total	**73,156**		**73,190**		**72,998**	

*Percentages may not total 100 due to rounding.

Table 5-76. 2009 MCAS-Alt: Participation Results—Grade 10 and High School (Grades 9–11)

Assessment Format and Achievement Standard Measured	*Content Area*					
	English Language Arts (Grade 10 Only)		*Mathematics (Grade 10 Only)*		*Science and Technology/Engineering (Grades 9–11)*	
	Number	*Percentage**	*Number*	*Percentage**	*Number*	*Percentage**
Standard MCAS test, measured on grade level achievement standards	69,587	98.81	69,392	98.8	75,245	98.86
MCAS-Alt, measured on grade level achievement standards	12	0.02	20	0.03	28	0.04
MCAS-Alt, measured on alternate achievement standards	814	1.16	804	1.14	815	1.07
MCAS-Alt, achievement standards level not determined	12	0.02	16	0.02	22	0.03
Total	**70,425**		**70,232**		**76,110**	

*Percentages may not total 100 due to rounding.

5.4 Reports of Test Results

In addition to the statewide results reported in *Spring 2009 MCAS Tests: Summary of State Results* (www.doe.mass.edu/mcas/2009/results/summary.pdf), results for the 2009 MCAS tests were provided to individual students and their parents/guardians, schools, and districts through the following reports:

- Parent/Guardian Report
- School Report
- District Report
- Test Item Analysis Reports
  - School Test Item Analysis Roster
  - School Test Item Analysis Report Summary
  - District Test Item Analysis Report Summary

Each report was designed to disseminate information applicable only to the receiving party. Information to assist with interpreting the results was provided within each report; these reports are available at www.doe.mass.edu/mcas/results.html.

Chapter 6. STATISTICAL AND PSYCHOMETRIC SUMMARIES

Both qualitative and quantitative analyses are conducted to ensure that MCAS questions meet the standards presented in *Standards for Educational and Psychological Testing* (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999) and *Code of Fair Testing Practices in Education* (Joint Committee on Testing Practices, 1988). Three categories of statistical evaluations are performed to ensure that MCAS questions meet these standards:

- Difficulty indices
- Discrimination (item to total score correlation)
- Subgroup differences in item performance (differential item functioning, or DIF)

The results of these evaluations for the 2009 MCAS administration are presented in the related sections of this chapter. Additional information and explanation about statistical evaluation, including guidance regarding comparisons among data and an explanation of DIF procedure, is presented in the *2007 MCAS Technical Report.*

6.1 Item Difficulty and Discrimination

The difficulty of MCAS items was measured by averaging the proportion of points received for an item across all students to whom the item was administered.

Multiple-choice and short-answer items (i.e., dichotomous items) were scored "correct" or "incorrect"; for these items, the difficulty index was simply the proportion of students who answered correctly.[3]

Open-response items and English language arts (ELA) compositions (i.e., polytomous items) received scores within ranges specific to the item type.

- Open-response items were scored 0–4.
- ELA compositions were scored by two different scorers, each of whom assigned a separate score for each ELA composition scoring dimension.
  - One score for standard English conventions (1–4 points)
  - One score for topic development (1–6 points)

  The two scores were combined (summed) for each dimension, resulting in a final standard English conventions score in the range of 2–8 and a final topic development score in the range of 2–12.

For MCAS polytomous items, the item to total score correlation used as the discrimination index was the Pearson product-moment correlation; for MCAS dichotomous items, the point-biserial correlation was used.

[3] Short-answer items are used in mathematic s tests only.

6.1.1 Summary of Item Analysis Results

Summary statistics of the difficulty and discrimination indices for each item are provided in Tables 6-1 through 6-7. In general, the 2009 MCAS item difficulty and discrimination indices were within acceptable and expected ranges.

Multiple-choice items generally had a lower level of difficulty and less discrimination than constructed-response items. The lower difficulty of multiple-choice items is expected due to the opportunity of guessing correctly, and the higher discrimination of constructed-response items is expected due to the correlation of a larger range of item score points with total test scores.

Table 6-1. 2009 MCAS: Average Difficulty and Discrimination of Different Item Types—English Language Arts, Grades 3–8 and 10

		Item Type		
Grade Level	*Statistics*	*All*	*Multiple-Choice*	*Open-Response and Writing Prompt*
3	Difficulty	0.76 (0.13)	0.79 (0.10)	0.49 (0.14)
	Discrimination	0.43 (0.07)	0.42 (0.07)	0.53 (0.08)
	Number of Items	78	72	6
4	Difficulty	0.75 (0.12)	0.78 (0.08)	0.50 (0.03)
	Discrimination	0.42 (0.09)	0.39 (0.07)	0.59 (0.04)
	Number of Items	82	72	10
5	Difficulty	0.75 (0.11)	0.78 (0.08)	0.54 (0.05)
	Discrimination	0.42 (0.08)	0.40 (0.06)	0.54 (0.06)
	Number of Items	82	72	10
6	Difficulty	0.75 (0.12)	0.77 (0.10)	0.58 (0.03)
	Discrimination	0.42 (0.10)	0.40 (0.08)	0.61 (0.04)
	Number of Items	82	72	10
7	Difficulty	0.76 (0.10)	0.78 (0.08)	0.59 (0.04)
	Discrimination	0.41 (0.11)	0.37 (0.07)	0.65 (0.04)
	Number of Items	82	72	10
8	Difficulty	0.76 (0.10)	0.78 (0.09)	0.61 (0.05)
	Discrimination	0.44 (0.09)	0.42 (0.07)	0.63 (0.04)
	Number of Items	82	72	10
10	Difficulty	0.74 (0.10)	0.75 (0.10)	0.64 (0.04)
	Discrimination	0.41 (0.12)	0.37 (0.07)	0.67 (0.03)
	Number of Items	152	132	20

Numbers in parentheses denote standard deviations.

Table 6-2. 2009 MCAS: Average Difficulty and Discrimination of Different Item Types—Mathematics, Grades 3–8 and 10

		Item Type		
Grade Level	*Statistics*	*All*	*Multiple-Choice*	*Short-Answer and Open-Response*
3	Difficulty	0.77 (0.10)	0.78 (0.10)	0.74 (0.09)
	Discrimination	0.43 (0.08)	0.42 (0.07)	0.46 (0.10)
	Number of Items	70	50	20
4	Difficulty	0.72 (0.13)	0.74 (0.13)	0.67 (0.10)
	Discrimination	0.43 (0.10)	0.40 (0.07)	0.52 (0.10)
	Number of Items	78	58	20
5	Difficulty	0.71 (0.12)	0.73 (0.11)	0.64 (0.12)
	Discrimination	0.47 (0.10)	0.44 (0.08)	0.56 (0.10)
	Number of Items	78	58	20
6	Difficulty	0.74 (0.10)	0.76 (0.09)	0.66 (0.09)
	Discrimination	0.48 (0.10)	0.45 (0.08)	0.56 (0.12)
	Number of Items	78	58	20
7	Difficulty	0.70 (0.11)	0.72 (0.10)	0.66 (0.10)
	Discrimination	0.50 (0.09)	0.46 (0.05)	0.60 (0.11)
	Number of Items	78	58	20
8	Difficulty	0.64 (0.14)	0.66 (0.14)	0.60 (0.15)
	Discrimination	0.49 (0.11)	0.44 (0.08)	0.61 (0.11)
	Number of Items	78	58	20
10	Difficulty	0.57 (0.12)	0.57 (0.12)	0.58 (0.13)
	Discrimination	0.47 (0.13)	0.42 (0.09)	0.65 (0.13)
	Number of Items	122	96	26

Numbers in parentheses denote standard deviations.

Table 6-3. 2009 MCAS: Average Difficulty and Discrimination of Different Item Types—Science and Technology/Engineering, Grades 5 and 8

		Item Type		
Grade Level	*Statistics*	*All*	*Multiple-Choice*	*Open-Response*
5	Difficulty	0.70 (0.14)	0.73 (0.12)	0.51 (0.12)
	Discrimination	0.36 (0.08)	0.35 (0.06)	0.49 (0.06)
	Number of Items	78	68	10
8	Difficulty	0.64 (0.14)	0.66 (0.14)	0.51 (0.08)
	Discrimination	0.40 (0.10)	0.37 (0.07)	0.59 (0.07)
	Number of Items	78	68	10

Numbers in parentheses denote standard deviations.

Table 6-4. 2009 MCAS: Average Difficulty and Discrimination of Different Item Types—Biology, High School (Grades 9–11)

	Item Type		
Statistics	*All*	*Multiple-Choice*	*Open-Response*
Difficulty	0.64 (0.14)	0.66 (0.12)	0.46 (0.17)
Discrimination	0.43 (0.10)	0.40 (0.07)	0.64 (0.03)
Number of Items	45	40	5

Numbers in parentheses denote standard deviations.

Table 6-5. 2009 MCAS: Average Difficulty and Discrimination of Different Item Types—Chemistry, High School (Grades 9–11)

	Item Type		
Statistics	*All*	*Multiple-Choice*	*Open-Response*
Difficulty	0.56 (0.14)	0.57 (0.14)	0.46 (0.10)
Discrimination	0.45 (0.13)	0.42 (0.10)	0.69 (0.03)
Number of Items	45	40	5

Numbers in parentheses denote standard deviations.

Table 6-6. 2009 MCAS: Average Difficulty and Discrimination of Different Item Types—Introductory Physics, High School (Grades 9–11)

	Item Type		
Statistics	*All*	*Multiple-Choice*	*Open-Response*
Difficulty	0.60 (0.14)	0.62 (0.13)	0.46 (0.05)
Discrimination	0.41 (0.13)	0.38 (0.09)	0.68 (0.05)
Number of Items	45	40	5

Numbers in parentheses denote standard deviations.

Table 6-7. 2009 MCAS: Average Difficulty and Discrimination of Different Item Types—Technology/Engineering, High School (Grades 9–11)

	Item Type		
Statistics	*All*	*Multiple-Choice*	*Open-Response*
Difficulty	0.63 (0.16)	0.65 (0.16)	0.49 (0.12)
Discrimination	0.33 (0.11)	0.30 (0.09)	0.53 (0.06)
Number of Items	45	40	5

Numbers in parentheses denote standard deviations.

6.1.2 Differential Item Functioning (DIF)

The DIF procedure (Dorans & Kulick, 1986) determines the difference in item performance for groups of students matched for achievement on the total test by

- calculating average item performance for students at every total score,
- calculating an overall average,
- weighting the total score distribution so it is the same for the two groups.

For the 2009 MCAS tests, three subgroups were evaluated for DIF:

- Male/female
- White/African American
- White/Hispanic

Other race/ethnicity groups (e.g., Asian) were not analyzed using DIF procedures because limited sample sizes would have inflated the type I error rates.

Computed DIF indices theoretically range from -1.00 to 1.00 for multiple-choice items; those for constructed-response items (short-answer, open-response, and ELA composition writing prompts) are adjusted to the same scale. Dorans and Holland (1993) suggest that index values between -0.05 and 0.05, dubbed "Type A," should be considered negligible. Most 2009 MCAS items fell within

this range. The authors further suggest that any item with a value between -0.10 and -0.05 or between 0.05 and 0.10 ("Type B") could be considered low DIF, but should be inspected to ensure that no possible effect is overlooked. Finally, they recommend that any items with a value less than -.10 or greater than 0.10 ("Type C") should be considered high DIF and be carefully examined. Each 2009 MCAS test item was categorized according to these guidelines.

6.1.2.1 *How DIF Statistics Are Used*

Item statistics for new items are reviewed by the Assessment Development Committees (ADCs) and by the Bias/Sensitivity Committee. ADCs convene by content and grade to review the item statistics during their summer and fall meetings. They are given an overview of how to use the item statistics and which scores should raise red flags. Using the following item statistics—item difficulty, item discrimination, and differential item functioning—the ADCs sort new items into the following categories:

- Approved for use as a common item in subsequent test administrations;
- Edited and sent back for field-testing; and
- Rejected.

The Bias/Sensitivity Committee reviews items after they have been reviewed by the ADCs. If an item is rejected on the ADC, it is not presented to the Bias/Sensitivity Committee for review. In all cases, all committee recommendations regarding items must be reviewed and approved by the ESE.

6.1.2.2 *DIF Analysis by Test Form and Item Type*

Tables 6-8 through 6-27 show the number of items classified into each DIF category by test form and item type, i.e., multiple-choice (MC) or constructed-response (CR)—in English language arts, constructed-response includes open-response items at all grades and ELA composition writing prompts at grades 4, 7, and 10; in mathematics, constructed-response includes short-answer and open-response items at all grades.

The counts of high DIF across forms are as follows:

- Male versus female
  - 9 forms with 1 item high DIF
  - 3 forms with 2 items high DIF
  - 1 forms with 3 or more items high DIF

- White versus African American
  - 24 forms with 1 item high DIF
  - 4 forms with 2 items high DIF
  - 7 forms with 3 or more items high DIF

- White versus Hispanic
  - 19 forms with 1 item high DIF
  - 3 forms with 2 items high DIF
  - 4 forms with 3 or more items high DIF

Table 6-8. 2009 MCAS: DIF Analysis by Form—English Language Arts Grade 3

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	41	1	0	39	1	0	2	0	0	40	2	0	38	2	0	2	0	0	40	2	0	38	2	0	2	0	0
01	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0	6	3	0	5	3	0	1	0	0
02	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	7	1	1	6	1	1	1	0	0
13	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0	8	0	1	7	0	1	1	0	0
14	9	0	0	8	0	0	1	0	0	7	1	1	6	1	1	1	0	0	9	0	0	8	0	0	1	0	0

Table 6-9. 2009 MCAS: DIF Analysis by Form—English Language Arts Grade 4

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	33	7	0	29	7	0	4	0	0	32	8	0	28	8	0	4	0	0	32	8	0	28	8	0	4	0	0
01	7	2	0	6	2	0	1	0	0	8	1	0	7	1	0	1	0	0	4	4	1	3	4	1	1	0	0
03	4	1	0	3	1	0	1	0	0	4	1	0	3	1	0	1	0	0	3	2	0	3	1	0	0	1	0
05	8	1	0	7	1	0	1	0	0	6	2	1	6	1	1	0	1	0	8	1	0	7	1	0	1	0	0
08	3	1	1	2	1	1	1	0	0	2	2	1	1	2	1	1	0	0	4	1	0	3	1	0	1	0	0
10	9	0	0	8	0	0	1	0	0	7	1	1	6	1	1	1	0	0	4	4	1	3	4	1	1	0	0
12	1	3	1	0	3	1	1	0	0	3	2	0	2	2	0	1	0	0	4	1	0	3	1	0	1	0	0

Table 6-10. 2009 MCAS: DIF Analysis by Form—English Language Arts Grade 5

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	37	3	0	33	3	0	4	0	0	34	6	0	30	6	0	4	0	0	35	5	0	31	5	0	4	0	0
01	9	0	0	8	0	0	1	0	0	7	2	0	6	2	0	1	0	0	9	0	0	8	0	0	1	0	0
03	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0
05	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0	8	1	0	7	1	0	1	0	0
08	4	1	0	3	1	0	1	0	0	4	1	0	3	1	0	1	0	0	4	1	0	3	1	0	1	0	0
10	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0	7	2	0	6	2	0	1	0	0
12	2	3	0	1	3	0	1	0	0	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0

Table 6-11. 2009 MCAS: DIF Analysis by Form—English Language Arts Grade 6

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	38	2	0	34	2	0	4	0	0	35	5	0	31	5	0	4	0	0	35	5	0	31	5	0	4	0	0
01	8	1	0	8	0	0	0	1	0	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0
03	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0
05	8	1	0	7	1	0	1	0	0	6	3	0	5	3	0	1	0	0	7	1	1	6	1	1	1	0	0
08	4	1	0	3	1	0	1	0	0	4	1	0	3	1	0	1	0	0	4	0	1	3	0	1	1	0	0
10	7	2	0	6	2	0	1	0	0	5	4	0	4	4	0	1	0	0	7	1	1	6	1	1	1	0	0
12	4	1	0	3	1	0	1	0	0	3	1	1	2	1	1	1	0	0	3	2	0	2	2	0	1	0	0

Table 6-12. 2009 MCAS: DIF Analysis by Form—English Language Arts Grade 7

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	32	6	2	29	5	2	3	1	0	32	8	0	28	8	0	4	0	0	34	6	0	30	6	0	4	0	0
01	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0
03	4	1	0	3	1	0	1	0	0	3	2	0	3	1	0	0	1	0	4	1	0	3	1	0	1	0	0
05	8	1	0	7	1	0	1	0	0	5	3	1	4	3	1	1	0	0	7	2	0	6	2	0	1	0	0
08	5	0	0	4	0	0	1	0	0	2	3	0	1	3	0	1	0	0	4	1	0	3	1	0	1	0	0
10	7	2	0	6	2	0	1	0	0	5	1	3	4	1	3	1	0	0	6	3	0	5	3	0	1	0	0
12	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0

Table 6-13. 2009 MCAS: DIF Analysis by Form—English Language Arts Grade 8

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	32	7	1	30	5	1	2	2	0	32	5	3	28	5	3	4	0	0	33	4	3	29	4	3	4	0	0
01	7	2	0	6	2	0	1	0	0	9	0	0	8	0	0	1	0	0	6	3	0	5	3	0	1	0	0
03	4	1	0	4	0	0	0	1	0	4	1	0	3	1	0	1	0	0	3	2	0	2	2	0	1	0	0
05	6	2	1	6	1	1	0	1	0	6	2	1	5	2	1	1	0	0	8	1	0	7	1	0	1	0	0
08	4	1	0	4	0	0	0	1	0	3	1	1	2	1	1	1	0	0	2	3	0	1	3	0	1	0	0
10	8	1	0	8	0	0	0	1	0	7	2	0	6	2	0	1	0	0	8	1	0	7	1	0	1	0	0
12	5	0	0	4	0	0	1	0	0	3	1	1	2	1	1	1	0	0	3	2	0	2	2	0	1	0	0

Table 6-14. 2009 MCAS: DIF Analysis by Form—English Language Arts Grade 10

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	36	3	1	33	2	1	3	1	0	31	5	4	27	5	4	4	0	0	33	5	2	29	5	2	4	0	0
01	12	2	0	10	2	0	2	0	0	8	4	2	6	4	2	2	0	0	8	3	3	6	3	3	2	0	0
02	14	0	0	12	0	0	2	0	0	9	3	2	8	2	2	1	1	0	10	4	0	8	4	0	2	0	0
13	12	2	0	11	1	0	1	1	0	8	5	1	6	5	1	2	0	0	7	6	1	5	6	1	2	0	0
14	10	2	2	8	2	2	2	0	0	8	3	3	6	3	3	2	0	0	8	4	2	6	4	2	2	0	0
25	12	2	0	10	2	0	2	0	0	9	3	2	7	3	2	2	0	0	8	5	1	6	5	1	2	0	0
26	14	0	0	12	0	0	2	0	0	8	5	1	6	5	1	2	0	0	8	4	2	6	4	2	2	0	0
37	11	3	0	9	3	0	2	0	0	12	2	0	10	2	0	2	0	0	6	7	1	4	7	1	2	0	0
38	11	1	2	9	1	2	2	0	0	5	4	5	3	4	5	2	0	0	8	5	1	6	5	1	2	0	0

Table 6-15. 2009 MCAS: 08 DIF Analysis by Form—Mathematics Grade 3

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	33	2	0	23	2	0	10	0	0	30	5	0	23	2	0	7	3	0	32	3	0	24	1	0	8	2	0
1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
2	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
3	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
4	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0
5	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
6	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0
7	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
8	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
9	3	0	0	2	0	0	1	0	0	2	1	0	2	0	0	0	1	0	3	0	0	2	0	0	1	0	0
10	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
11	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	2	1	0	1	1	0	1	0	0
12	2	1	0	2	1	0	0	0	0	1	1	1	1	1	1	0	0	0	3	0	0	3	0	0	0	0	0

Table 6-16. 2009 MCAS: DIF Analysis by Form—Mathematics Grade 4

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	36	3	0	28	1	0	8	2	0	35	2	2	25	2	2	10	0	0	35	3	1	25	3	1	10	0	0
1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
2	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
3	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
4	4	0	0	3	0	0	1	0	0	3	1	0	3	0	0	0	1	0	3	0	1	3	0	0	0	0	1
5	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
6	3	0	1	2	0	1	1	0	0	3	0	1	2	0	1	1	0	0	3	1	0	2	1	0	1	0	0
7	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
8	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
9	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
10	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
11	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0
12	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
13	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	2	0	1	2	0	1	0	0	0
14	2	1	0	2	1	0	0	0	0	1	1	1	1	1	1	0	0	0	3	0	0	3	0	0	0	0	0
15	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	1	2	0	1	2	0	0	0	0

Table 6-17. 2009 MCAS: DIF Analysis by Form—Mathematics Grade 5

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	36	3	0	26	3	0	10	0	0	33	6	0	25	4	0	8	2	0	37	2	0	28	1	0	9	1	0
1	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0
2	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
3	5	0	0	4	0	0	1	0	0	4	1	0	4	0	0	0	1	0	5	0	0	4	0	0	1	0	0
4	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
5	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0	2	0	0	1	0	0	1	0	0
6	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	3	1	0	3	0	0	0	1	0
7	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
8	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	3	1	0	3	0	0	0	1	0
9	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
10	1	2	0	1	2	0	0	0	0	1	2	0	1	2	0	0	0	0	3	0	0	3	0	0	0	0	0
11	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0	2	0	0	1	0	0	1	0	0
12	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0

Table 6-18. 2009 MCAS: DIF Analysis by Form—Mathematics Grade 6

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	32	6	1	22	6	1	10	0	0	38	1	0	29	0	0	9	1	0	38	1	0	29	0	0	9	1	0
1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
2	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1
3	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
4	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0	3	1	0	3	0	0	0	1	0
5	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
6	3	0	1	2	0	1	1	0	0	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0
7	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
8	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	3	1	0	2	1	0	1	0	0
9	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0
10	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
11	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
12	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
13	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
14	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
15	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0

Table 6-19. 2009 MCAS: DIF Analysis by Form—Mathematics Grade 7

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	29	10	0	22	7	0	7	3	0	37	2	0	28	1	0	9	1	0	38	1	0	29	0	0	9	1	0
1	2	0	0	1	0	0	1	0	0	0	2	0	0	1	0	0	1	0	1	1	0	0	1	0	1	0	0
2	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
3	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
4	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
5	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
6	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
7	3	1	0	3	0	0	0	1	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
8	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
9	4	1	0	3	1	0	1	0	0	3	2	0	3	1	0	0	1	0	3	2	0	2	2	0	1	0	0
10	3	2	0	2	2	0	1	0	0	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0
11	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0
12	3	1	0	3	1	0	0	0	0	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0

Table 6-20. 2009 MCAS: DIF Analysis by Form—Mathematics Grade 8

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	35	4	0	27	2	0	8	2	0	35	4	0	27	2	0	8	2	0	38	1	0	28	1	0	10	0	0
1	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0
2	0	2	0	0	1	0	0	1	0	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0
3	1	1	0	0	1	0	1	0	0	1	1	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0
4	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0	2	0	0	1	0	0	1	0	0
5	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
6	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
7	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
8	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
9	5	0	0	4	0	0	1	0	0	3	2	0	2	2	0	1	0	0	5	0	0	4	0	0	1	0	0
10	4	1	0	3	1	0	1	0	0	3	2	0	2	2	0	1	0	0	4	1	0	3	1	0	1	0	0
11	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0	4	0	0	4	0	0	0	0	0
12	3	1	0	3	1	0	0	0	0	2	2	0	2	2	0	0	0	0	4	0	0	4	0	0	0	0	0

Table 6-21. 2009 MCAS: DIF Analysis by Form—Mathematics Grade 10

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	37	5	0	27	5	0	10	0	0	36	5	1	26	5	1	10	0	0	38	4	0	28	4	0	10	0	0
01	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0	3	1	0	3	1	0	0	0	0
02	2	0	0	2	0	0	0	0	0	1	1	0	1	1	0	0	0	0	2	0	0	2	0	0	0	0	0
03	4	0	0	4	0	0	0	0	0	1	3	0	1	3	0	0	0	0	2	1	1	2	1	1	0	0	0
04	3	0	0	1	0	0	2	0	0	3	0	0	1	0	0	2	0	0	2	0	1	0	0	1	2	0	0
05	4	0	0	3	0	0	1	0	0	1	3	0	0	3	0	1	0	0	2	1	1	1	1	1	1	0	0
06	3	0	0	2	0	0	1	0	0	0	3	0	0	2	0	0	1	0	2	1	0	2	0	0	0	1	0
07	4	0	0	3	0	0	1	0	0	2	1	1	2	0	1	0	1	0	3	1	0	2	1	0	1	0	0
08	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	1	2	0	1	1	0	0	1	0
09	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0
10	2	1	0	1	1	0	1	0	0	2	0	1	1	0	1	1	0	0	3	0	0	2	0	0	1	0	0
11	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0	4	0	0	4	0	0	0	0	0
12	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	2	1	0	1	1	0	1	0	0
13	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0	2	2	0	2	2	0	0	0	0
14	2	0	0	2	0	0	0	0	0	2	0	0	2	0	0	0	0	0	1	1	0	1	1	0	0	0	0
15	4	0	0	4	0	0	0	0	0	1	2	1	1	2	1	0	0	0	4	0	0	4	0	0	0	0	0
16	1	1	0	0	1	0	1	0	0	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0
17	3	1	0	2	1	0	1	0	0	1	2	1	0	2	1	1	0	0	2	2	0	1	2	0	1	0	0
18	1	1	0	1	1	0	0	0	0	1	1	0	1	1	0	0	0	0	2	0	0	2	0	0	0	0	0
19	3	1	0	3	0	0	0	1	0	4	0	0	3	0	0	1	0	0	3	0	1	2	0	1	1	0	0
20	2	1	0	1	1	0	1	0	0	2	1	0	1	1	0	1	0	0	2	1	0	1	1	0	1	0	0
21	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
22	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
23	4	0	0	4	0	0	0	0	0	2	2	0	2	2	0	0	0	0	2	2	0	2	2	0	0	0	0
24	2	1	0	1	1	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
26	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
28	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0

Table 6-22. 2009 MCAS: DIF Analysis by Form—Science and Technology/Engineering Grade 5

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	33	5	1	29	4	1	4	1	0	34	5	0	30	4	0	4	1	0	37	2	0	32	2	0	5	0	0
1	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
2	4	0	0	4	0	0	0	0	0	3	0	1	3	0	1	0	0	0	2	2	0	2	2	0	0	0	0
3	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
4	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
5	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
6	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	2	2	0	1	2	0	1	0	0
7	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
8	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	2	1	0	1	1	0	1	0	0
9	3	0	0	3	0	0	0	0	0	1	2	0	1	2	0	0	0	0	2	1	0	2	1	0	0	0	0
10	2	1	0	2	1	0	0	0	0	2	0	1	2	0	1	0	0	0	3	0	0	3	0	0	0	0	0
11	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0
12	3	1	0	2	1	0	1	0	0	1	3	0	0	3	0	1	0	0	3	1	0	2	1	0	1	0	0

Table 6-23. 2009 MCAS: DIF Analysis by Form—Science and Technology/Engineering Grade 8

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	38	1	0	34	0	0	4	1	0	33	6	0	29	5	0	4	1	0	36	3	0	31	3	0	5	0	0
1	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
2	4	0	0	4	0	0	0	0	0	2	2	0	2	2	0	0	0	0	4	0	0	4	0	0	0	0	0
3	1	2	0	1	1	0	0	1	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
4	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
5	2	1	0	2	1	0	0	0	0	0	3	0	0	3	0	0	0	0	2	1	0	2	1	0	0	0	0
6	4	0	0	3	0	0	1	0	0	2	1	1	1	1	1	1	0	0	3	1	0	2	1	0	1	0	0
7	3	0	0	2	0	0	1	0	0	1	2	0	1	1	0	0	1	0	3	0	0	2	0	0	1	0	0
8	2	1	0	1	1	0	1	0	0	1	1	1	0	1	1	1	0	0	1	2	0	0	2	0	1	0	0
9	3	0	0	3	0	0	0	0	0	2	0	1	2	0	1	0	0	0	1	2	0	1	2	0	0	0	0
10	0	3	0	0	3	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
11	3	0	0	3	0	0	0	0	0	1	2	0	1	2	0	0	0	0	3	0	0	3	0	0	0	0	0
12	4	0	0	3	0	0	1	0	0	2	2	0	1	2	0	1	0	0	4	0	0	3	0	0	1	0	0

Table 6-24. 2009 MCAS: DIF Analysis by Form—
High School Biology (Grades 9–11)

A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	38	7	0	33	7	0	5	0	0	41	4	0	36	4	0	5	0	0	43	2	0	38	2	0	5	0	0

Table 6-25. 2009 MCAS: DIF Analysis by Form—
High School Chemistry (Grades 9–11)
A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	37	8	0	32	8	0	5	0	0	29	12	4	24	12	4	5	0	0	30	12	3	26	11	3	4	1	0

Table 6-26. 2009 MCAS: DIF Analysis by Form—
High School Introductory Physics (Grades 9–11)
A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	41	4	0	37	3	0	4	1	0	34	11	0	30	10	0	4	1	0	41	4	0	36	4	0	5	0	0

Table 6-27. 2009 MCAS: DIF Analysis by Form—
High School Technology/Engineering (Grades 9–11)
A = negligible DIF, B = low DIF, C = high DIF

	Male/Female DIF Class									*White/African American DIF Class*									*White/Hispanic DIF Class*								
	All			*MC*			*CR*			*All*			*MC*			*CR*			*All*			*MC*			*CR*		
Form Number	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Common	26	16	3	23	14	3	3	2	0	31	7	7	27	6	7	4	1	0	29	12	4	25	11	4	4	1	0

6.1.2.3 *DIF Categorization by Gender and Item Type*

Tables 6-28 (grades 3 through 8) and 6-29 (high school) show the number of items in each of the three DIF categories that favored females or males. Only common items (on which student scores are based) were considered in these calculations.

- In grades 3 through 8 (Table 6-28), three tests each had one item (ELA grade 8, mathematics grade 6, and science and technology/engineering grade 5), and one test had two items (ELA grade 7), where there was a high level of DIF. In all cases the items identified with high DIF were MC items that favored males.
- In grade 10 ELA (Table 6-29), one MC item was identified as having high level DIF that favored males.
- In the high school technology/engineering test (also Table 6-29), three MC items were identified as having high level DIF that favored males. One should keep in mind that for this particular test there were fewer examinees and an increased likelihood that the items identified could be a statistical artifact (i.e., Type I error).

Table 6-28. 2009 MCAS: DIF Categorization of Common Items by Gender and Item Type—Grades 3–8

MC = multiple-choice, OR = open-response and writing prompt

			Negligible DIF				*Low DIF*				*High DIF*			
Content Area	*Grade Level*	*Item Type*	*Favor Female*	*Favor Male*	*Number*	*%*	*Favor Female*	*Favor Male*	*Number*	*%*	*Favor Female*	*Favor Male*	*Number*	*%*
English Language Arts	3	MC	28	11	39	98	0	1	1	3	0	0	0	0
		OR	2	0	2	100	0	0	0	0	0	0	0	0
	4	MC	12	17	29	81	0	7	7	19	0	0	0	0
		OR	5	1	6	100	0	0	0	0	0	0	0	0
	5	MC	17	16	33	92	0	3	3	8	0	0	0	0
		OR	4	0	4	100	0	0	0	0	0	0	0	0
	6	MC	14	20	34	94	1	1	2	6	0	0	0	0
		OR	4	0	4	100	0	0	0	0	0	0	0	0
	7	MC	13	16	29	81	0	5	5	14	0	2	2	6
		OR	5	0	5	83	1	0	1	17	0	0	0	0
	8	MC	14	16	30	83	0	5	5	14	0	1	1	3
		OR	2	0	2	50	2	0	2	50	0	0	0	0
Mathematics	3	MC	12	11	23	92	0	2	2	8	0	0	0	0
		OR	9	1	10	100	0	0	0	0	0	0	0	0
	4	MC	18	10	28	97	0	1	1	3	0	0	0	0
		OR	7	1	8	80	0	2	2	20	0	0	0	0
	5	MC	16	10	26	90	1	2	3	10	0	0	0	0
		OR	8	2	10	100	0	0	0	0	0	0	0	0
	6	MC	12	10	22	76	2	4	6	21	0	1	1	3
		OR	9	1	10	100	0	0	0	0	0	0	0	0
	7	MC	12	10	22	76	2	5	7	24	0	0	0	0
		OR	5	2	7	70	1	2	3	30	0	0	0	0
	8	MC	20	7	27	93	0	2	2	7	0	0	0	0
		OR	5	3	8	80	0	2	2	20	0	0	0	0
Science and Technology/ Engineering	5	MC	10	19	29	85	2	2	4	12	0	1	1	3
		OR	2	2	4	80	1	0	1	20	0	0	0	0
	8	MC	12	22	34	100	0	0	0	0	0	0	0	0
		OR	3	1	4	80	1	0	1	20	0	0	0	0

Table 6-29. 2009 MCAS: Categorization of Common Items by Gender and Item Type—High School

MC = multiple-choice, OR = open-response

			Negligible DIF				*Low DIF*				*High DIF*			
Content Area	*Grade Level*	*Item Type*	*Favor Female*	*Favor Male*	*Number*	*%*	*Favor Female*	*Favor Male*	*Number*	*%*	*Favor Female*	*Favor Male*	*Number*	*%*
ELA	10	MC	8	25	33	92	0	2	2	6	0	1	1	3
		OR	5	0	5	83	1	0	1	17	0	0	0	0
Mathematics		MC	12	15	27	84	1	4	5	16	0	0	0	0
		OR	6	4	10	100	0	0	0	0	0	0	0	0
Biology	9-11	MC	17	16	33	83	2	5	7	18	0	0	0	0
		OR	5	0	5	100	0	0	0	0	0	0	0	0
Chemistry		MC	16	16	32	80	2	6	8	20	0	0	0	0
		OR	5	0	5	100	0	0	0	0	0	0	0	0
Introductory Physics		MC	18	19	37	93	0	3	3	8	0	0	0	0
		OR	4	0	4	80	1	0	1	20	0	0	0	0
Technology/ Engineering		MC	10	13	23	58	2	12	14	35	0	3	3	8
		OR	3	0	3	60	2	0	2	40	0	0	0	0

6.1.2.4 *DIF Categorization by Ethnicity and Item Type*

Tables 6-30 through 6-33 show the number of items in each of the three DIF categories that favored various ethnicity groups. The only ethnicity groups considered for this analysis were African American (Tables 6-30 and 6-31) and Hispanic (Tables 6-32 and 6-33). Other ethnicity groups did not have the necessary sample size to support these analyses. Additionally, only common items (on which student scores are based) were considered in these calculations.

For the African American – White DIF statistics (Tables 6-30 and 6-31):

- In grade 8 ELA, three MC items had high level DIF that favored the White student subgroup.
- In grade 4 mathematics, two MC items had high level DIF that favored the White student subgroup.
- In grade 10 ELA, four MC items had high level DIF that favored the White student subgroup.
- In grade 10 mathematics, one MC item had high level DIF that favored the White student subgroup.
- In high school chemistry, four MC items had high level DIF; three favored the White student subgroup while the fourth favored the African American student subgroup.
- In high school technology/engineering, seven MC items had high level DIF; six favored the White student subgroup while one favored the African American student subgroup.

For the Hispanic – White DIF statistics (Tables 6-32 and 6-33):

- In grade 8 ELA, three MC items had high level DIF that favored the White student subgroup.
- In grade 4 mathematics, one MC item had high level DIF that favored the White student subgroup.
- In grade 10 ELA, two MC items had high level DIF that favored the White student subgroup.
- In high school chemistry, three MC items had high level DIF that favored the White student subgroup.
- In high school technology/engineering, four MC items had high level DIF that favored the White student subgroup.

Table 6-30. 2009 MCAS: DIF Categorization of Common Items by Ethnicity and Item Type—Grades 3–8

MC = multiple-choice, OR = open-response and writing prompt

			Negligible DIF				*Low DIF*				*High DIF*			
Content Area	*Grade Level*	*Item Type*	*African American*	*White*	*Number*	*%*	*African American*	*White*	*Number*	*%*	*African American*	*White*	*Number*	*%*
English Language Arts	3	MC	12	26	38	95	0	2	2	5	0	0	0	0
		OR	2	0	2	100	0	0	0	0	0	0	0	0
	4	MC	3	25	28	78	0	8	8	22	0	0	0	0
		OR	6	0	6	100	0	0	0	0	0	0	0	0
	5	MC	10	20	30	83	0	6	6	17	0	0	0	0
		OR	4	0	4	100	0	0	0	0	0	0	0	0
	6	MC	8	23	31	86	0	5	5	14	0	0	0	0
		OR	4	0	4	100	0	0	0	0	0	0	0	0
	7	MC	7	21	28	78	1	7	8	22	0	0	0	0
		OR	4	2	6	100	0	0	0	0	0	0	0	0
	8	MC	11	17	28	78	0	5	5	14	0	3	3	8
		OR	4	0	4	100	0	0	0	0	0	0	0	0
Mathematics	3	MC	12	11	23	92	0	2	2	8	0	0	0	0
		OR	3	4	7	70	0	3	3	30	0	0	0	0
	4	MC	10	15	25	86	0	2	2	7	0	2	2	7
		OR	5	5	10	100	0	0	0	0	0	0	0	0
	5	MC	12	13	25	86	2	2	4	14	0	0	0	0
		OR	3	5	8	80	0	2	2	20	0	0	0	0
	6	MC	12	17	29	100	0	0	0	0	0	0	0	0
		OR	2	7	9	90	0	1	1	10	0	0	0	0
	7	MC	13	15	28	97	0	1	1	3	0	0	0	0
		OR	3	6	9	90	0	1	1	10	0	0	0	0
	8	MC	11	16	27	93	1	1	2	7	0	0	0	0
		OR	2	6	8	80	1	1	2	20	0	0	0	0
Science and Technology/ Engineering	5	MC	9	21	30	88	0	4	4	12	0	0	0	0
		OR	0	4	4	80	0	1	1	20	0	0	0	0
	8	MC	8	21	29	85	0	5	5	15	0	0	0	0
		OR	2	2	4	80	0	1	1	20	0	0	0	0

Table 6-31. 2009 MCAS: Categorization of Common Items by Ethnicity and Item Type—High School

MC = multiple-choice, OR = open-response

			Negligible DIF				*Low DIF*				*High DIF*			
Content Area	*Grade Level*	*Item Type*	*African American*	*White*	*Number*	*%*	*African American*	*White*	*Number*	*%*	*African American*	*White*	*Number*	*%*
ELA	10	MC	11	16	27	75	0	5	5	14	0	4	4	11
		OR	5	1	6	100	0	0	0	0	0	0	0	0
Mathematics		MC	13	13	26	81	0	5	5	16	0	1	1	3
		OR	5	5	10	100	0	0	0	0	0	0	0	0
Biology	9-11	MC	16	20	36	90	0	4	4	10	0	0	0	0
		OR	0	5	5	100	0	0	0	0	0	0	0	0
Chemistry		MC	15	9	24	60	3	9	12	30	1	3	4	10
		OR	2	3	5	100	0	0	0	0	0	0	0	0
Introductory Physics		MC	14	16	30	75	3	7	10	25	0	0	0	0
		OR	1	3	4	80	0	1	1	20	0	0	0	0
Technology/ Engineering		MC	13	14	27	68	1	5	6	15	1	6	7	18
		OR	3	1	4	80	1	0	1	20	0	0	0	0

Table 6-32. 2009 MCAS: DIF Categorization of Common Items by Ethnicity and Item Type—Grades 3–8

MC = multiple-choice, OR = open-response and writing prompt

			Negligible DIF				*Low DIF*				*High DIF*			
Content Area	*Grade Level*	*Item Type*	*Hispanic*	*White*	*Number*	*%*	*Hispanic*	*White*	*Number*	*%*	*Hispanic*	*White*	*Number*	*%*
English Language Arts	3	MC	12	26	38	95	0	2	2	5	0	0	0	0
		OR	2	0	2	100	0	0	0	0	0	0	0	0
	4	MC	4	24	28	78	0	8	8	22	0	0	0	0
		OR	6	0	6	100	0	0	0	0	0	0	0	0
	5	MC	6	25	31	86	0	5	5	14	0	0	0	0
		OR	4	0	4	100	0	0	0	0	0	0	0	0
	6	MC	3	28	31	86	0	5	5	14	0	0	0	0
		OR	4	0	4	100	0	0	0	0	0	0	0	0
	7	MC	9	21	30	83	0	6	6	17	0	0	0	0
		OR	4	2	6	100	0	0	0	0	0	0	0	0
	8	MC	11	18	29	81	0	4	4	11	0	3	3	8
		OR	4	0	4	100	0	0	0	0	0	0	0	0
Mathematics	3	MC	11	13	24	96	0	1	1	4	0	0	0	0
		OR	5	3	8	80	0	2	2	20	0	0	0	0
	4	MC	13	12	25	86	0	3	3	10	0	1	1	3
		OR	4	6	10	100	0	0	0	0	0	0	0	0
	5	MC	14	14	28	97	0	1	1	3	0	0	0	0
		OR	3	6	9	90	0	1	1	10	0	0	0	0
	6	MC	10	19	29	100	0	0	0	0	0	0	0	0
		OR	3	6	9	90	0	1	1	10	0	0	0	0
	7	MC	12	17	29	100	0	0	0	0	0	0	0	0
		OR	1	8	9	90	0	1	1	10	0	0	0	0
	8	MC	8	20	28	97	0	1	1	3	0	0	0	0
		OR	5	5	10	100	0	0	0	0	0	0	0	0
Science and Technology/ Engineering	5	MC	10	22	32	94	0	2	2	6	0	0	0	0
		OR	0	5	5	100	0	0	0	0	0	0	0	0
	8	MC	9	22	31	91	0	3	3	9	0	0	0	0
		OR	0	5	5	100	0	0	0	0	0	0	0	0

Table 6-33. 2009 MCAS: Categorization of Common Items by Ethnicity and Item Type—High School

MC = multiple-choice, OR = open-response

			Negligible DIF				*Low DIF*				*High DIF*			
Content Area	*Grade Level*	*Item Type*	*Hispanic*	*White*	*Number*	*%*	*Hispanic*	*White*	*Number*	*%*	*Hispanic*	*White*	*Number*	*%*
ELA	10	MC	10	19	29	81	0	5	5	14	0	2	2	6
		OR	4	2	6	100	0	0	0	0	0	0	0	0
Mathematics		MC	13	15	28	88	0	4	4	13	0	0	0	0
		OR	4	6	10	100	0	0	0	0	0	0	0	0
Biology	9-11	MC	15	23	38	95	0	2	2	5	0	0	0	0
		OR	0	5	5	100	0	0	0	0	0	0	0	0
Chemistry		MC	11	15	26	65	3	8	11	28	0	3	3	8
		OR	2	2	4	80	0	1	1	20	0	0	0	0
Introductory Physics		MC	19	17	36	90	0	4	4	10	0	0	0	0
		OR	0	5	5	100	0	0	0	0	0	0	0	0
Technology/ Engineering		MC	10	15	25	63	3	8	11	28	0	4	4	10
		OR	3	1	4	80	0	1	1	20	0	0	0	0

6.2 Item Response Theory (IRT) Analyses

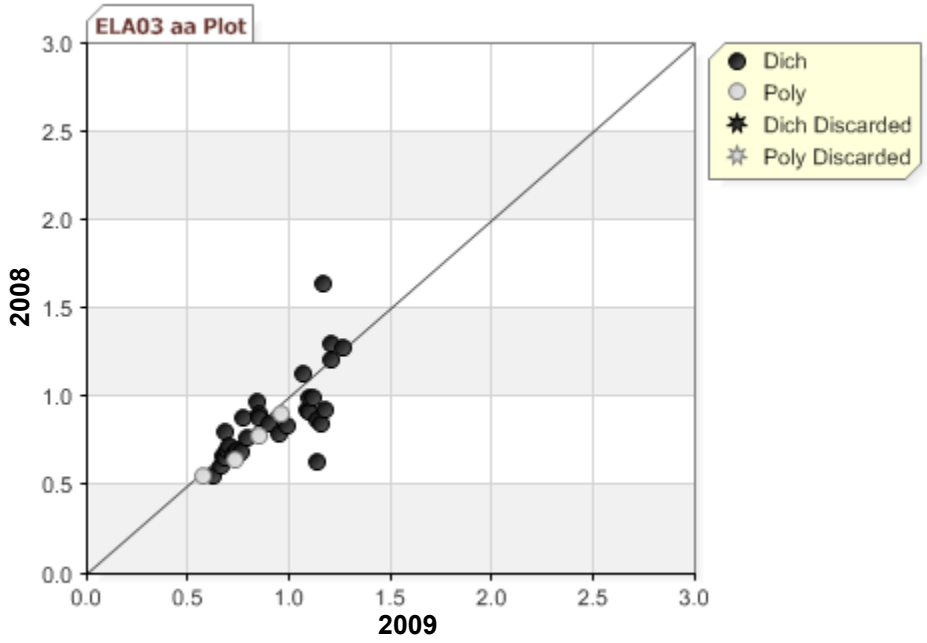
For the 2009 MCAS tests, the three-parameter logistic (3PL) model was used for dichotomous items. The graded-response model (GRM) was used for polytomous items. Detailed definitions of the 3PL model and the GRM are presented in the *2007 MCAS Technical Report*, along with descriptions of how item category characteristic curves (ICCCs), item characteristic curves (ICCs), and test characteristic curves (TCCs) are computed.

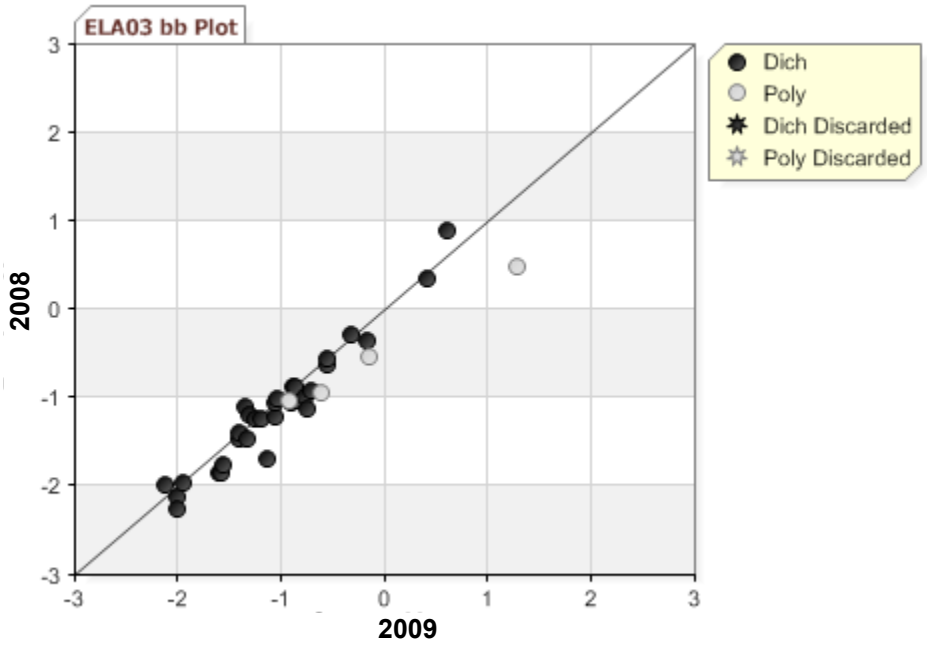
Figures 6-1 through 6-20 present, for each MCAS grade and content area test combination, a comparison between the 2009 and 2008 discrimination and difficulty indices (a/a and b/b plots), with the delta plot. The 2009 TCC and test information (TIF) and the student scaled score cumulative distribution are also provided with their 2008 counterparts, when applicable.

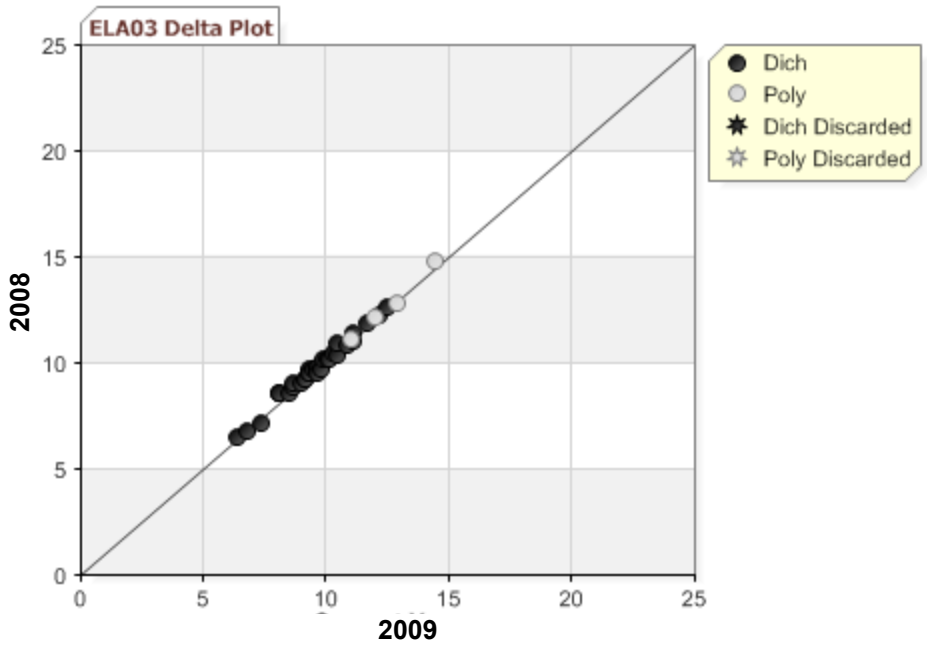
Note that for grade 10 the assessments are pre-equated. Thus, the various plots (e.g., a/a, b/b, and delta) are developed to ensure data accuracy, and not to evaluate the equating per se. That is, these plots are used to ensure that proper bookkeeping has been done and that all item parameters have been properly accounted for. Additionally, because the a/a and b/b plots are constructed using pre-equated item parameters, these plots can be used to evaluate item-model fit and to determine if any estimated parameters need to be further scrutinized by psychometricians.

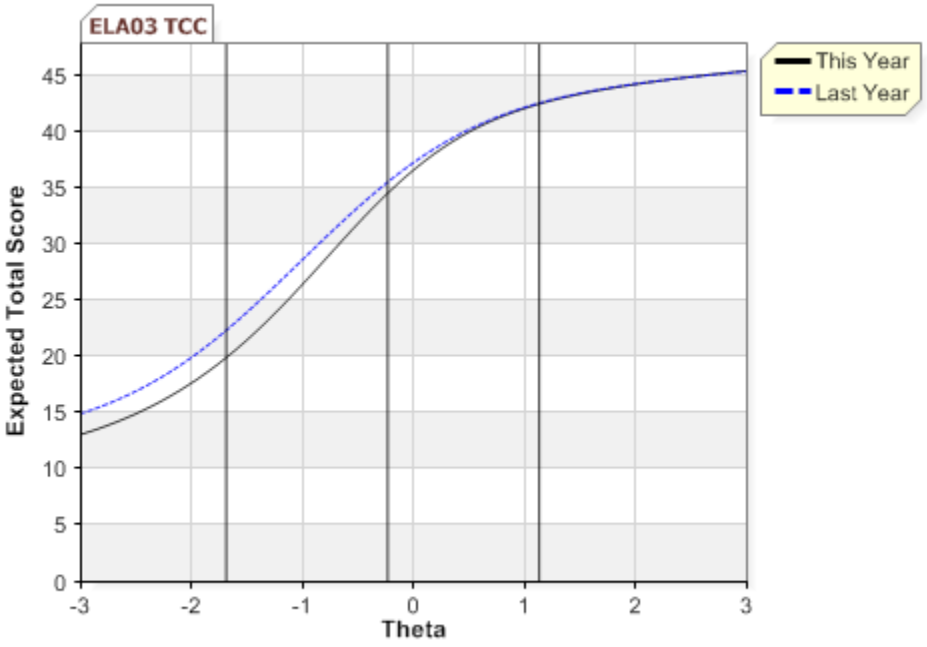
Information curves that are developed during the equating phase are also used to guide test development and form-construction activities. These curves can be used to determine if item dispersion across the performance continuum needs to change to ensure that performance across the entire continuum (with particular emphasis being made at the cutscores) is being adequately measured. Test developers work with psychometricians so that any changes to item dispersion happen gradually to ensure that equating from one year to the next is not compromised.

Figure 6-1. 2009 MCAS: IRT Statistics—English Language Arts Grade 3






ELA03 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


ELA03 TCC
This Year
Last Year
Expected Total Score
Theta
0
5
10
15
20
25
30
35
40
45
-3
-2
-1
0
1
2
3

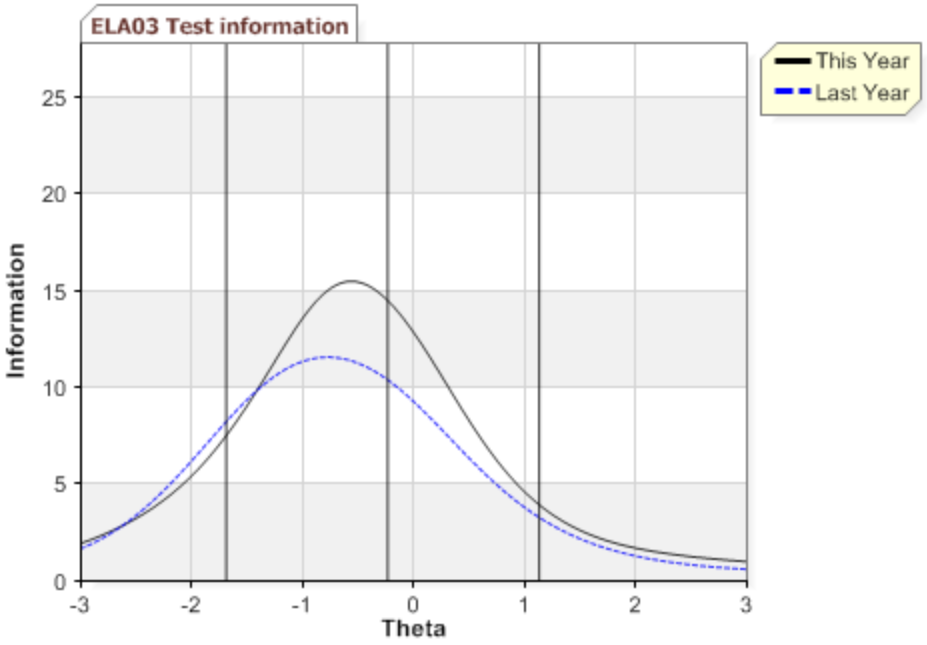
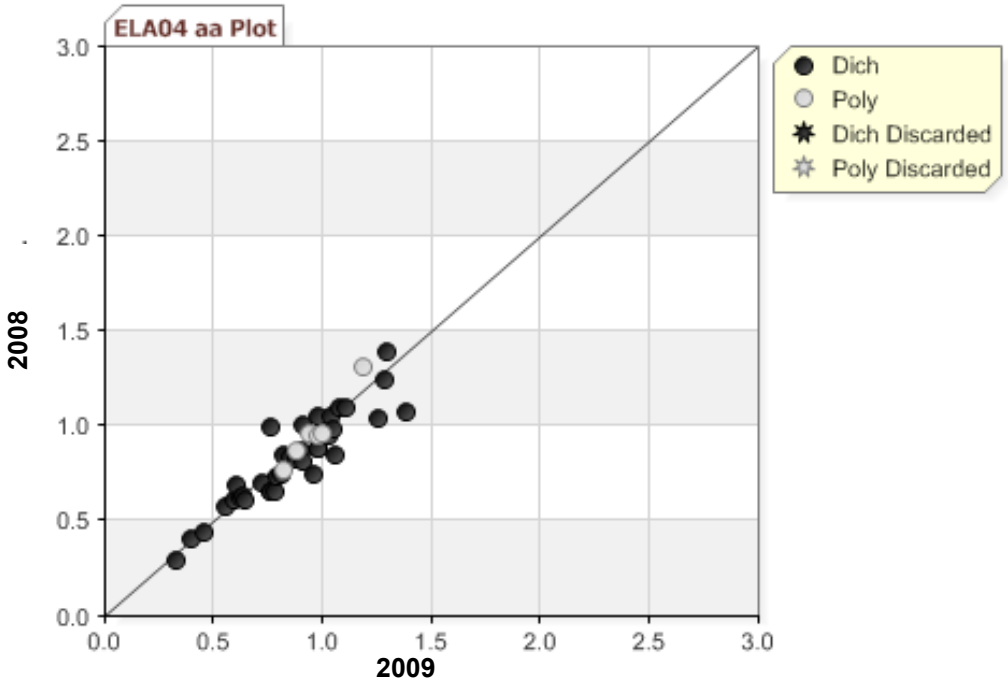
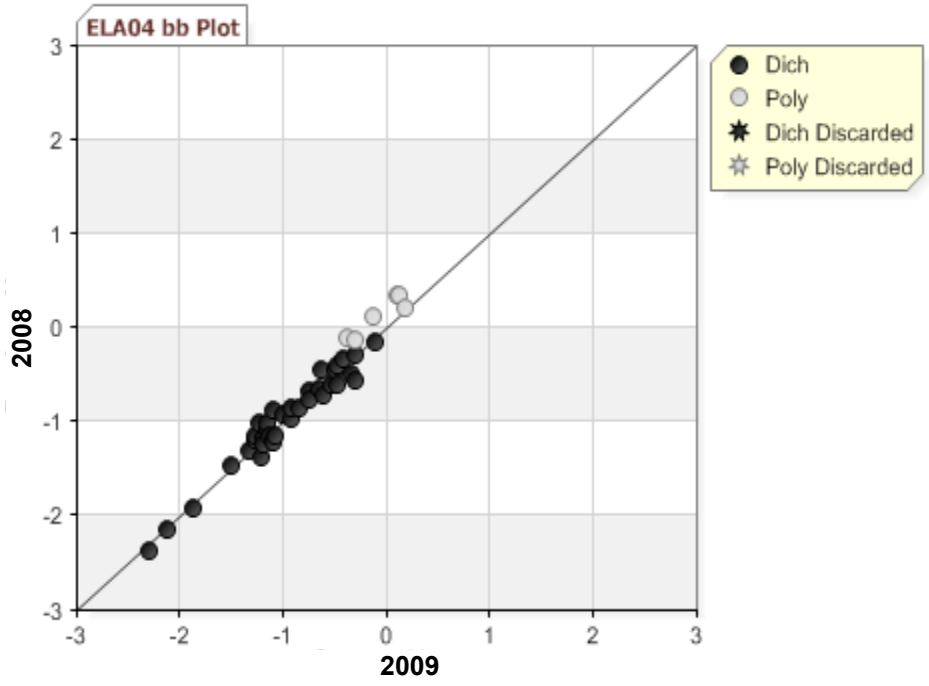
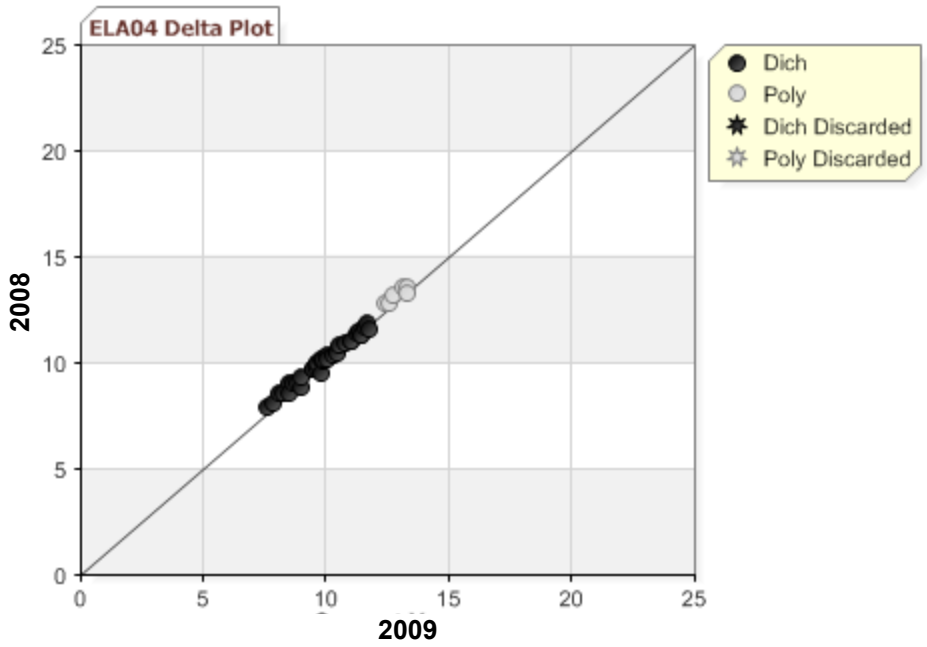
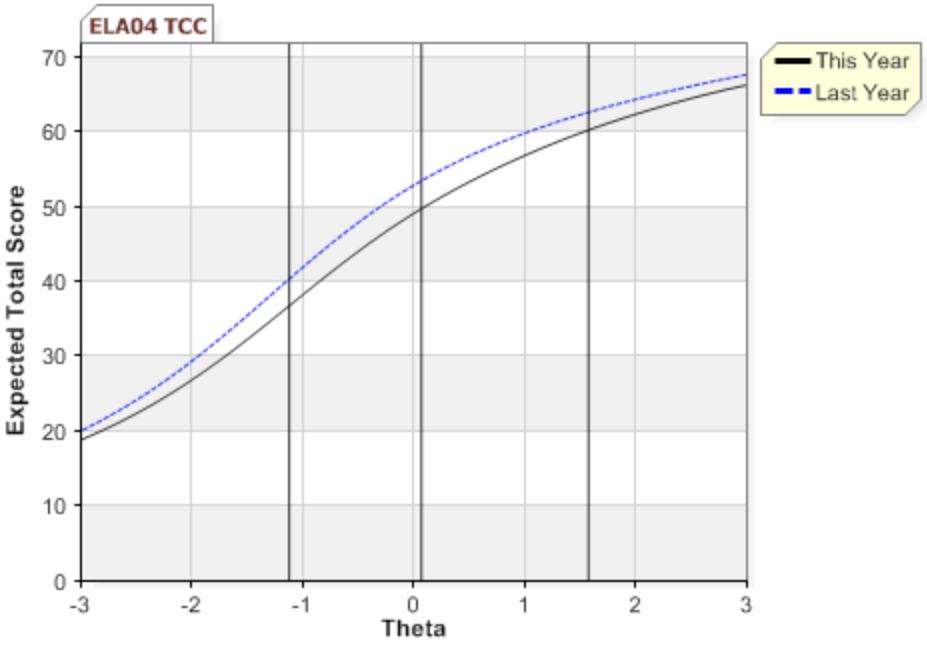

ELA03 Test information
This Year
Last Year
Information
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

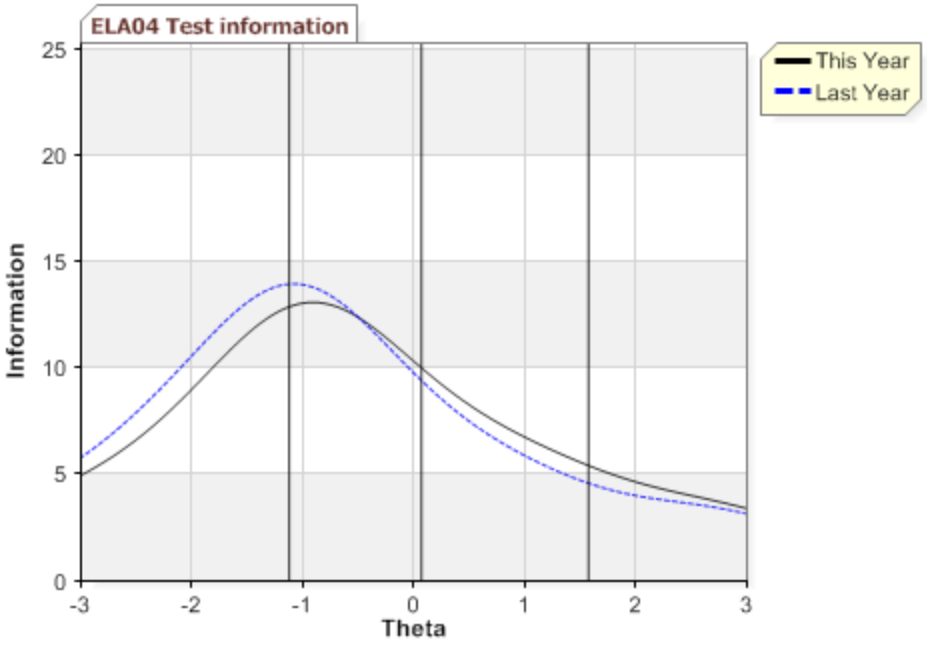
Figure 6-2. 2009 MCAS: IRT Statistics—English Language Arts Grade 4






ELA04 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


ELA04 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
60
70
-3
-2
-1
0
1
2
3


ELA04 Test information
This Year
Last Year
Information
Theta
25
20
15
10
5
0
-3
-2
-1
0
1
2
3

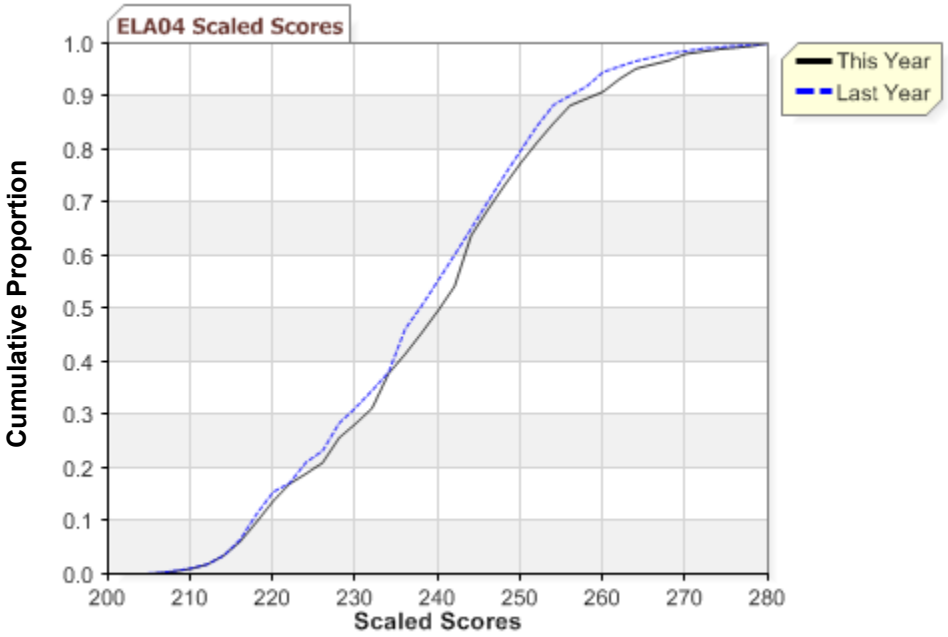
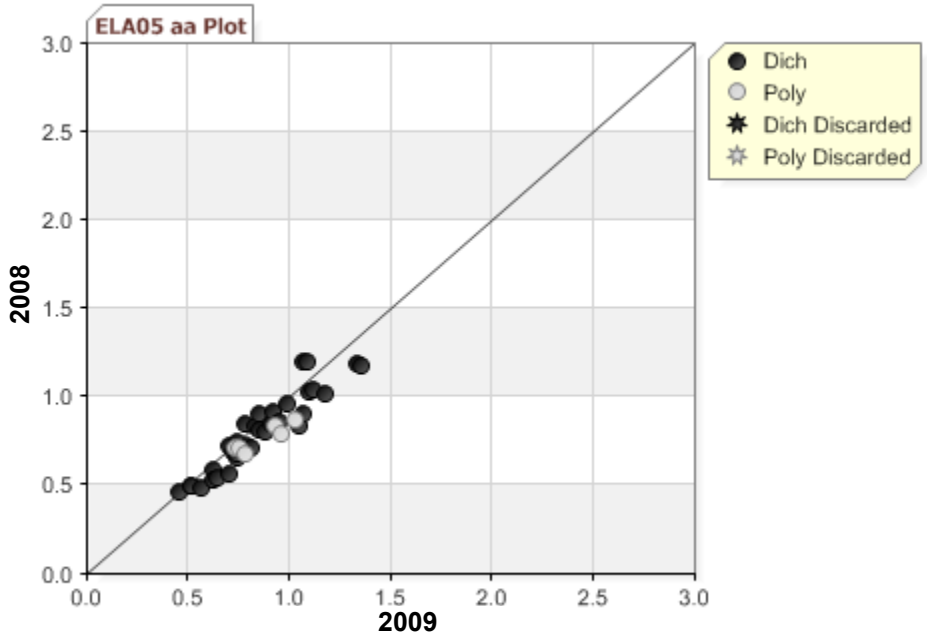
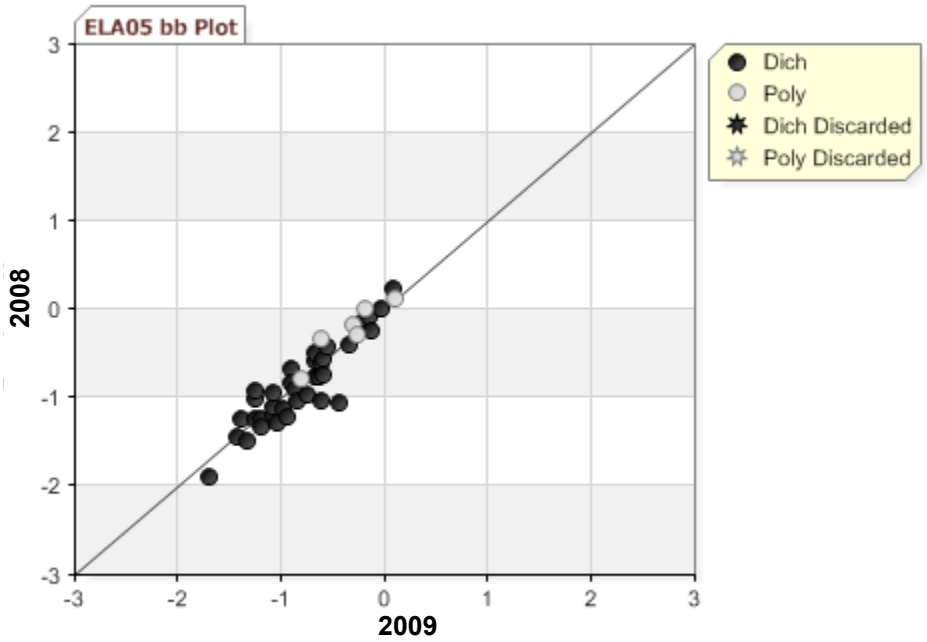
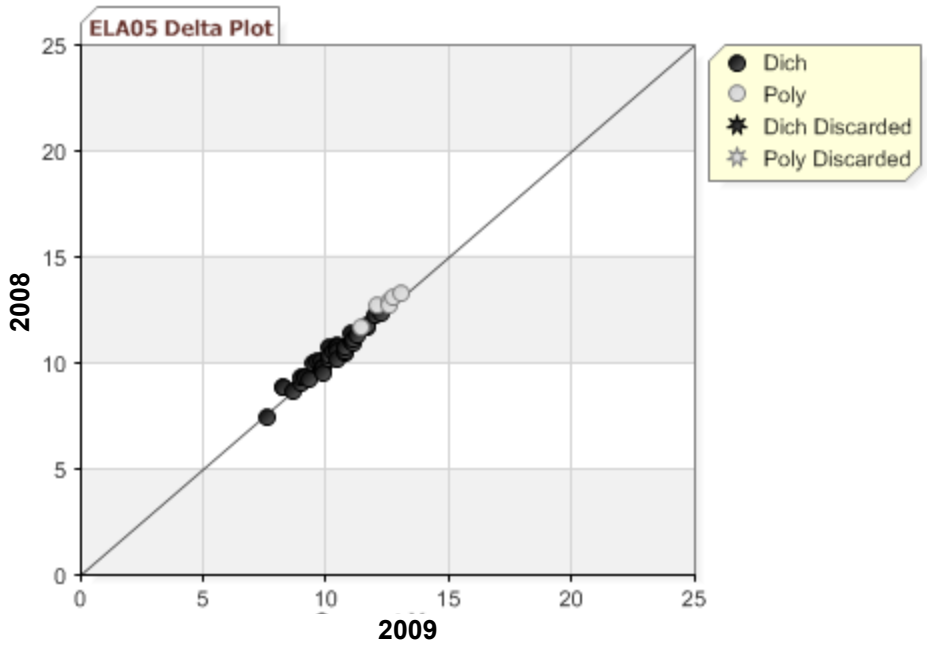
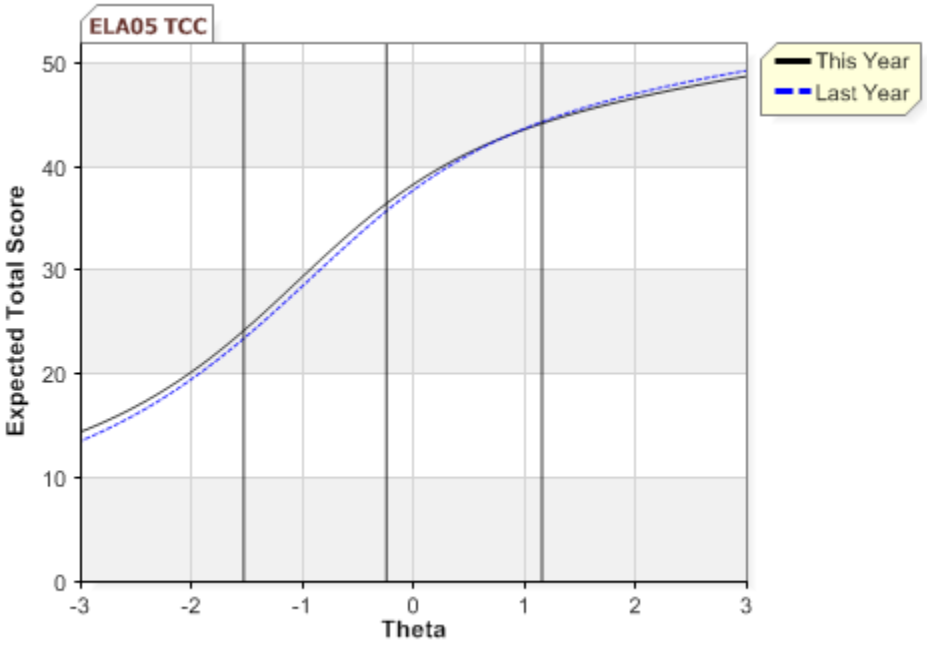

ELA04 Scaled Scores
This Year
Last Year
Cumulative Proportion
Scaled Scores
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280

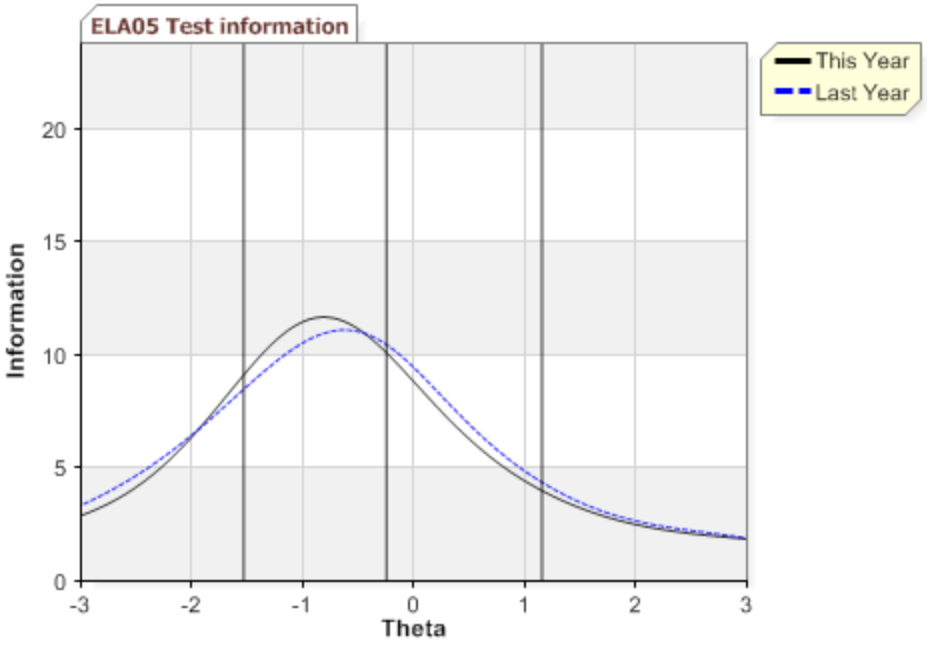
Figure 6-3. 2009 MCAS: IRT Statistics—English Language Arts Grade 5






ELA05 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


ELA05 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


ELA05 Test information
This Year
Last Year
Information
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

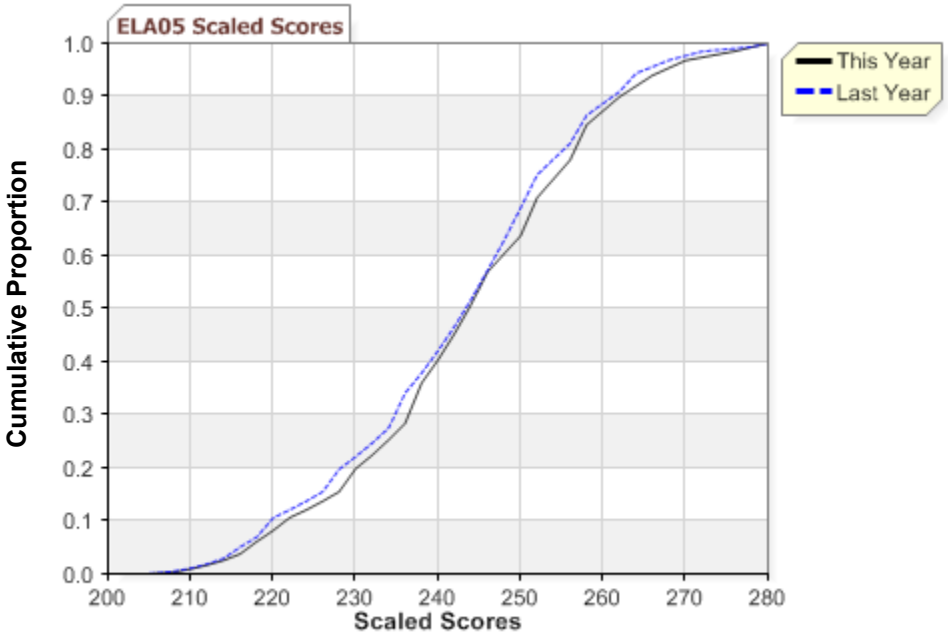
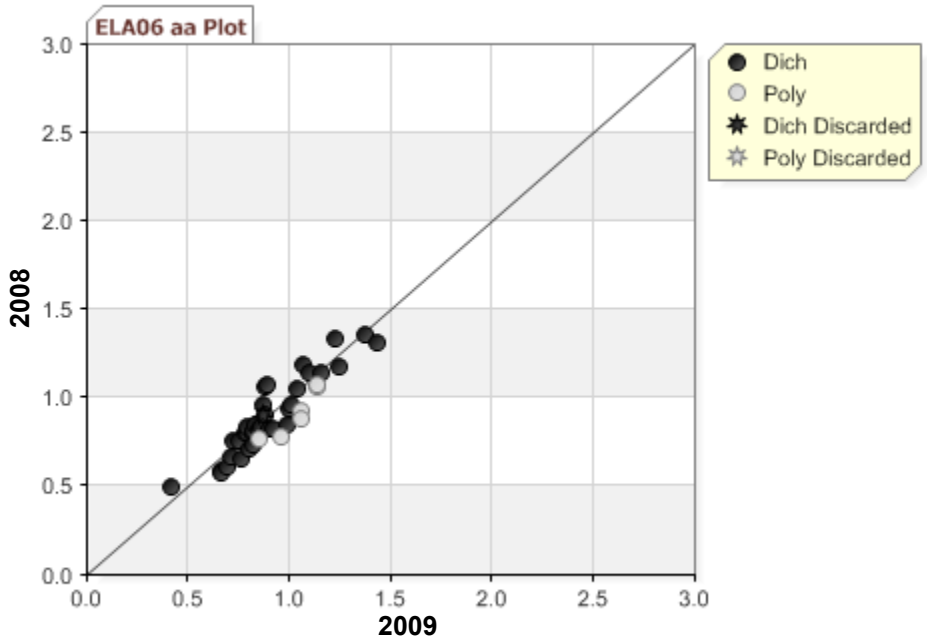
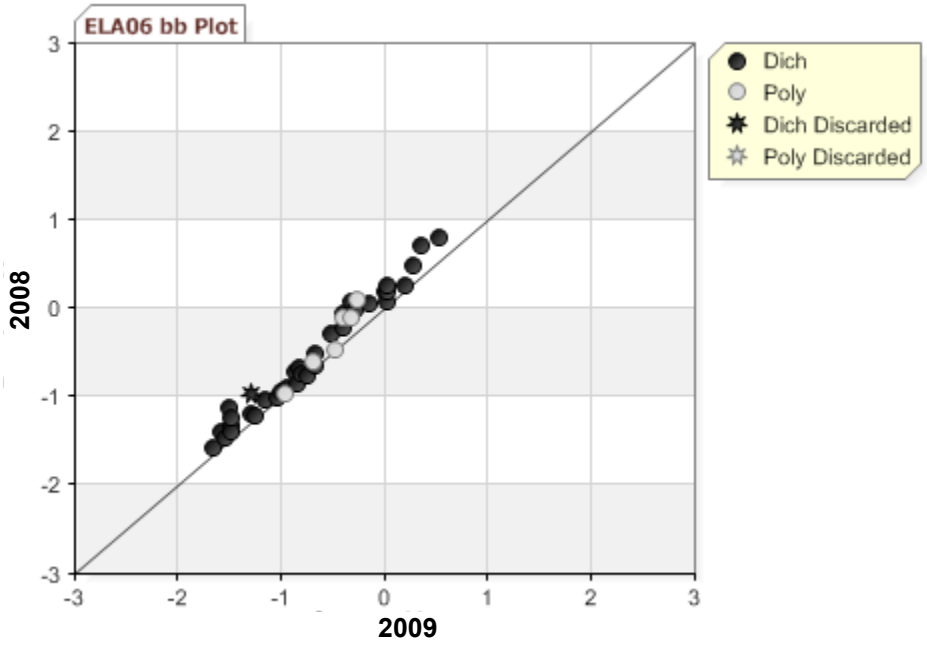
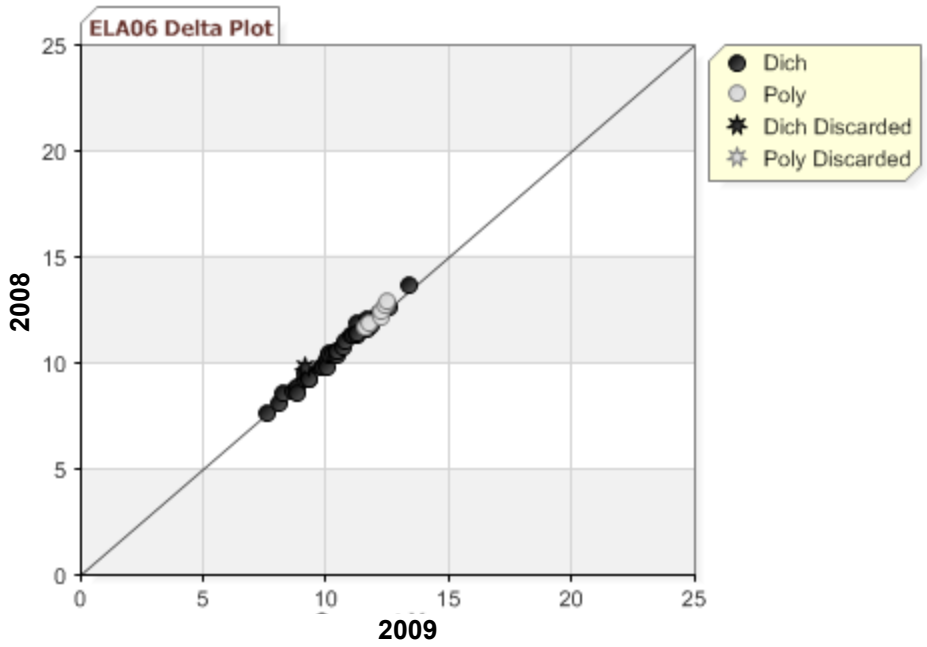
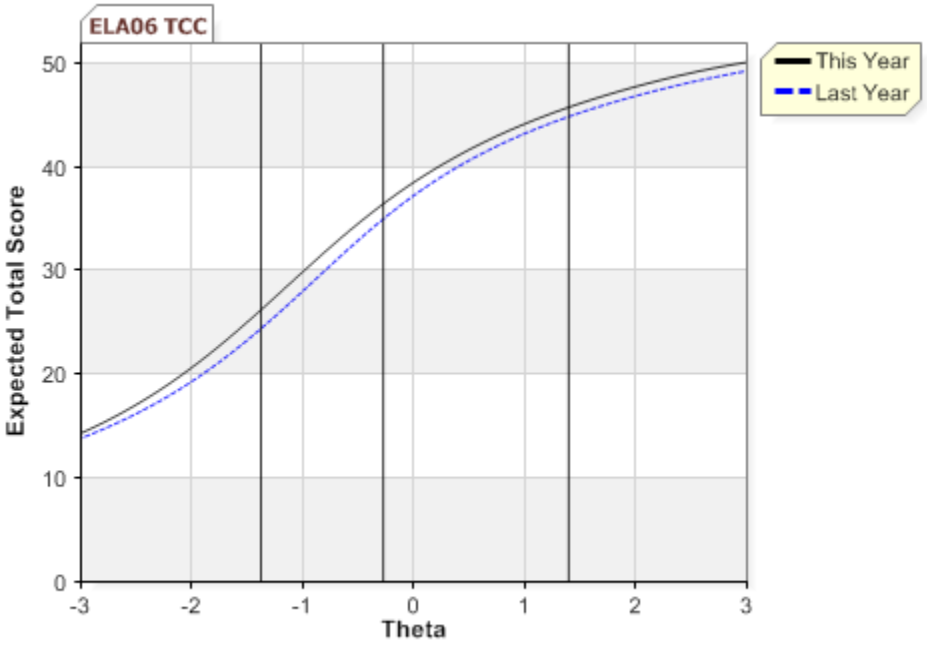

ELA05 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

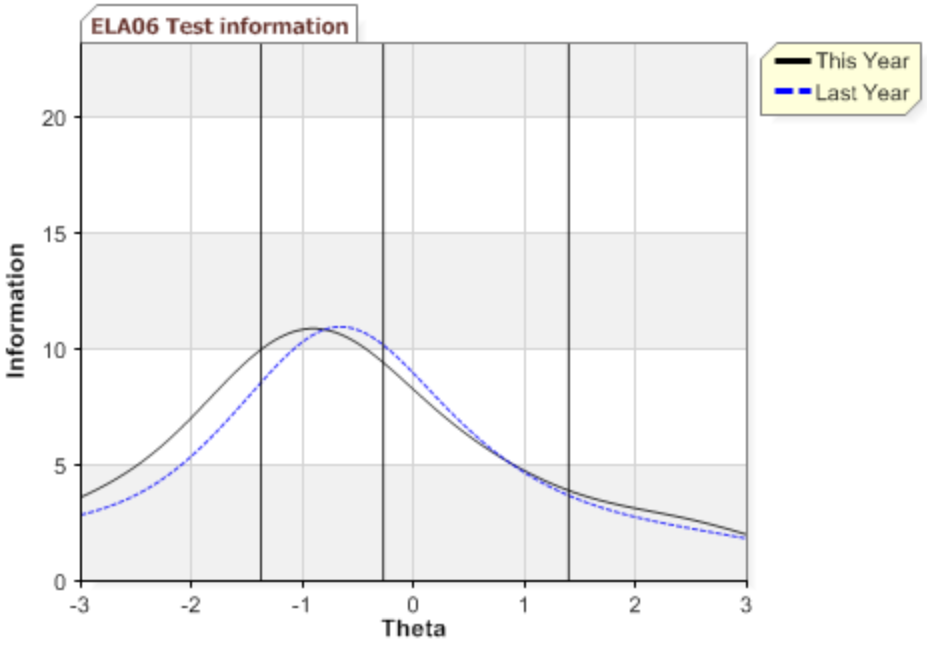
Figure 6-4. 2009 MCAS: IRT Statistics—English Language Arts Grade 6






ELA06 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


ELA06 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


ELA06 Test information
This Year
Last Year
Information
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

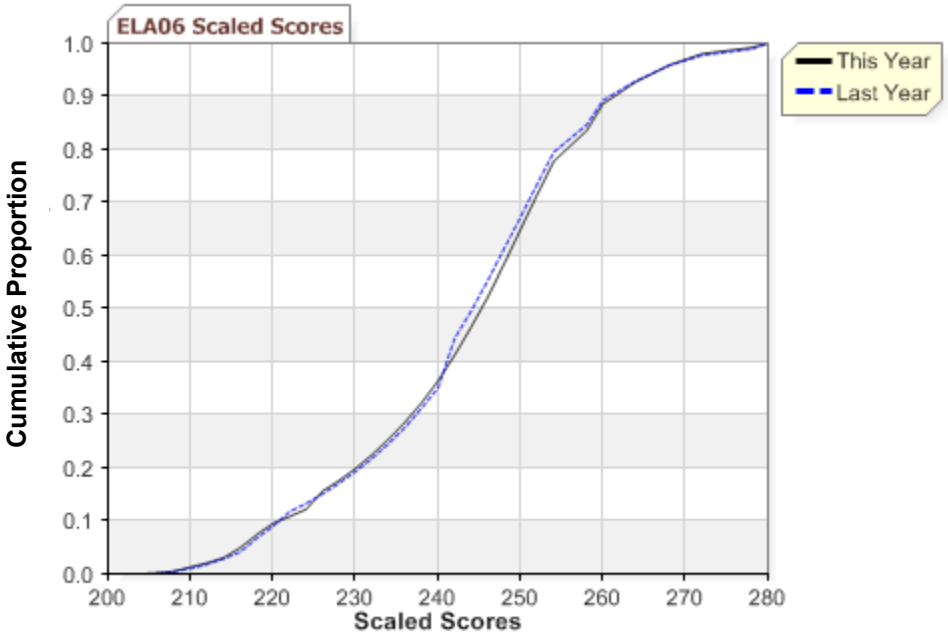
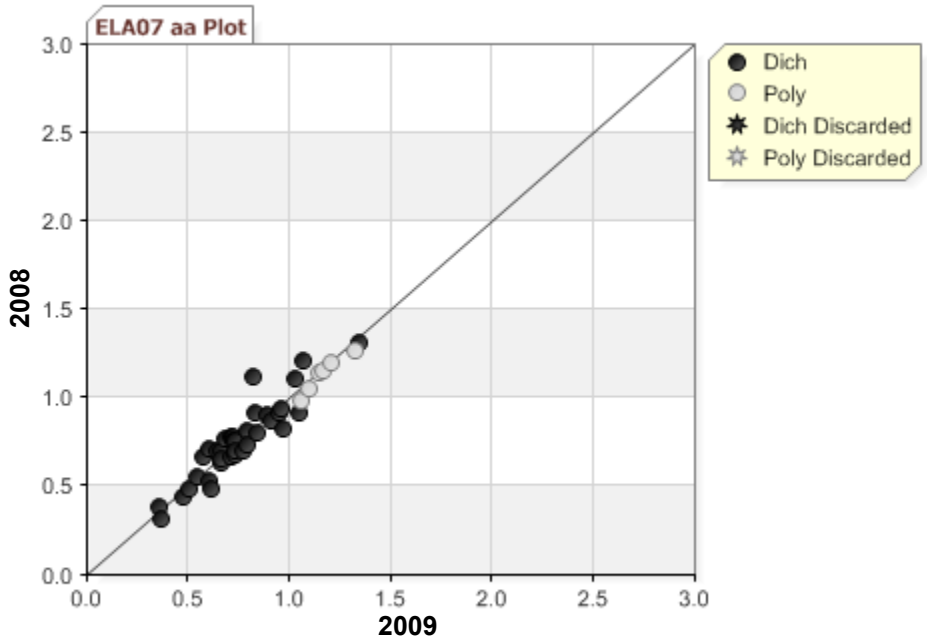
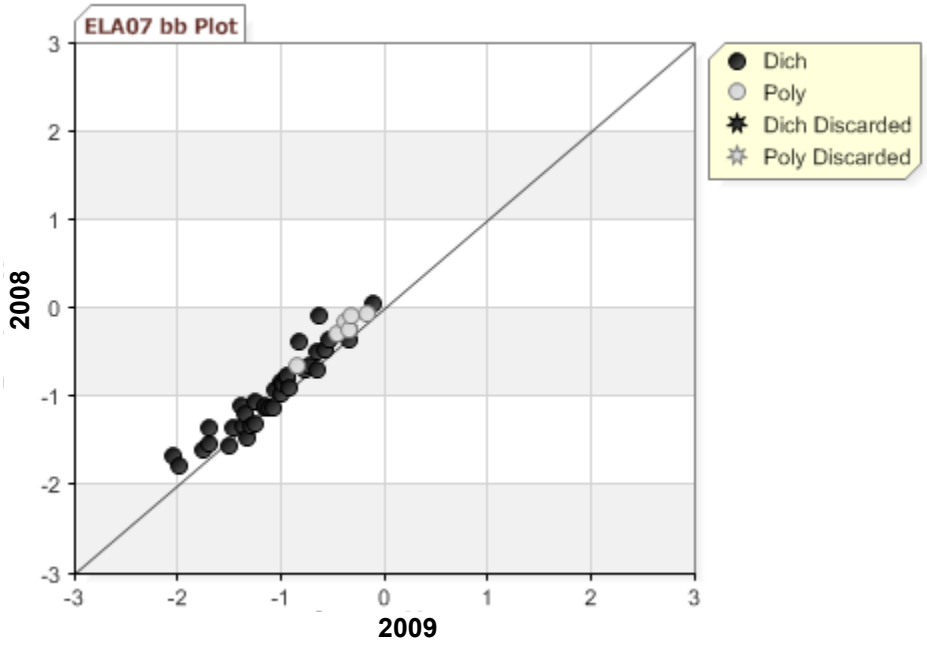
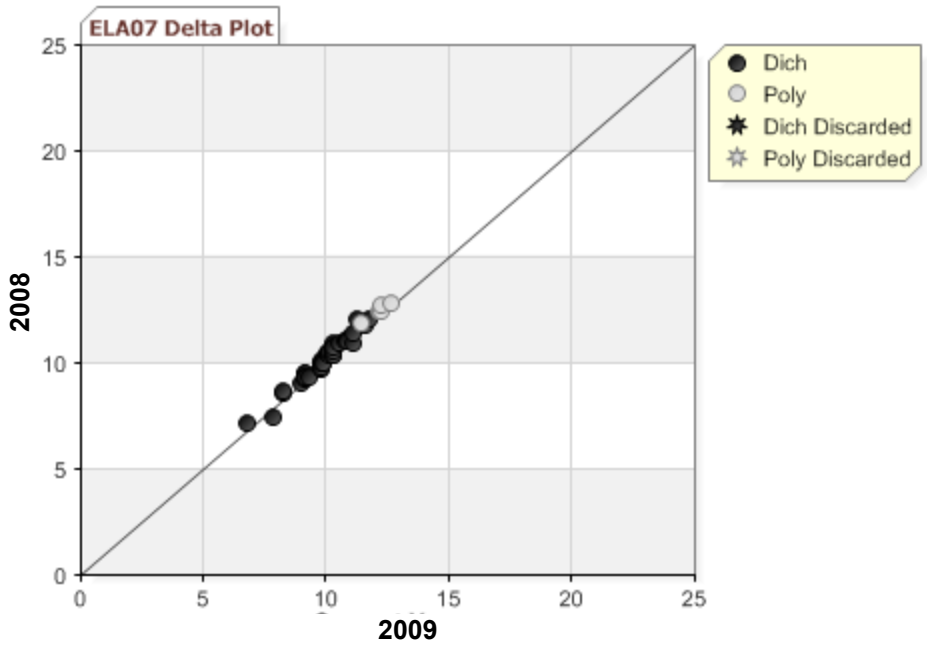
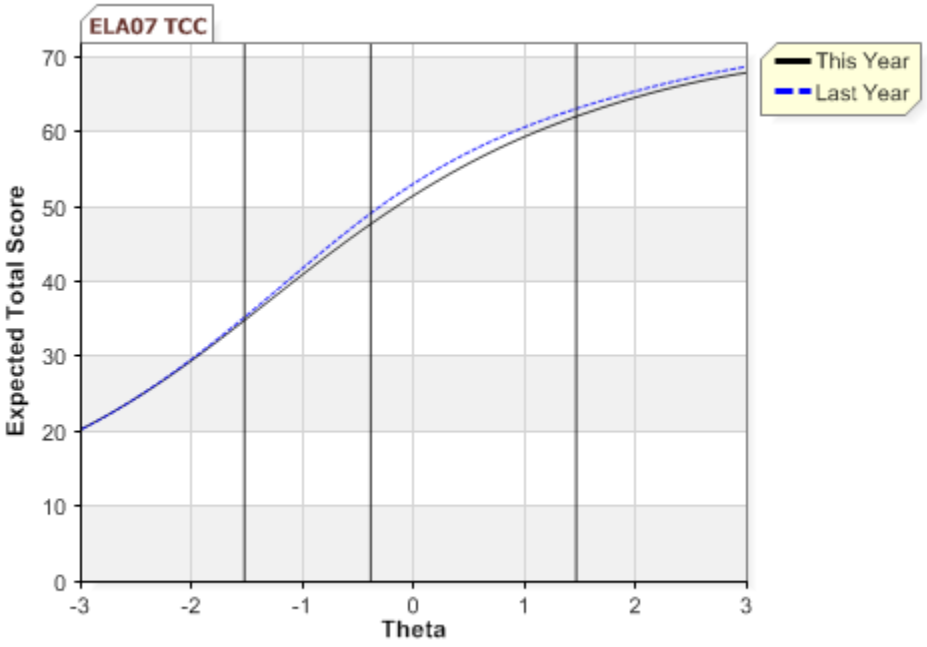

ELA06 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

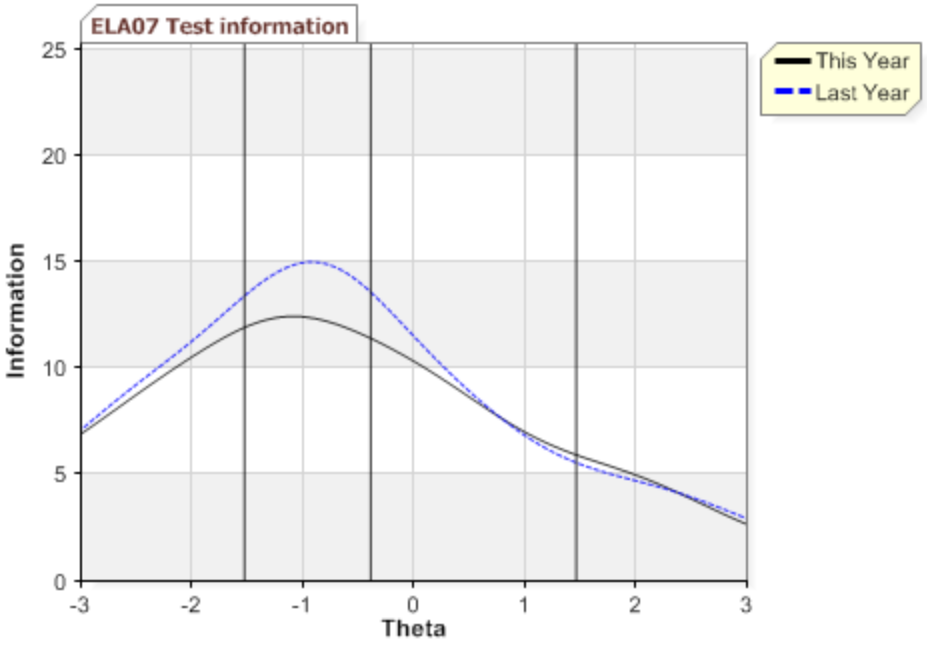
Figure 6-5. 2009 MCAS: IRT Statistics—English Language Arts Grade 7






ELA07 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


ELA07 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
60
70
-3
-2
-1
0
1
2
3


ELA07 Test information
This Year
Last Year
Information
Theta
25
20
15
10
5
0
-3
-2
-1
0
1
2
3

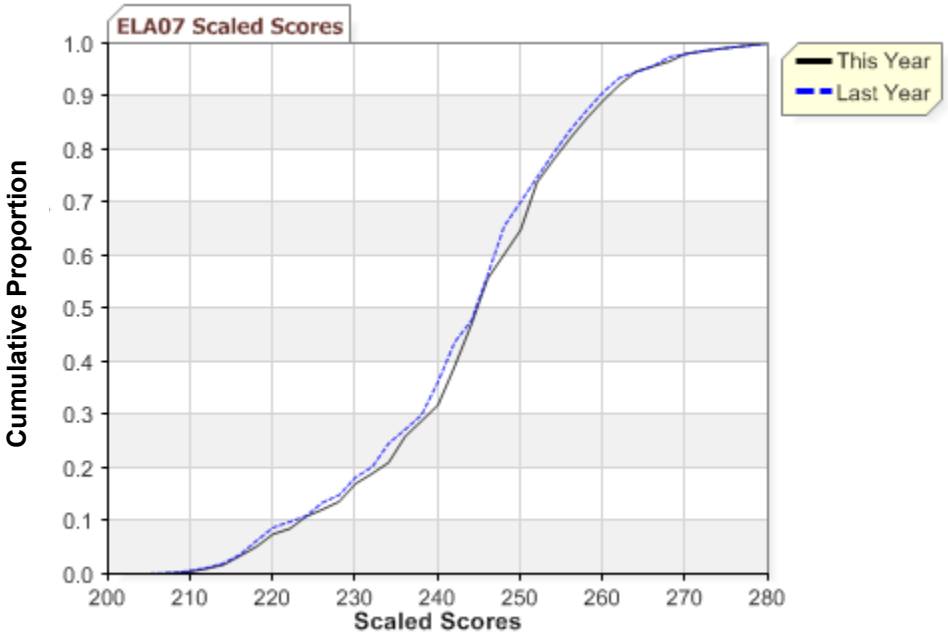
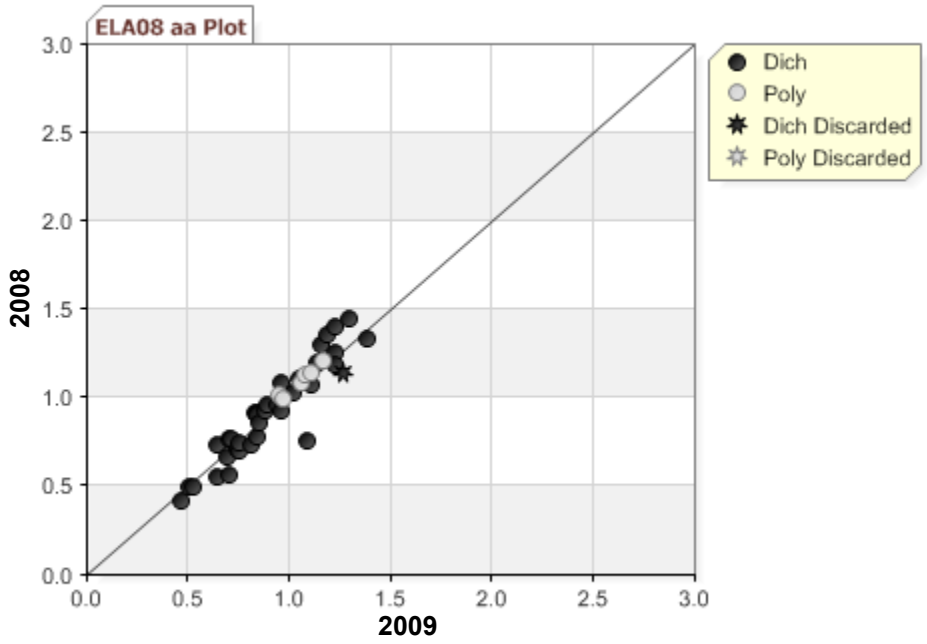
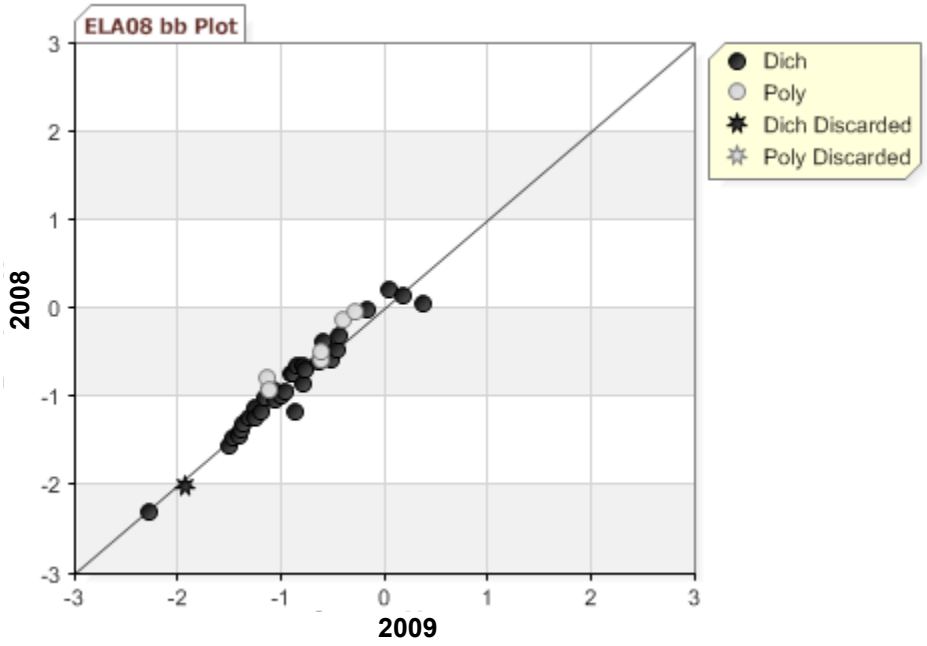
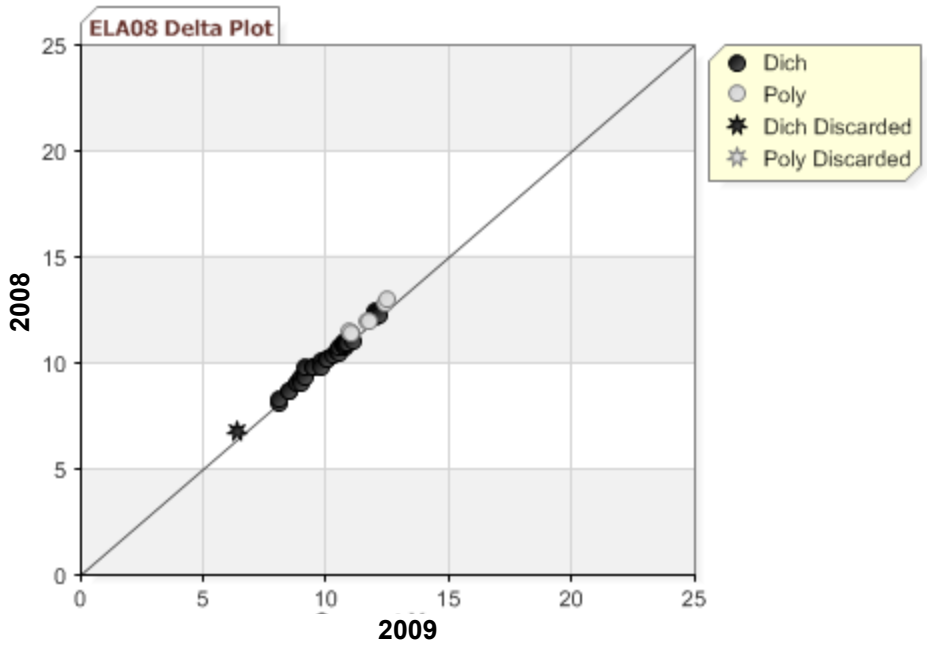
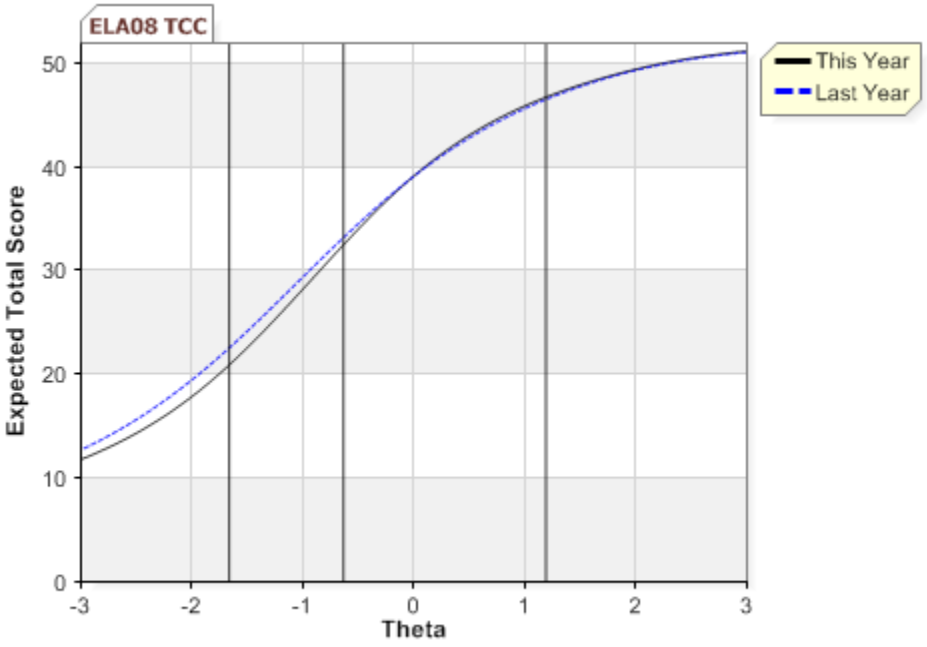

ELA07 Scaled Scores
This Year
Last Year
Cumulative Proportion
Scaled Scores
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280

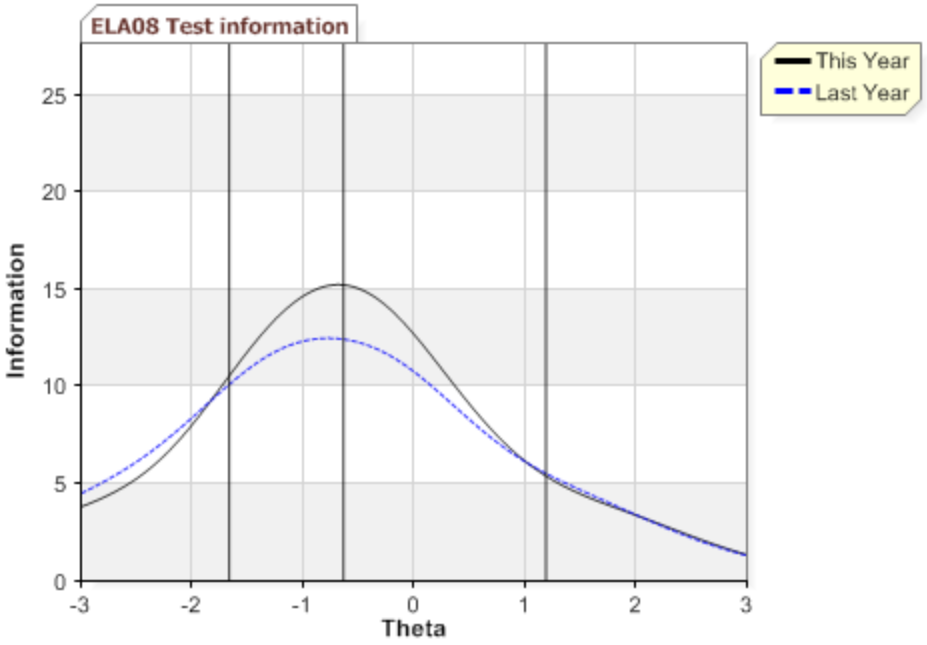
Figure 6-6. 2009 MCAS: IRT Statistics—English Language Arts Grade 8






ELA08 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


ELA08 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


ELA08 Test information
This Year
Last Year
Information
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

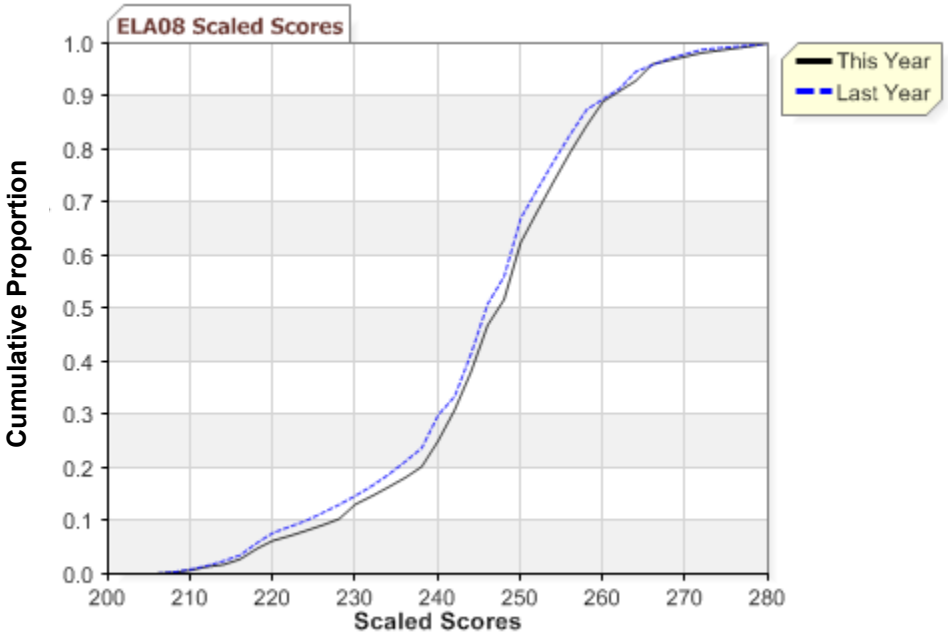
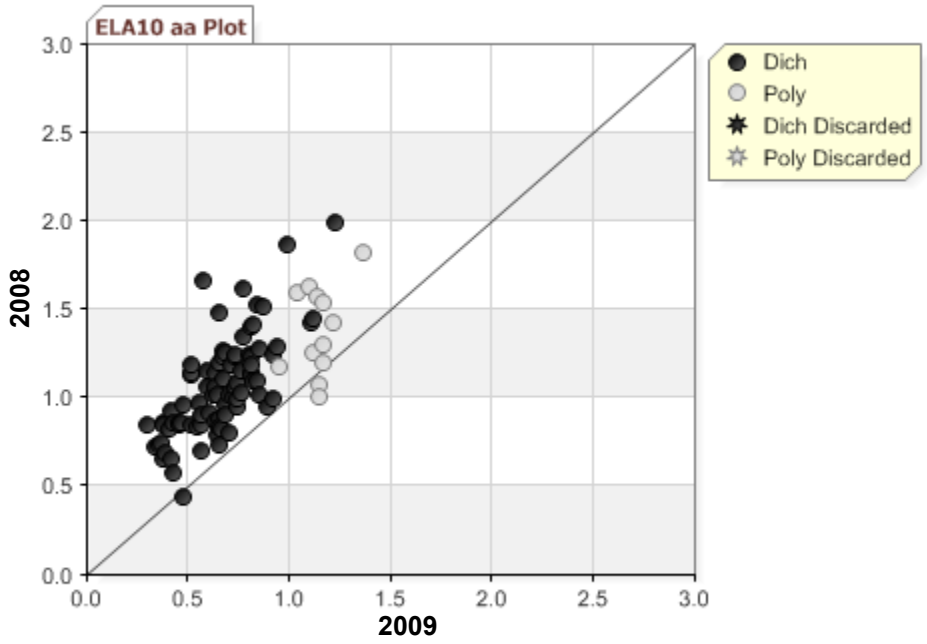
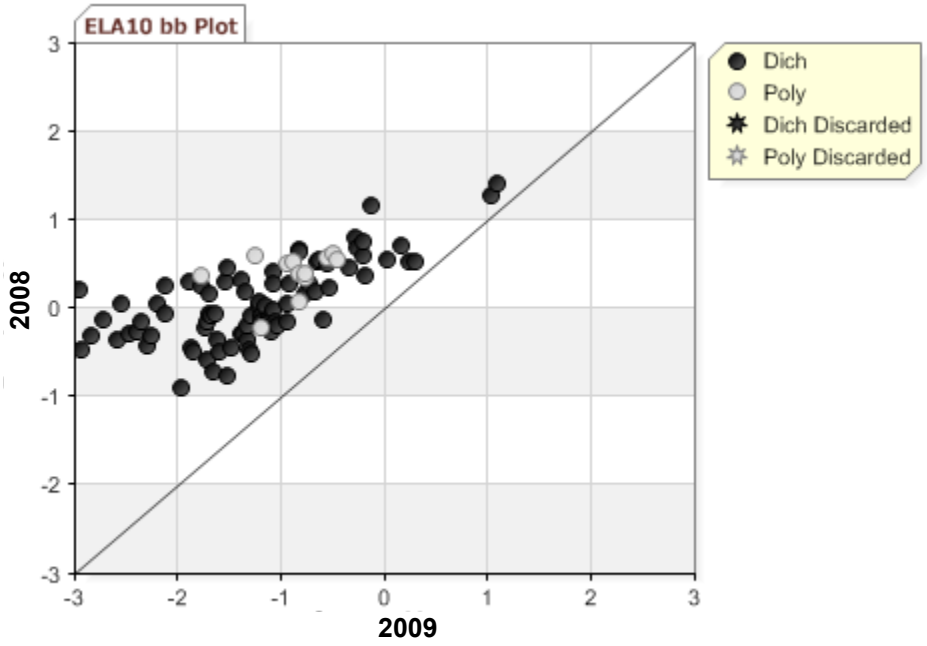
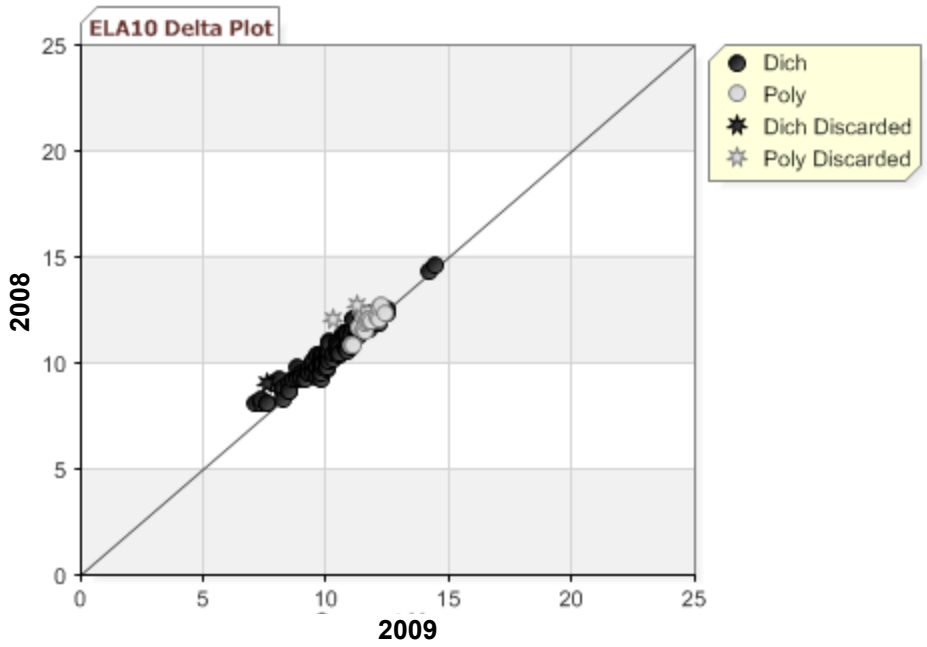
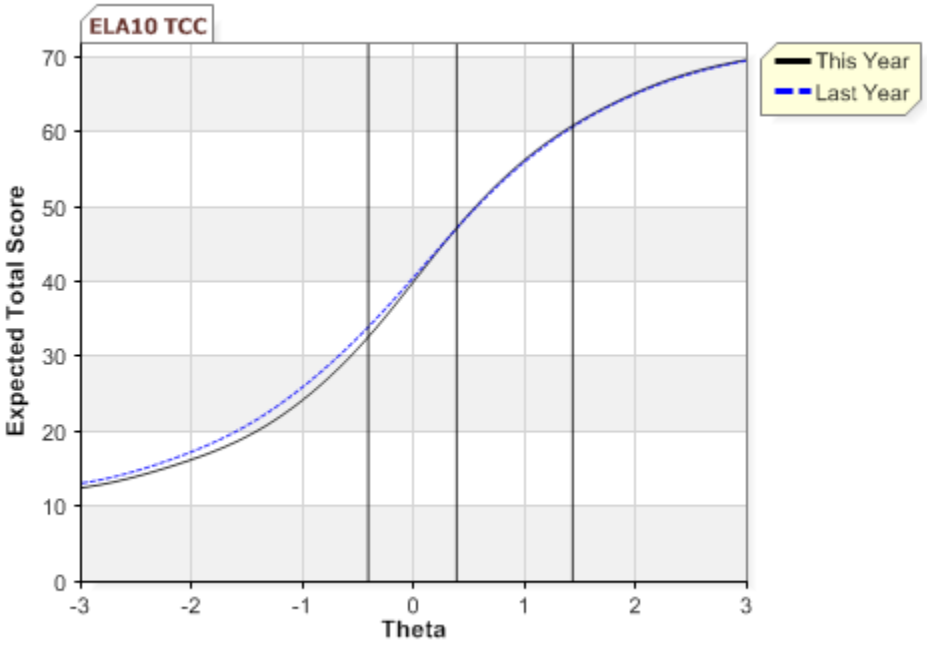

ELA08 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

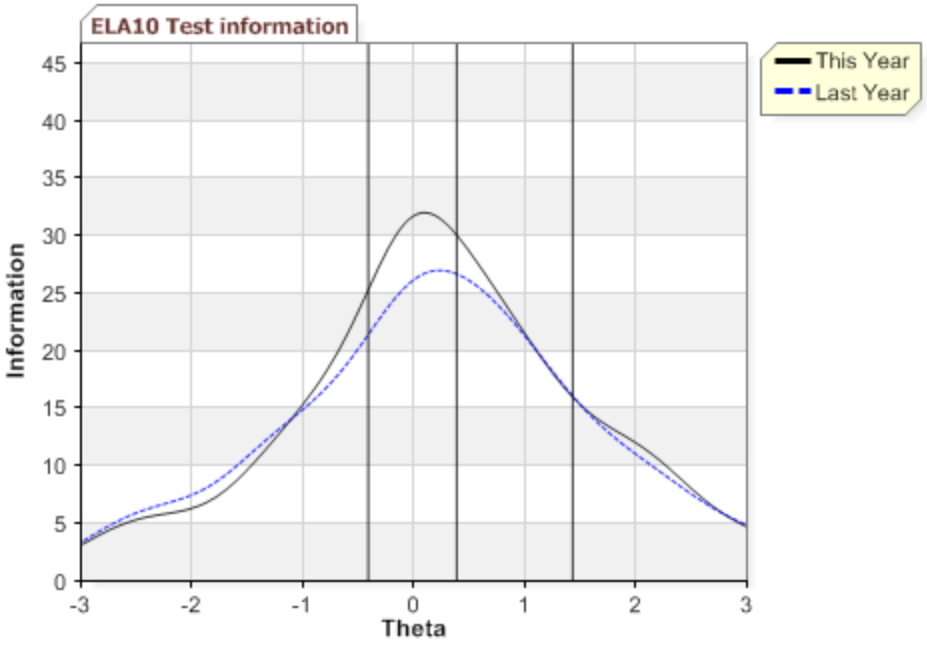
Figure 6-7. 2009 MCAS: IRT Statistics—English Language Arts Grade 10






ELA10 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


ELA10 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
60
70
-3
-2
-1
0
1
2
3


ELA10 Test information
This Year
Last Year
Information
Theta
0
5
10
15
20
25
30
35
40
45
-3
-2
-1
0
1
2
3

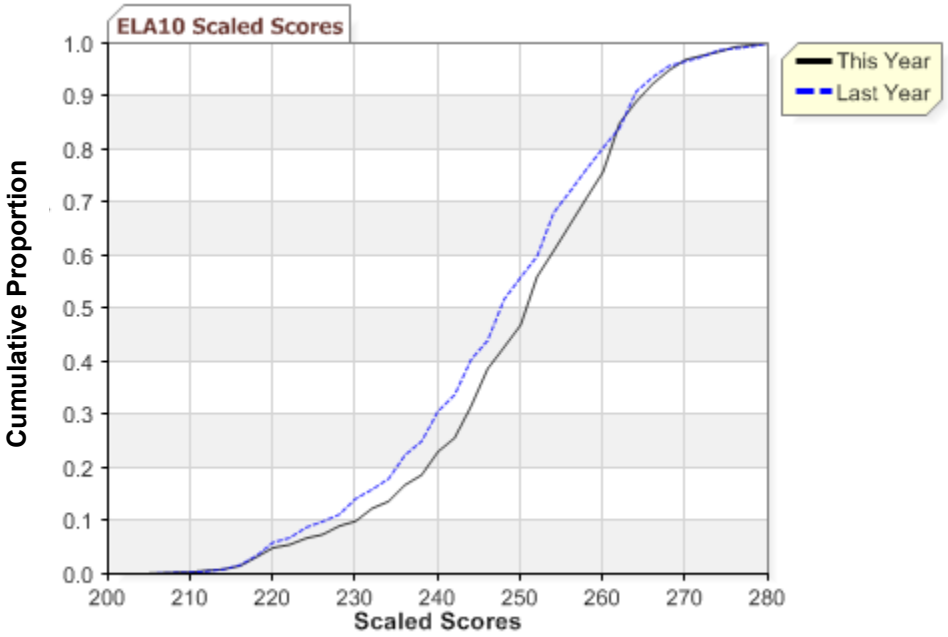
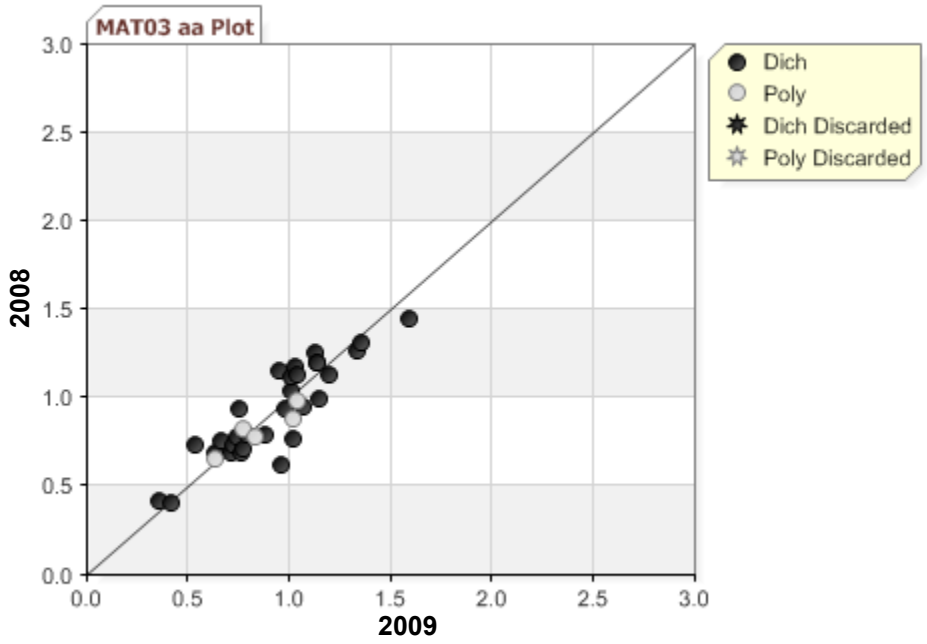
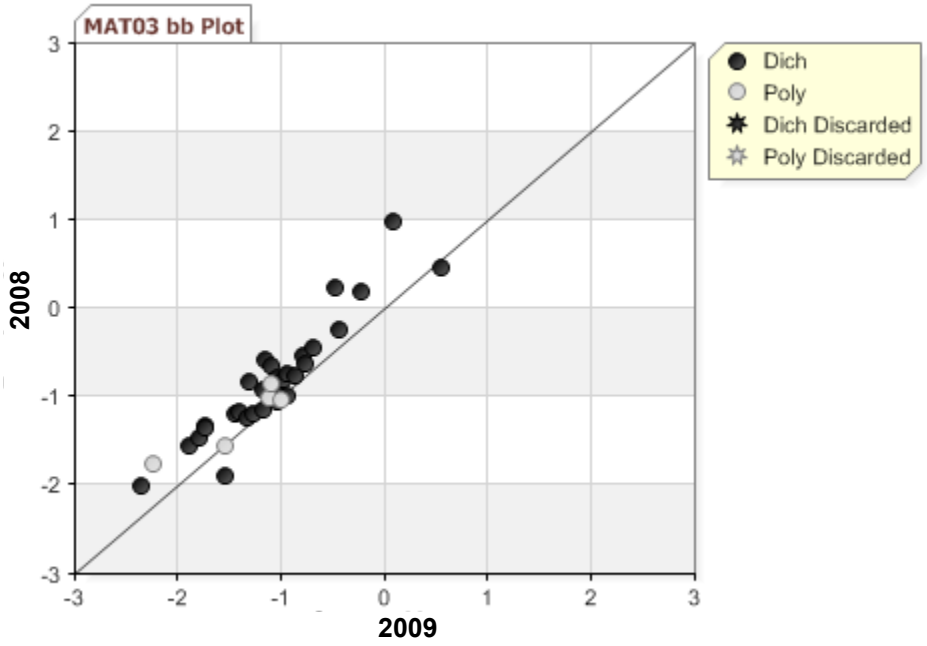
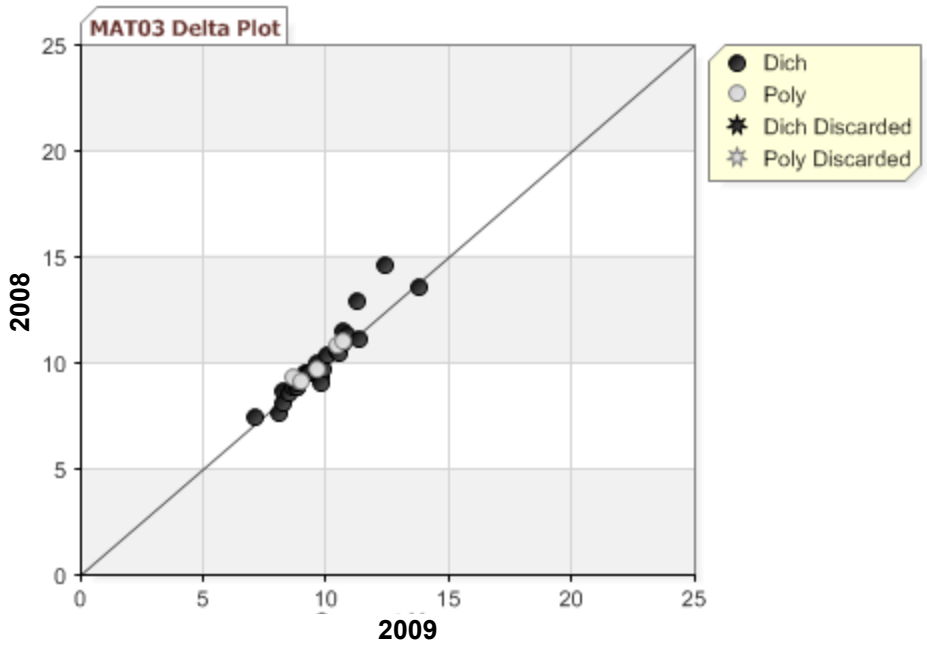
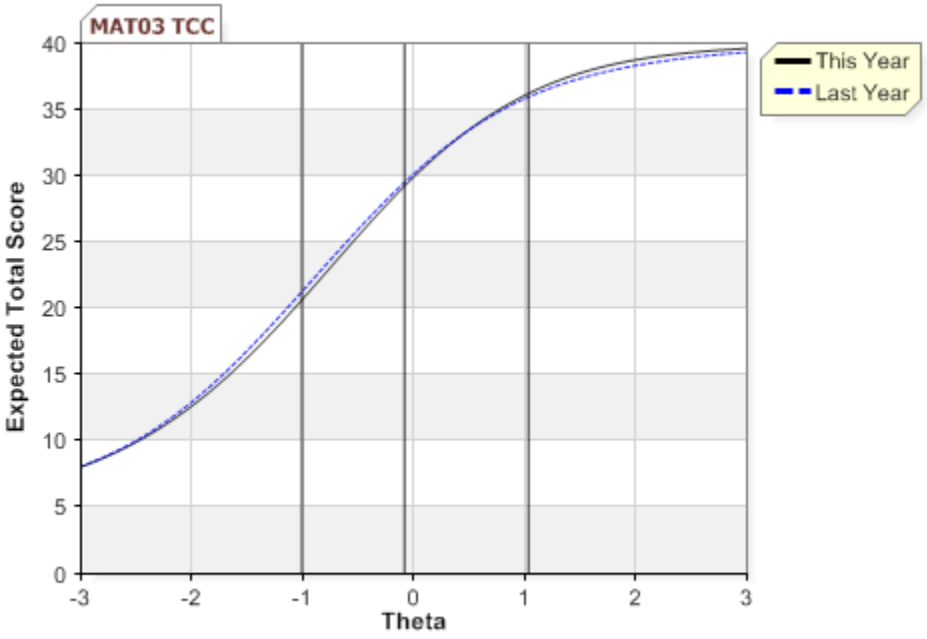

ELA10 Scaled Scores
This Year
Last Year
Cumulative Proportion
Scaled Scores
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
200
210
220
230
240
250
260
270
280

Figure 6-8. 2009 MCAS: IRT Statistics—Mathematics Grade 3






MAT03 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


MAT03 TCC
This Year
Last Year
Expected Total Score
Theta
0
5
10
15
20
25
30
35
40
-3
-2
-1
0
1
2
3

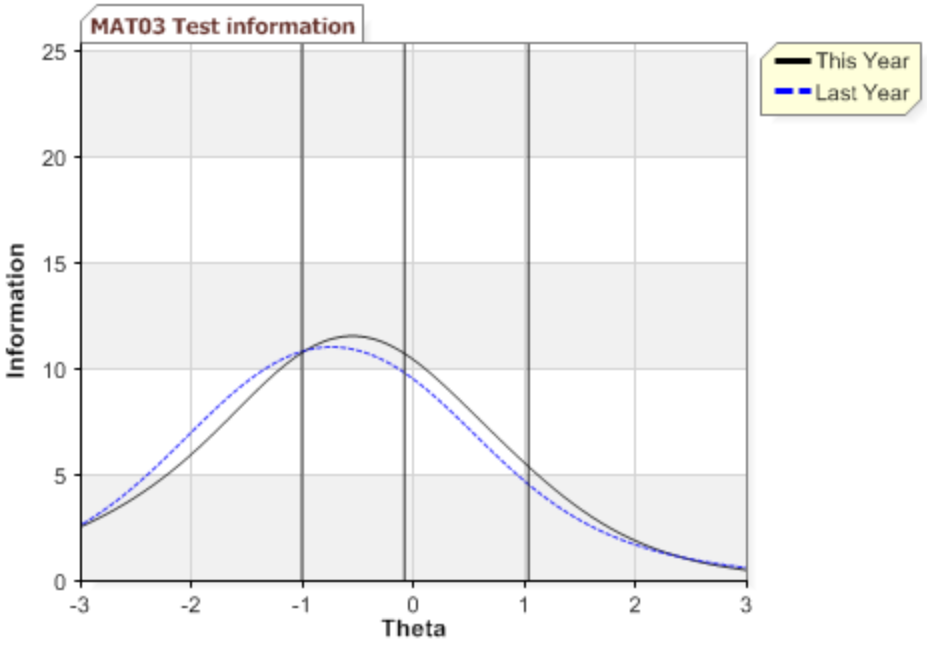
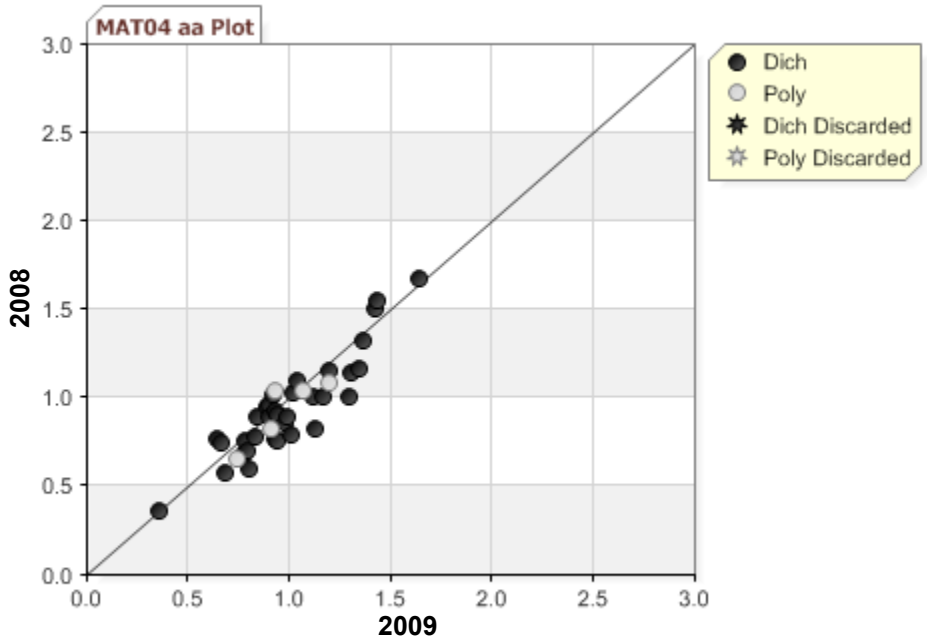
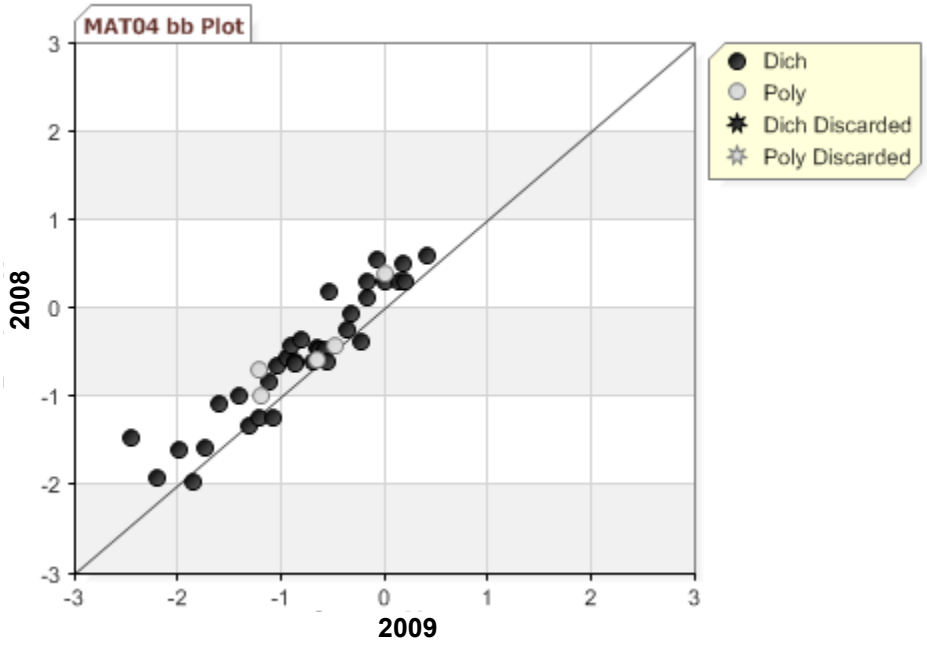
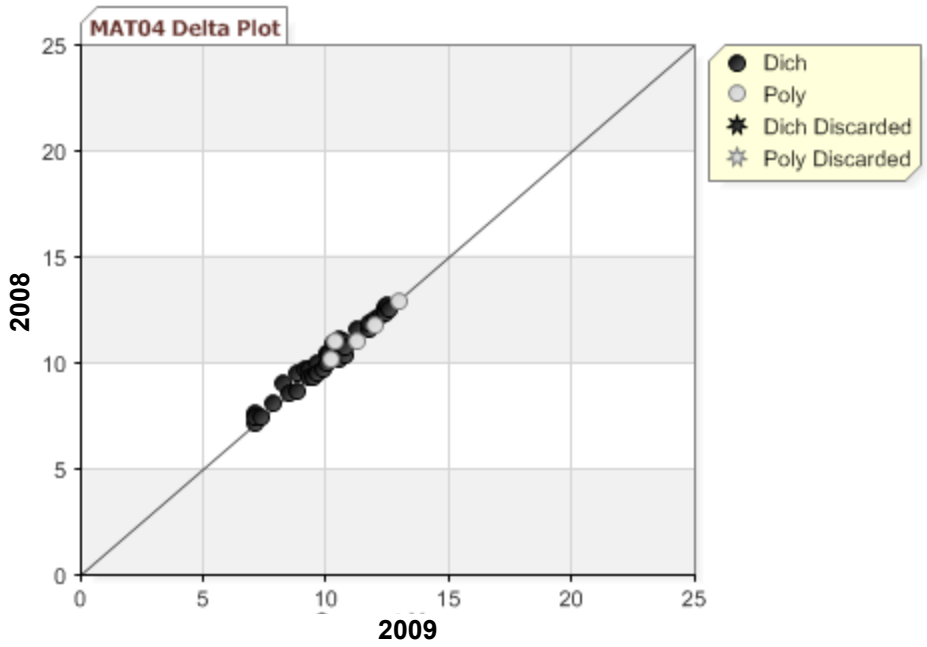
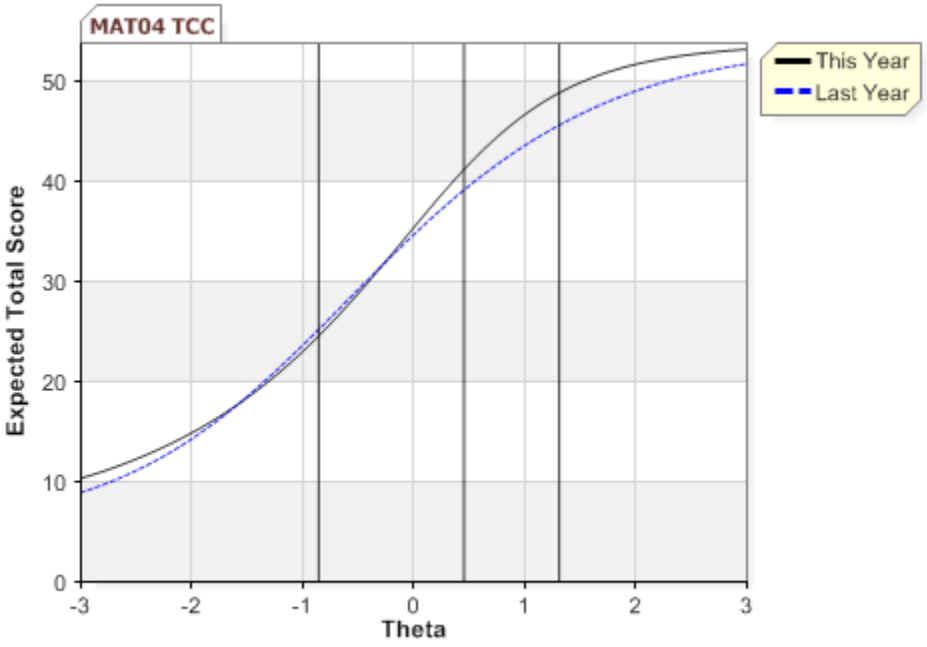

MAT03 Test information
This Year
Last Year
Information
Theta
25
20
15
10
5
0
-3
-2
-1
0
1
2
3

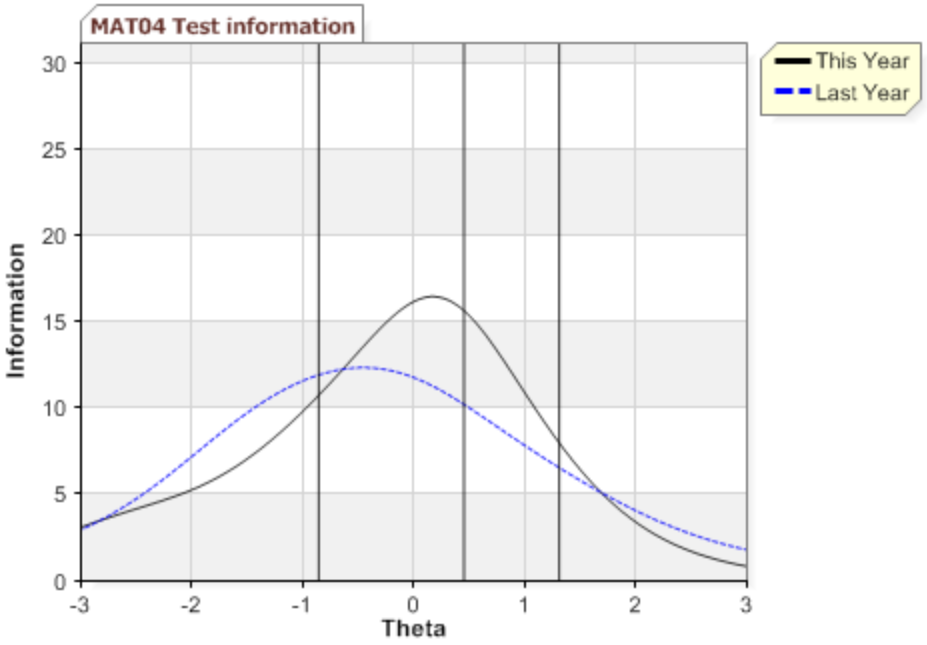
Figure 6-9. 2009 MCAS: IRT Statistics—Mathematics Grade 4






MAT04 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


MAT04 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


MAT04 Test information
This Year
Last Year
Information
Theta
30
25
20
15
10
5
0
-3
-2
-1
0
1
2
3

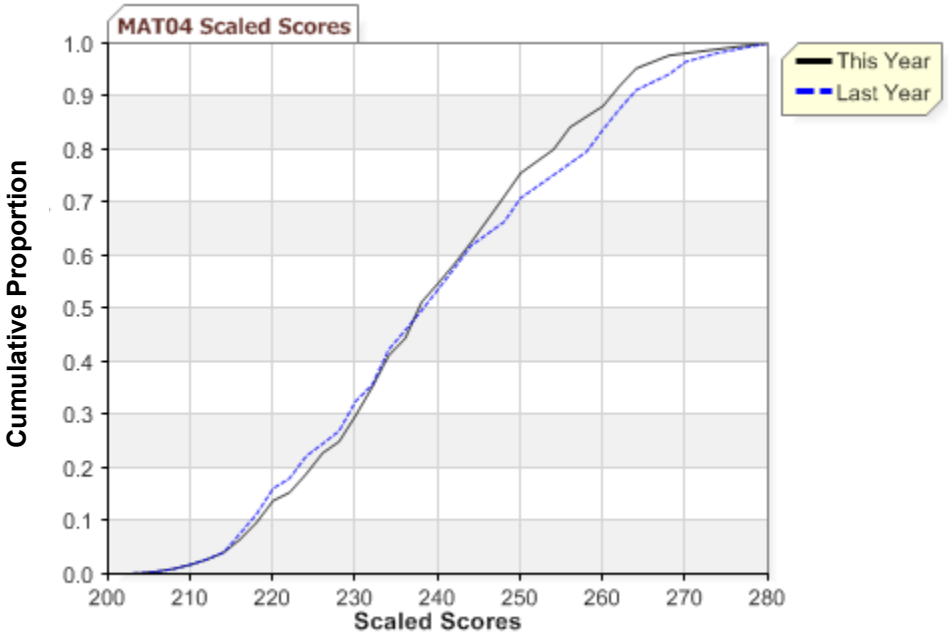
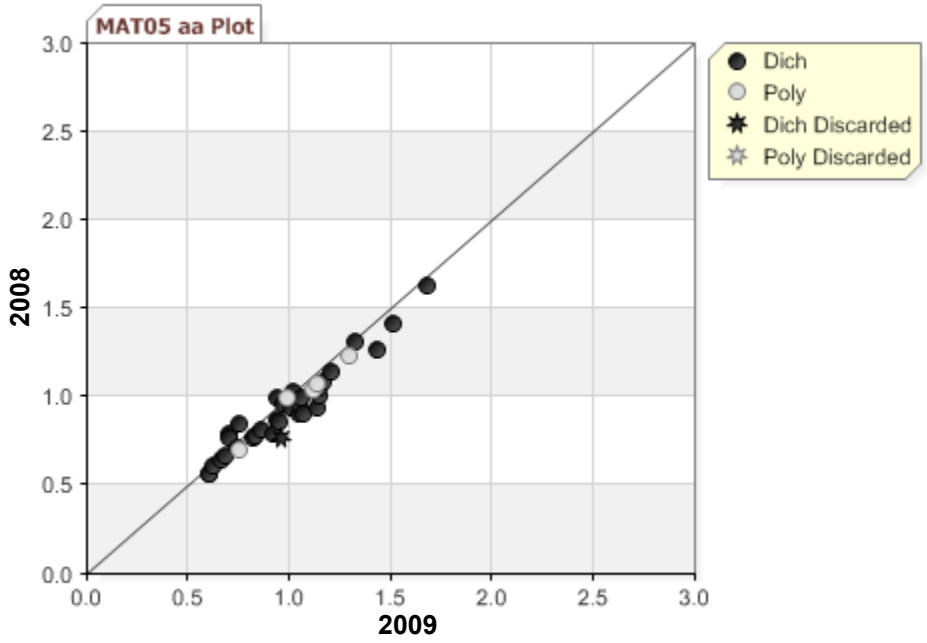
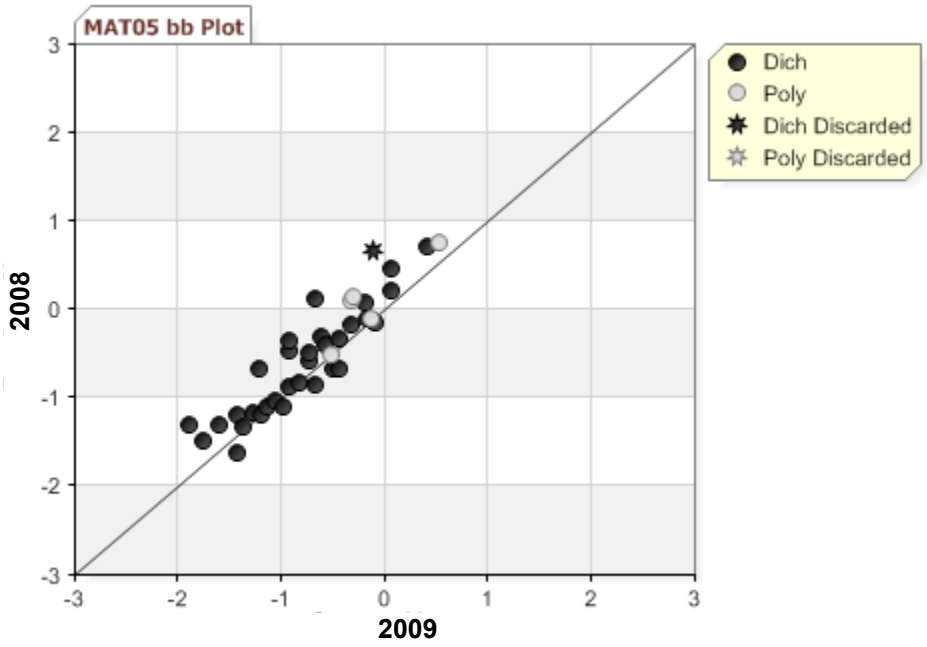
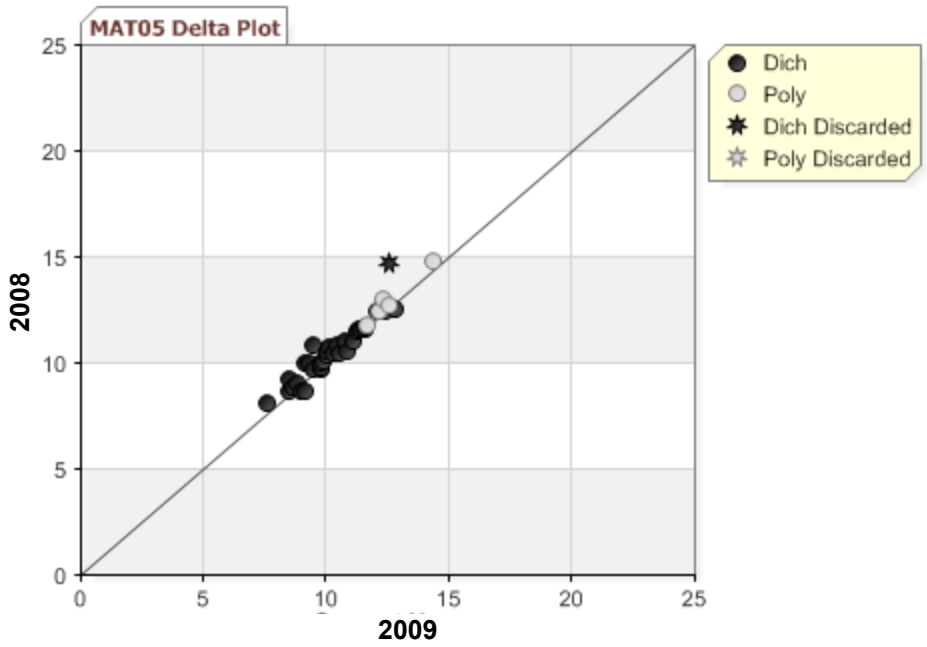
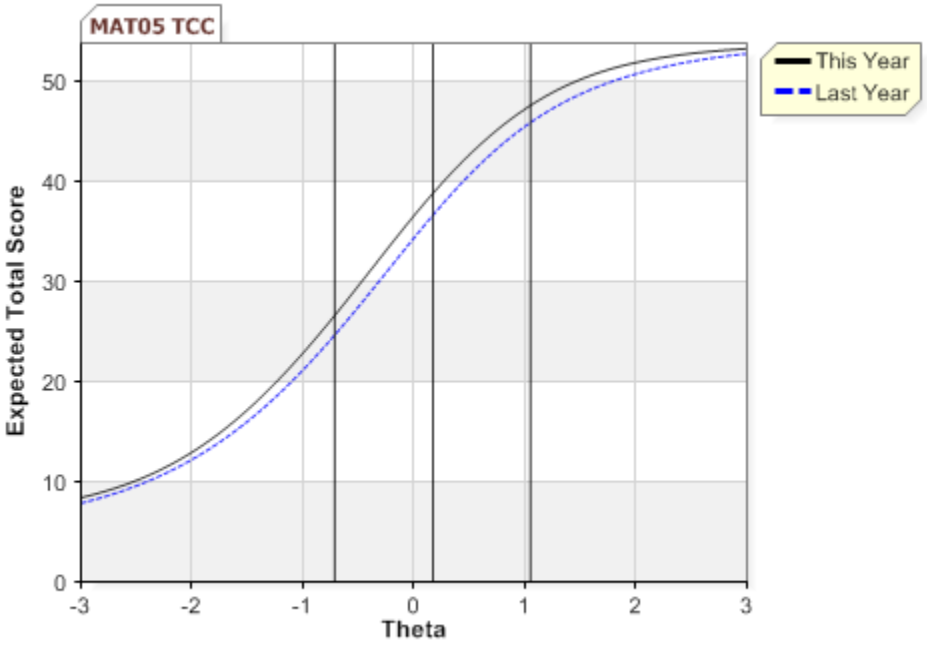

MAT04 Scaled Scores
This Year
Last Year
Cumulative Proportion
Scaled Scores
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280

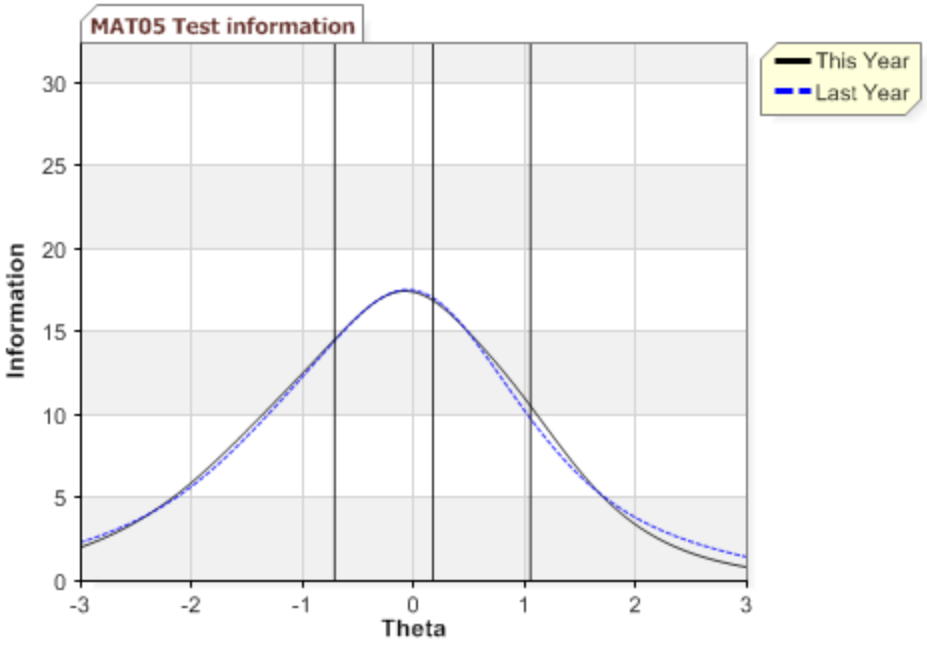
Figure 6-10. 2009 MCAS: IRT Statistics—Mathematics Grade 5






MAT05 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


MAT05 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


MAT05 Test information
This Year
Last Year
Information
30
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

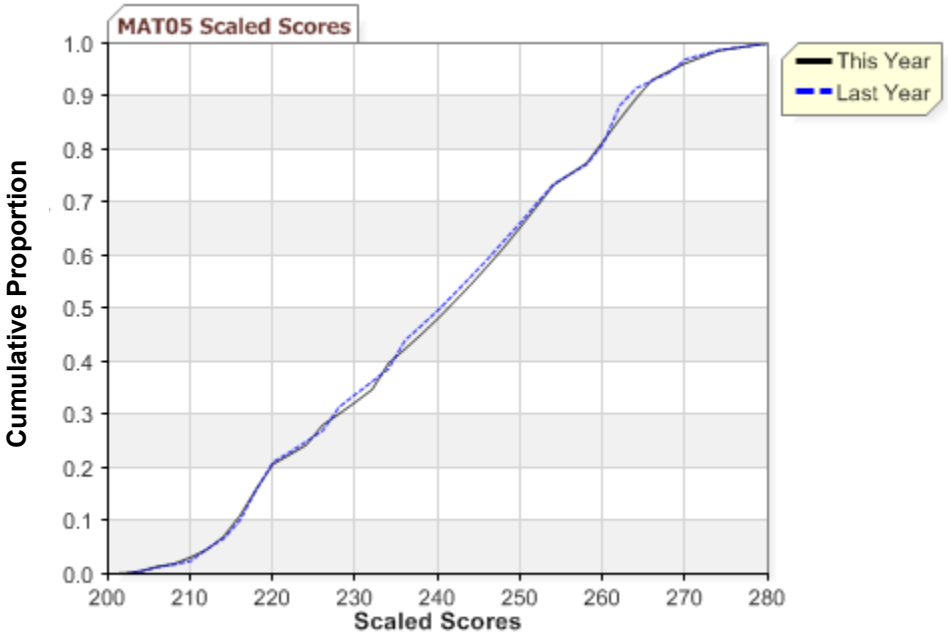
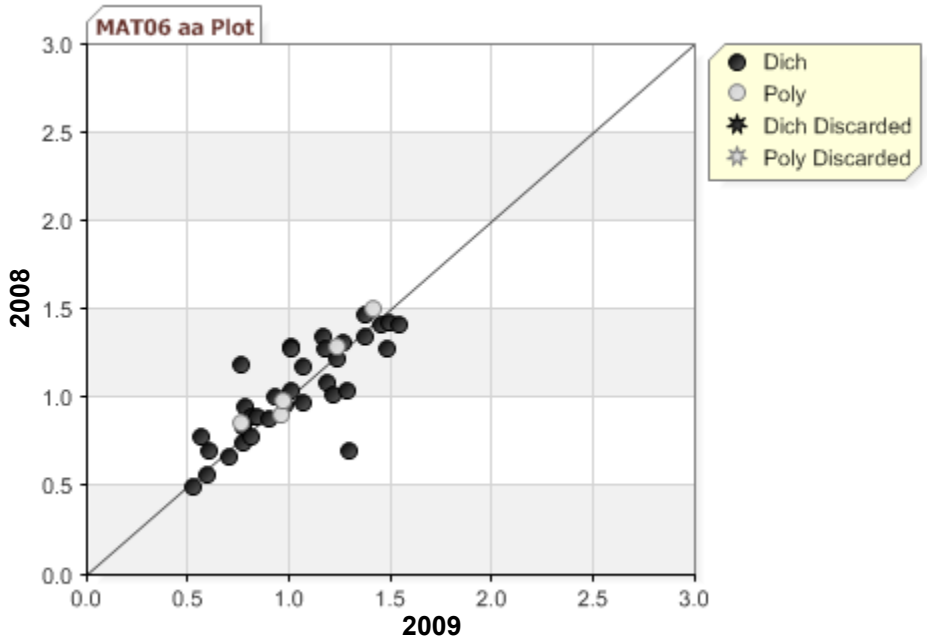
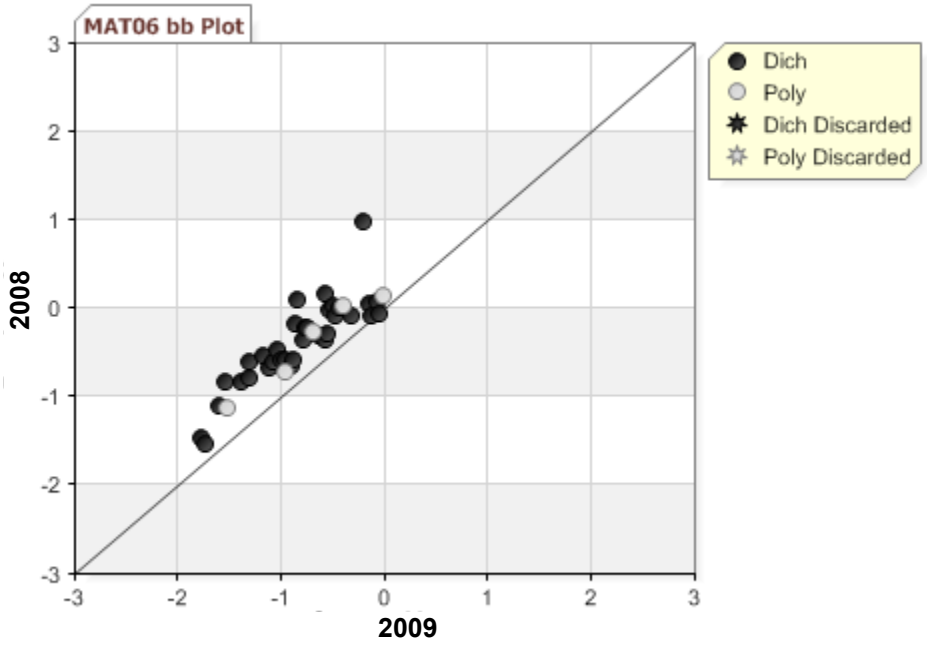
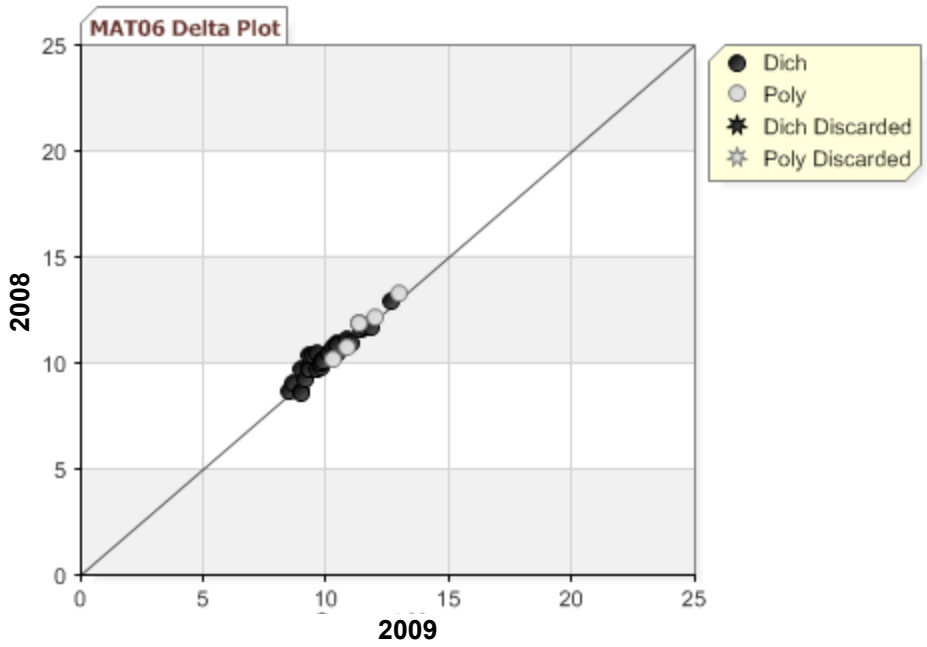
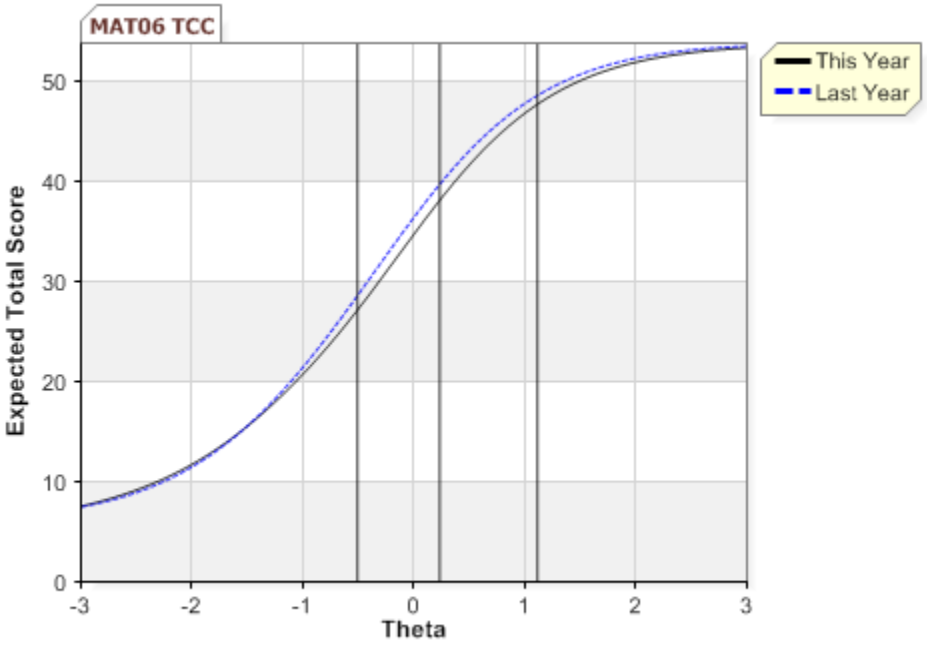

MAT05 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

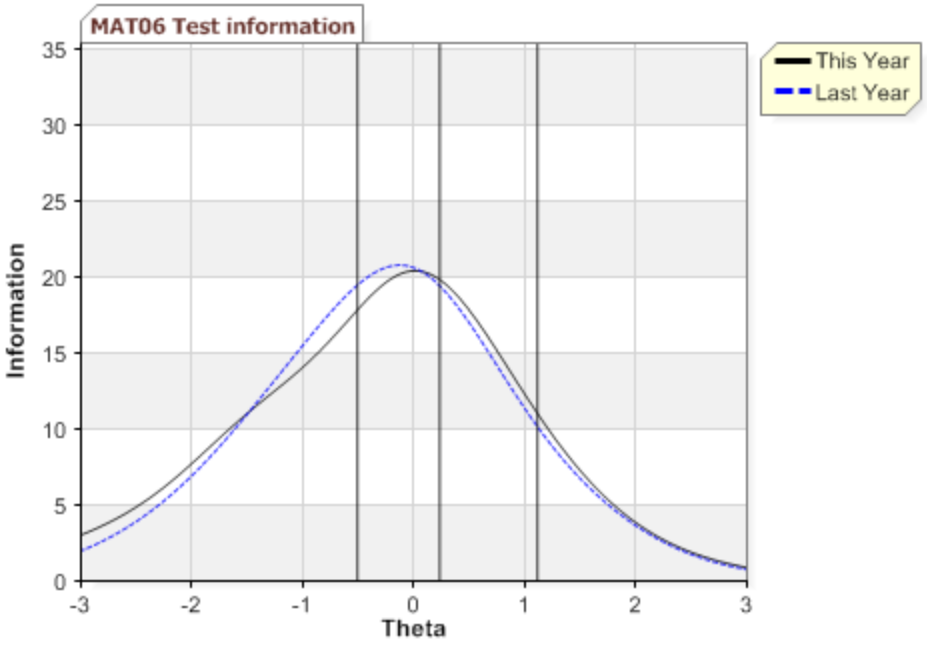
Figure 6-11. 2009 MCAS: IRT Statistics—Mathematics Grade 6






MAT06 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


MAT06 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


MAT06 Test information
This Year
Last Year
Information
Theta
35
30
25
20
15
10
5
0
-3
-2
-1
0
1
2
3

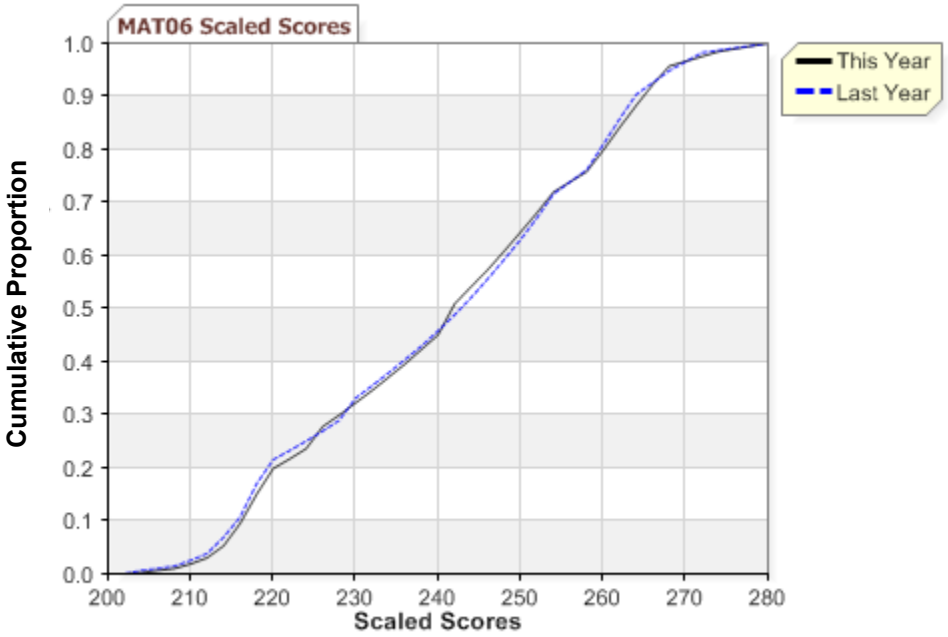
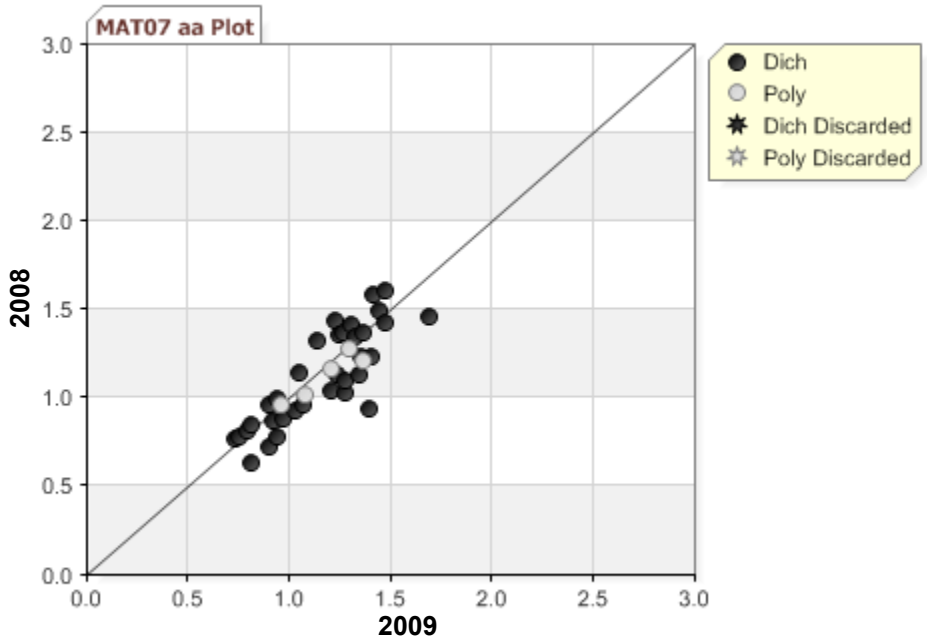
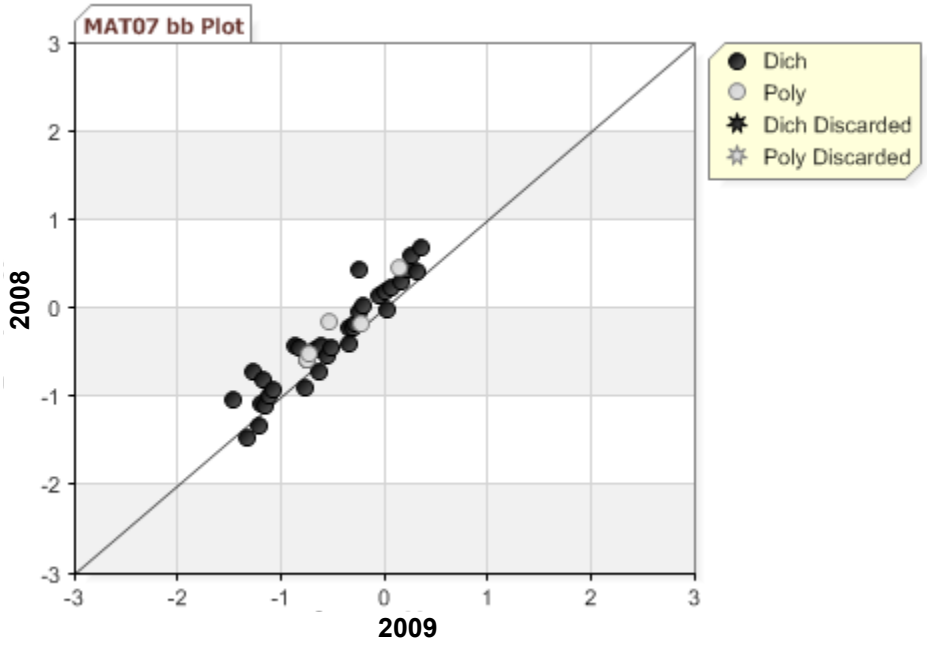
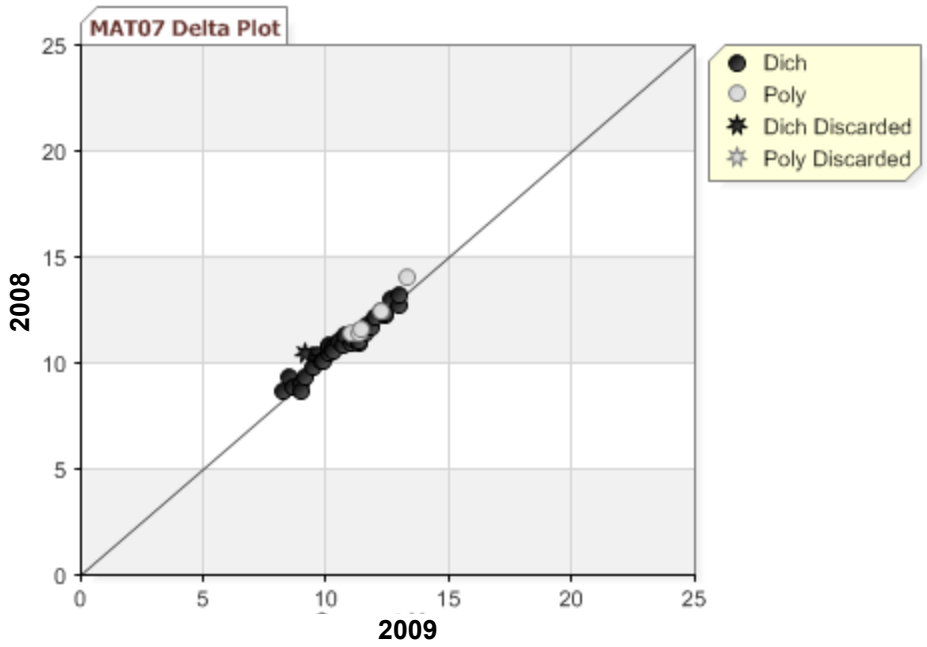
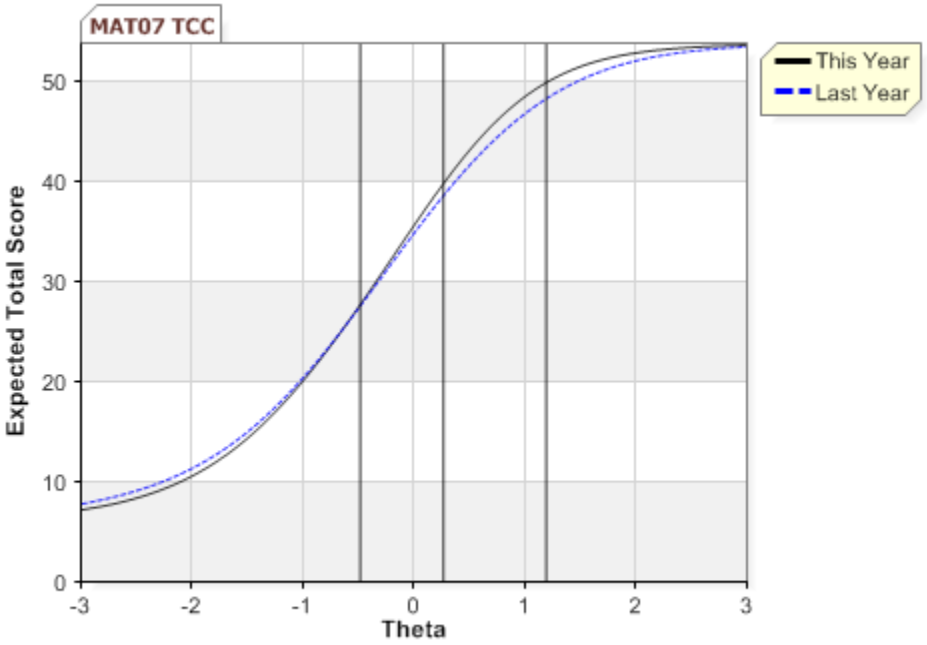

MAT06 Scaled Scores
This Year
Last Year
Cumulative Proportion
Scaled Scores
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280

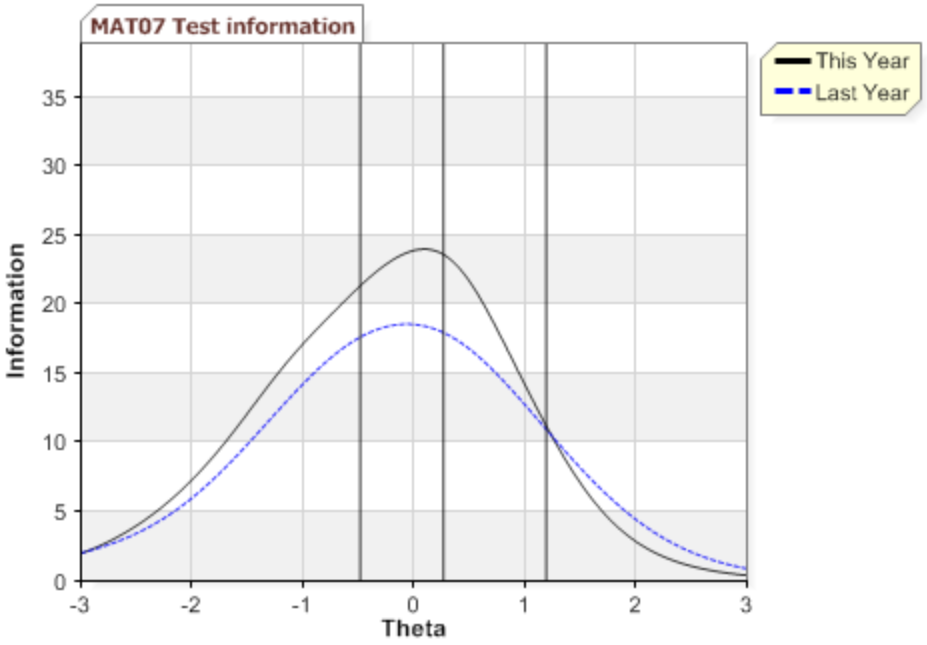
Figure 6-12. 2009 MCAS: IRT Statistics—Mathematics Grade 7






MAT07 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


MAT07 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


MAT07 Test information
This Year
Last Year
Information
35
30
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

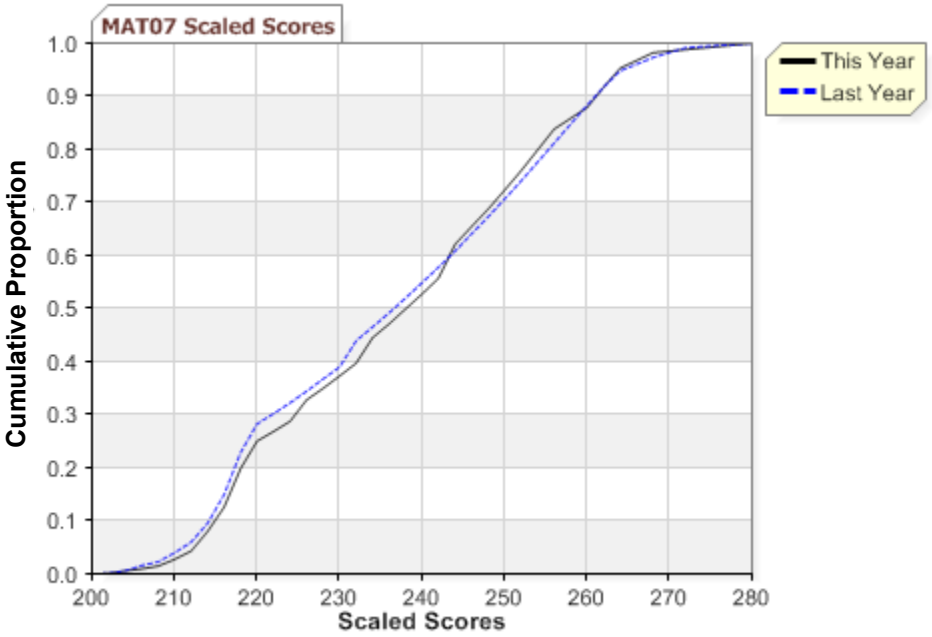
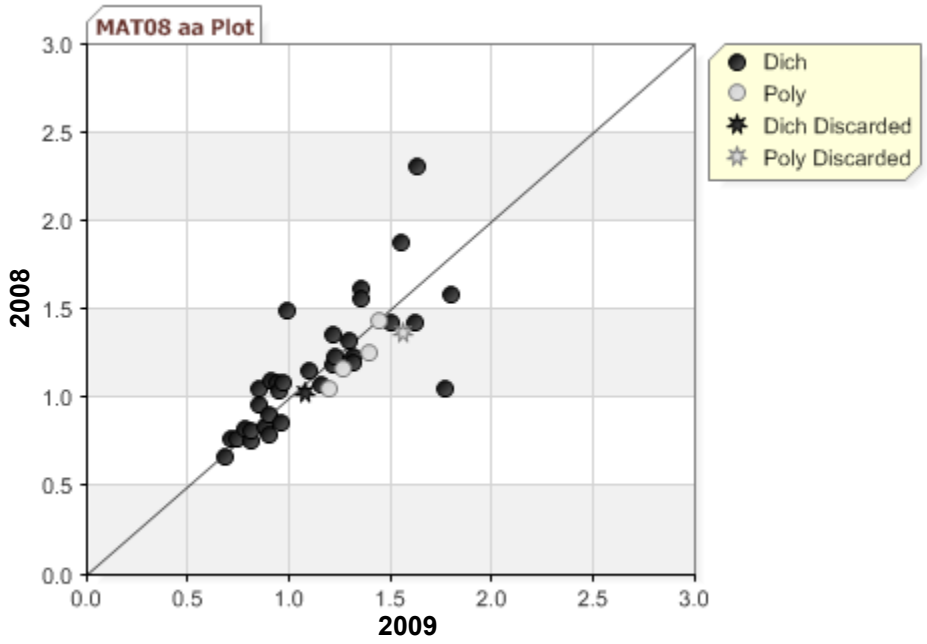
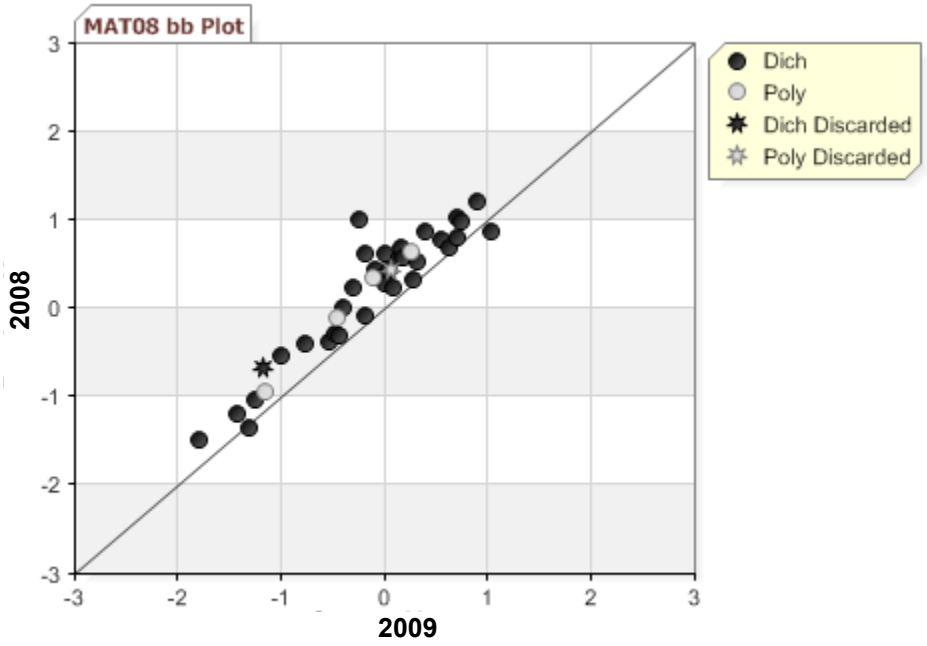
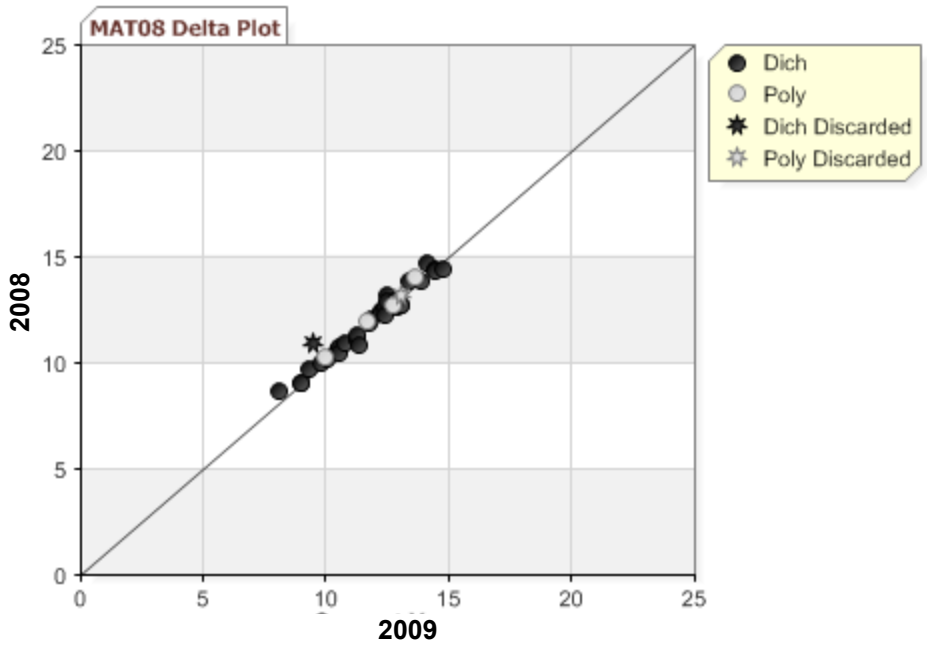
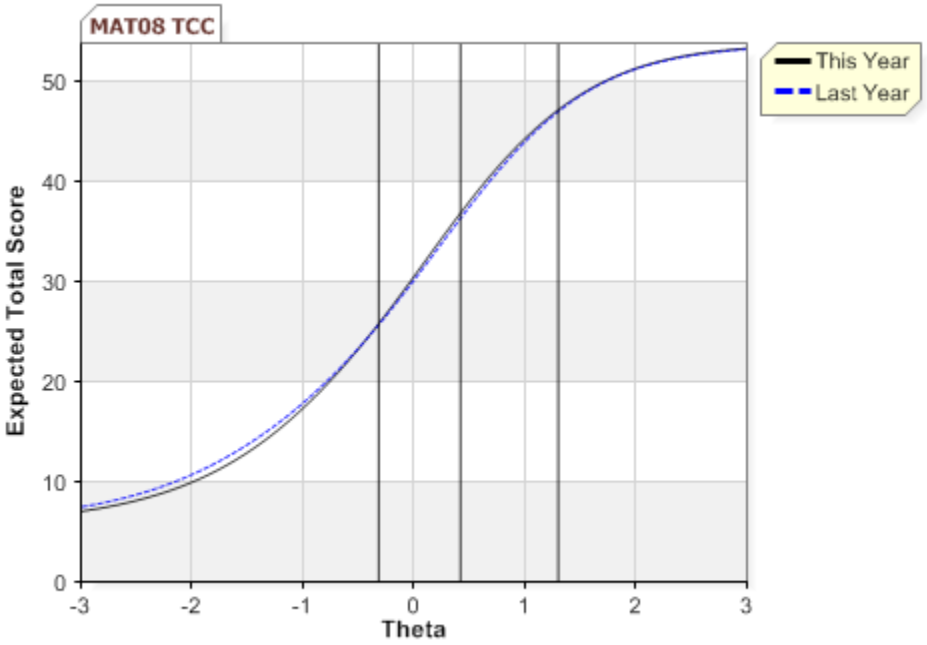

MAT07 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

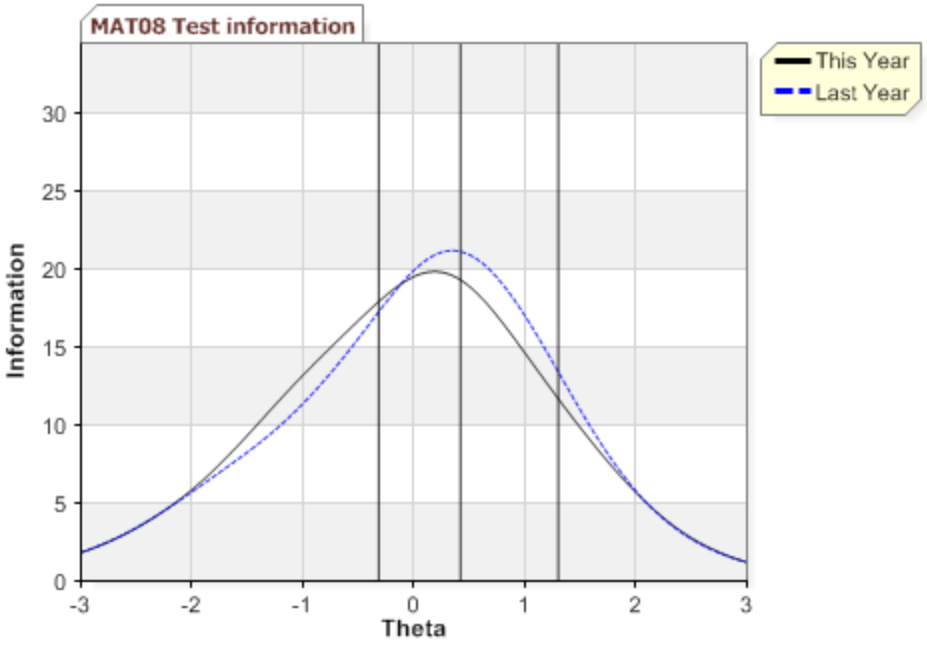
Figure 6-13. 2009 MCAS: IRT Statistics—Mathematics Grade 8






MAT08 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


MAT08 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


MAT08 Test information
This Year
Last Year
Information
30
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

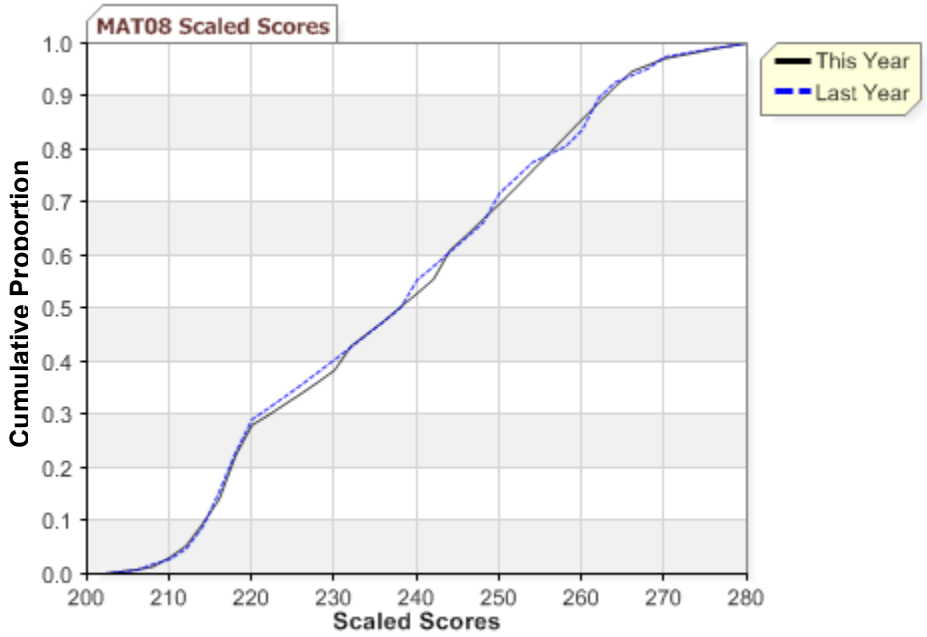
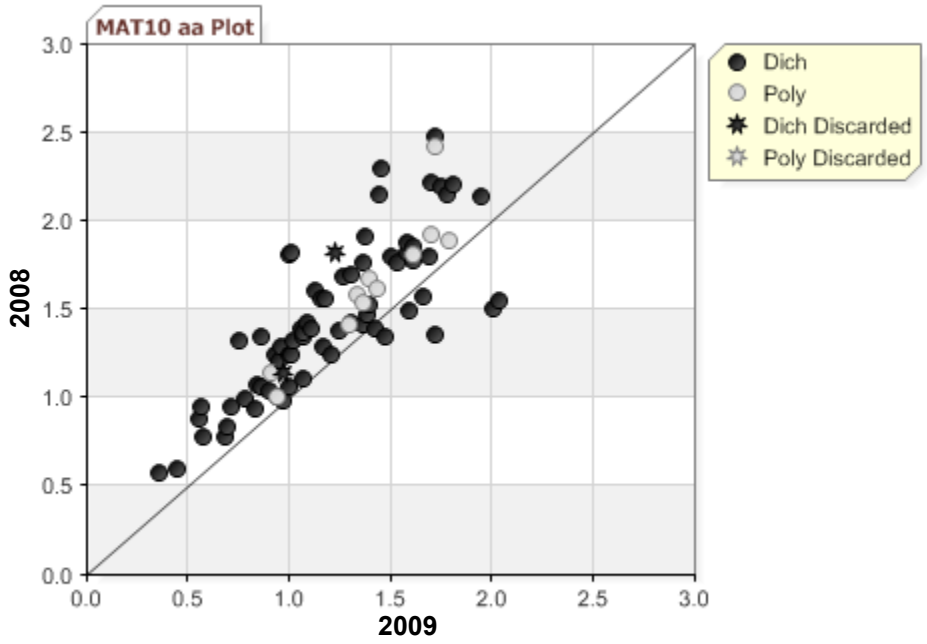
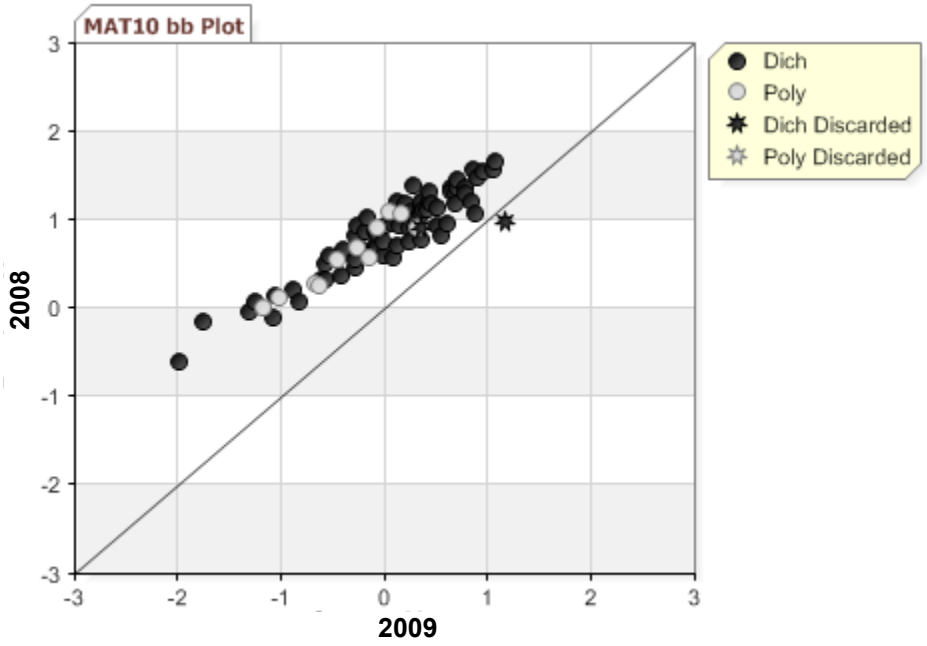
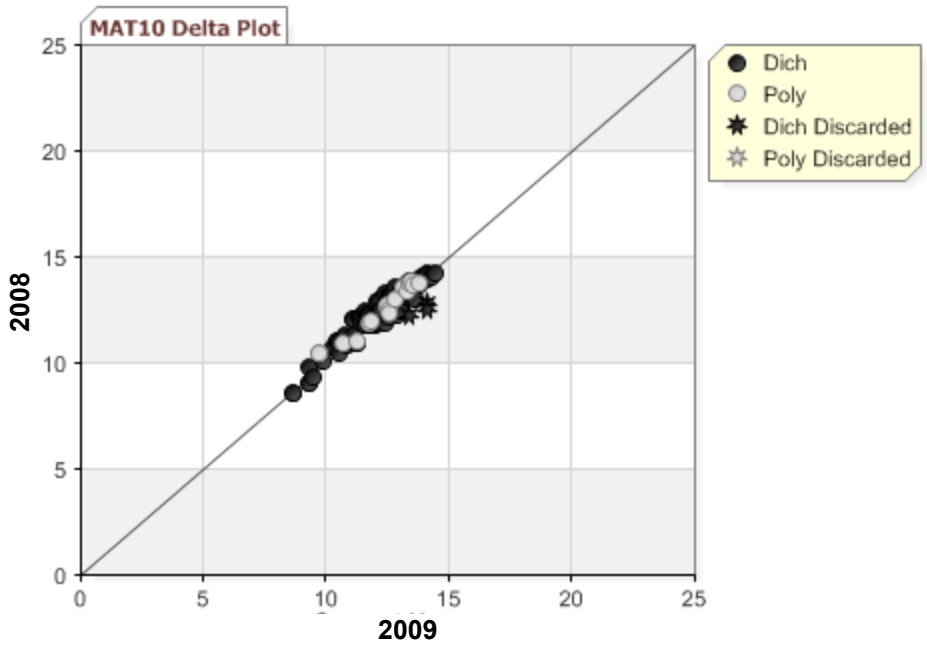
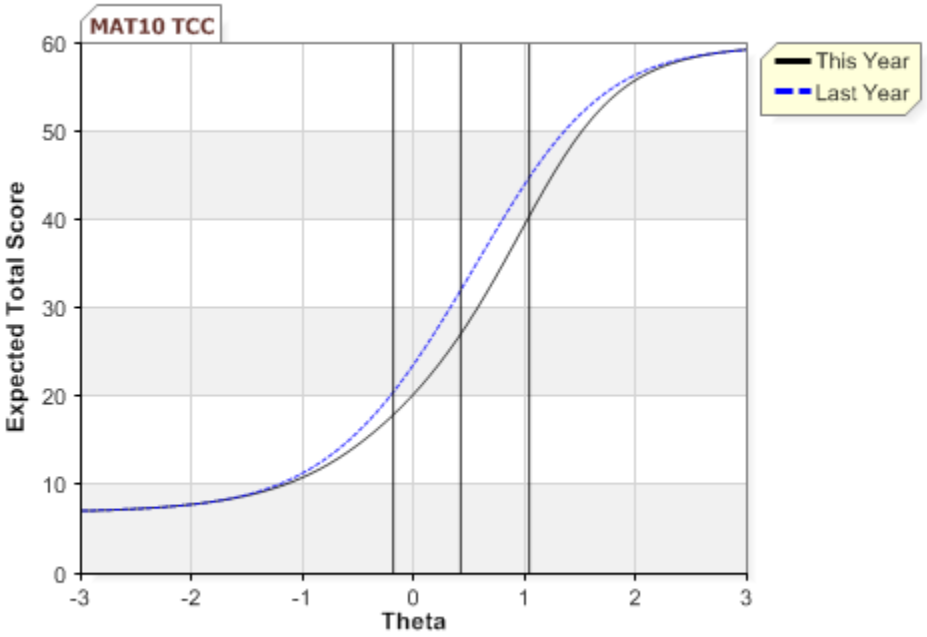

MAT08 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

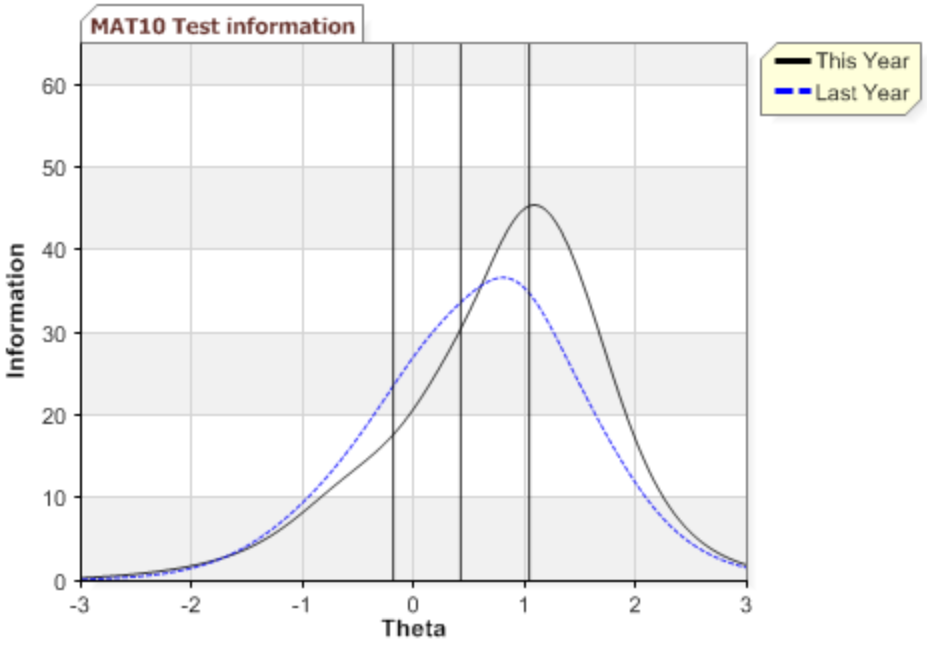
Figure 6-14. 2009 MCAS: IRT Statistics—Mathematics Grade 10






MAT10 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


MAT10 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
60
-3
-2
-1
0
1
2
3


MAT10 Test information
This Year
Last Year
Information
60
50
40
30
20
10
0
-3
-2
-1
0
1
2
3
Theta

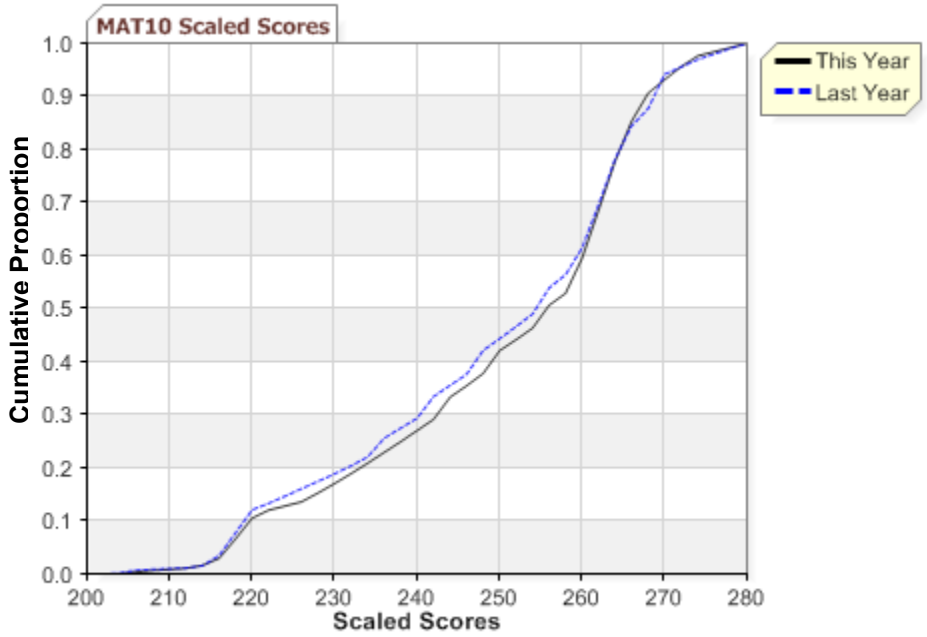
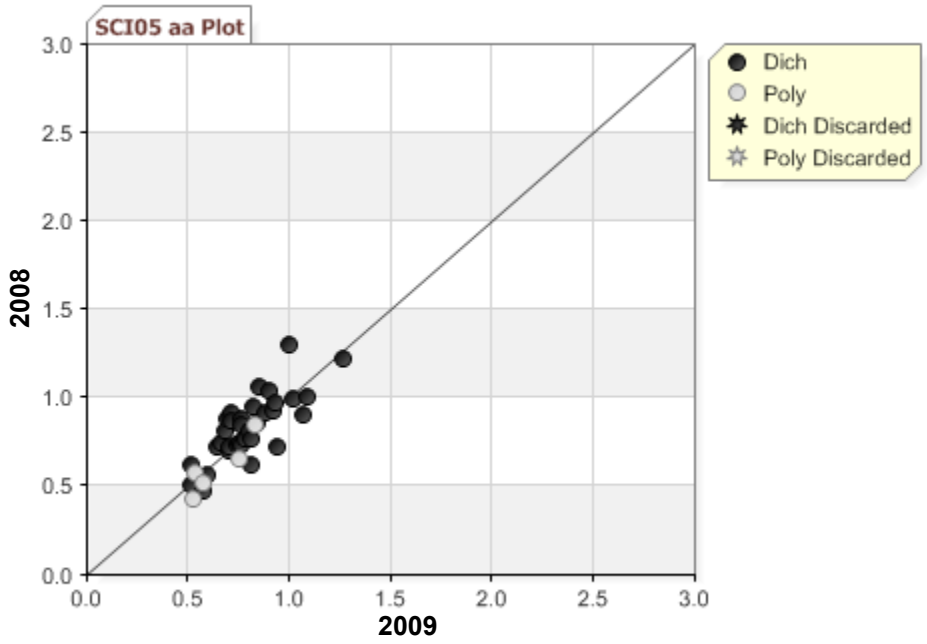
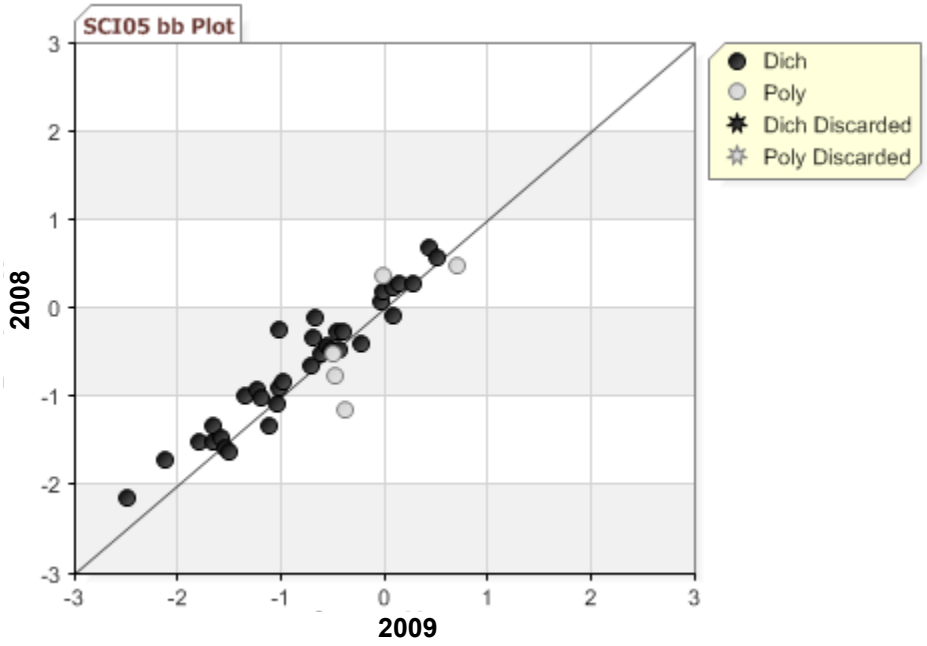
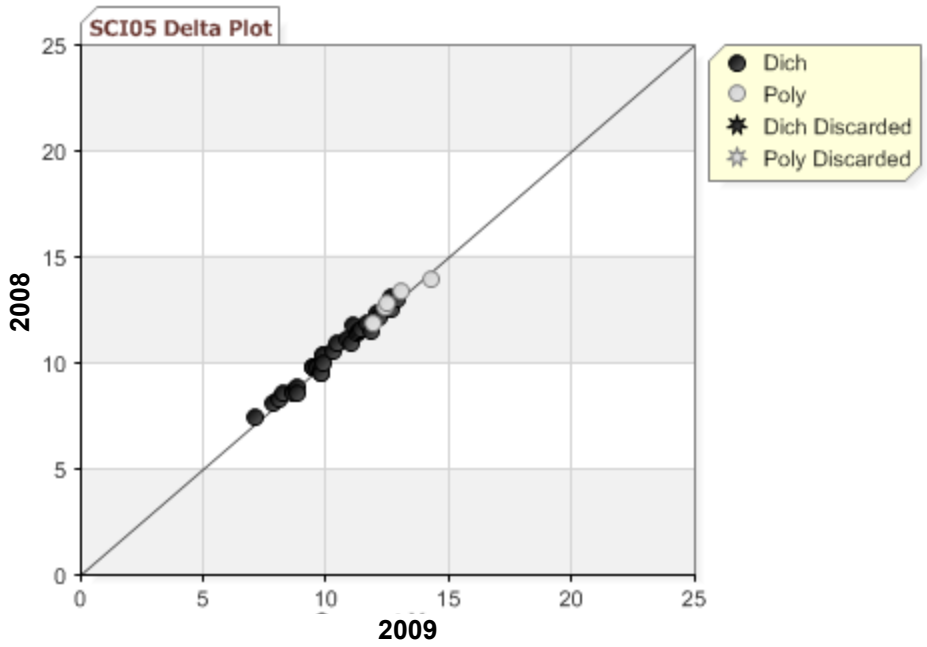
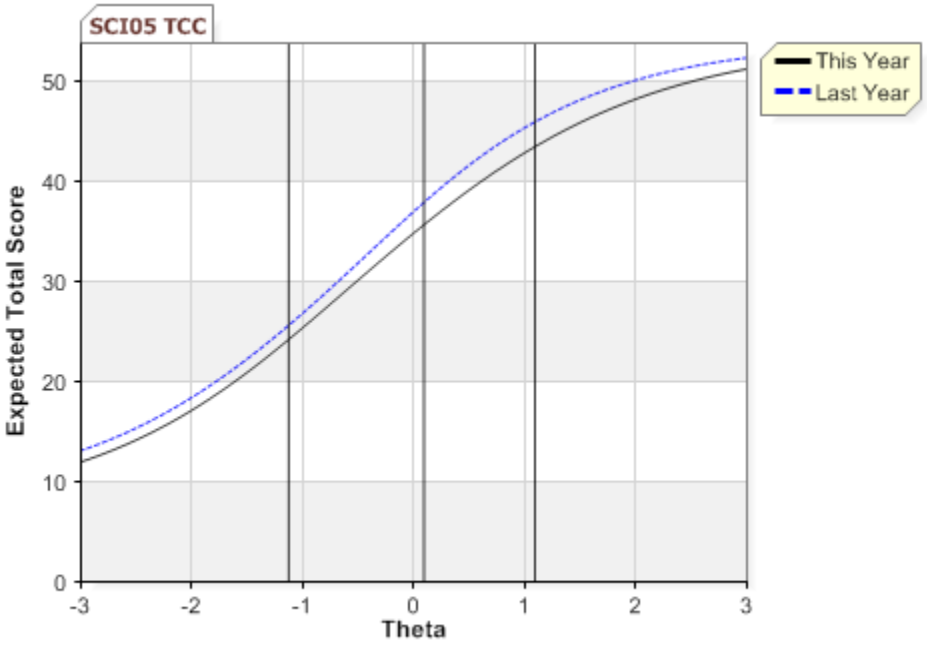

MAT10 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

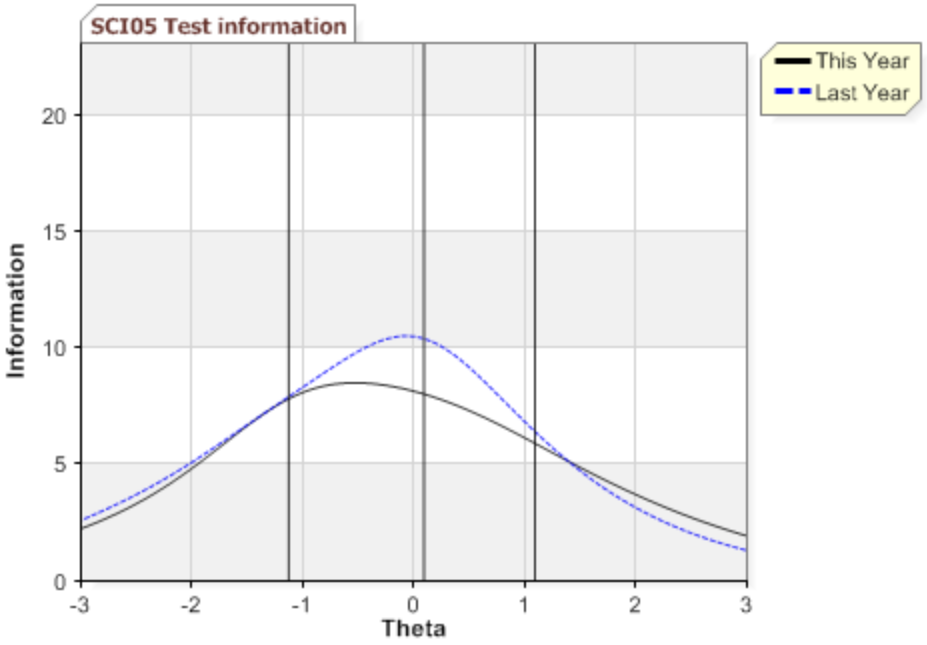
Figure 6-15. 2009 MCAS: IRT Statistics—Science and Technology/Engineering Grade 5






SCI05 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


SCI05 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


SCI05 Test information
This Year
Last Year
Information
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

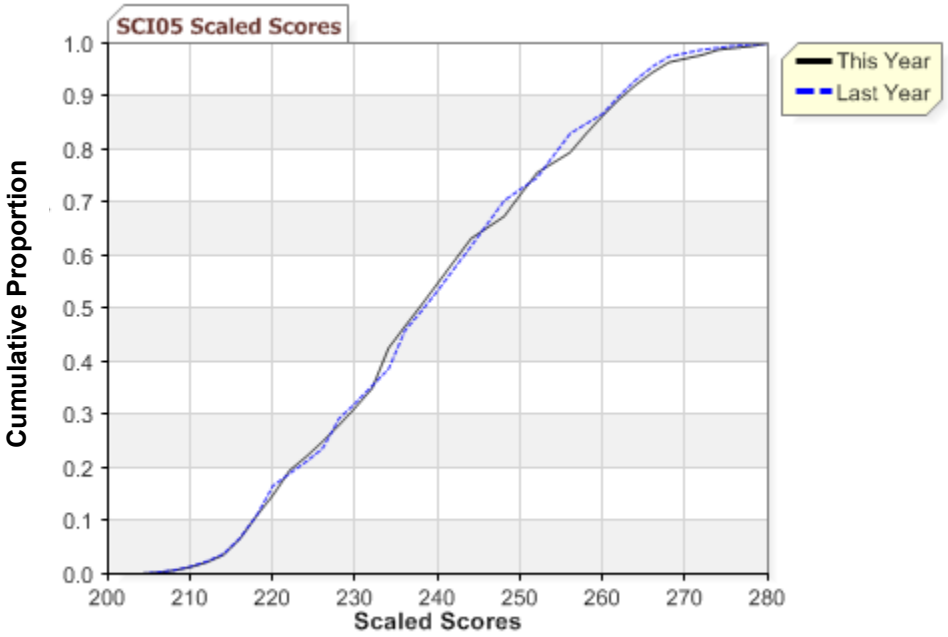
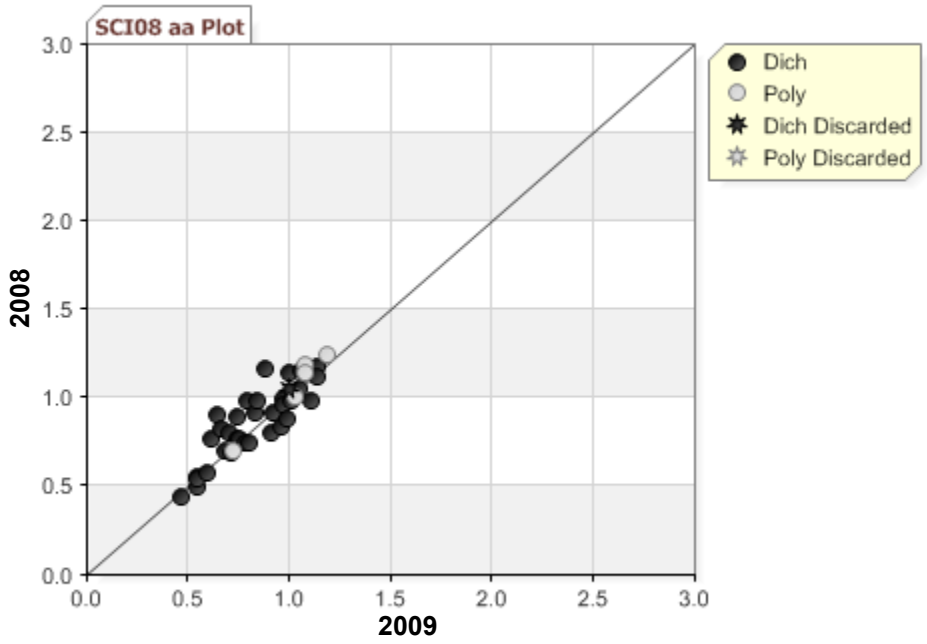
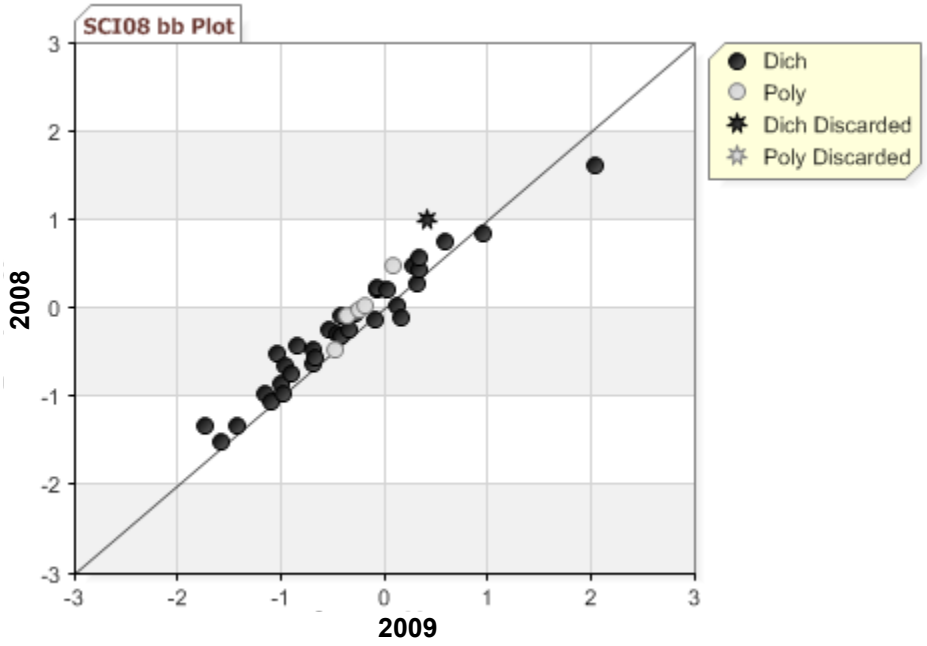
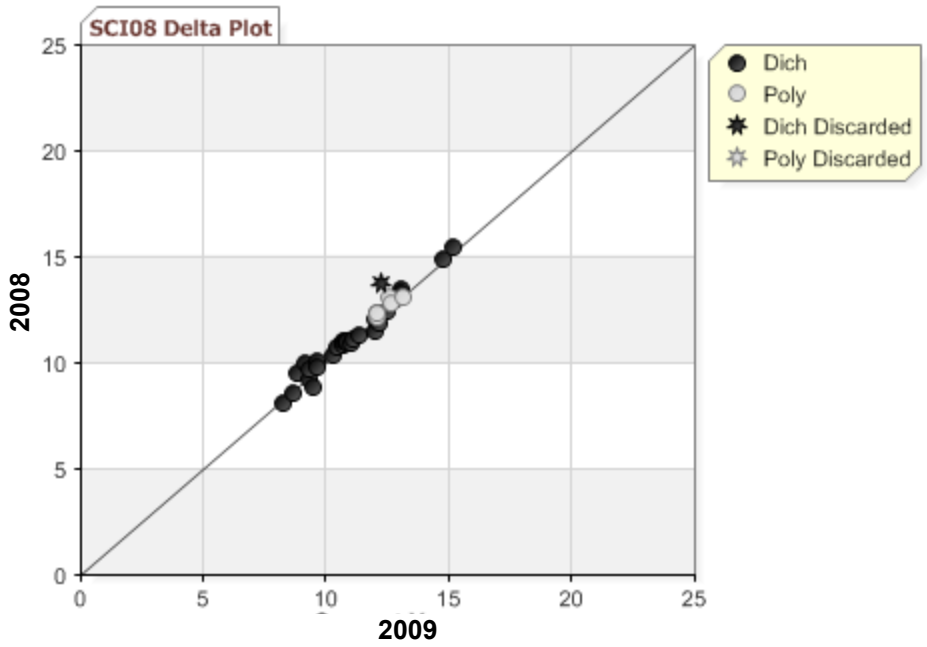
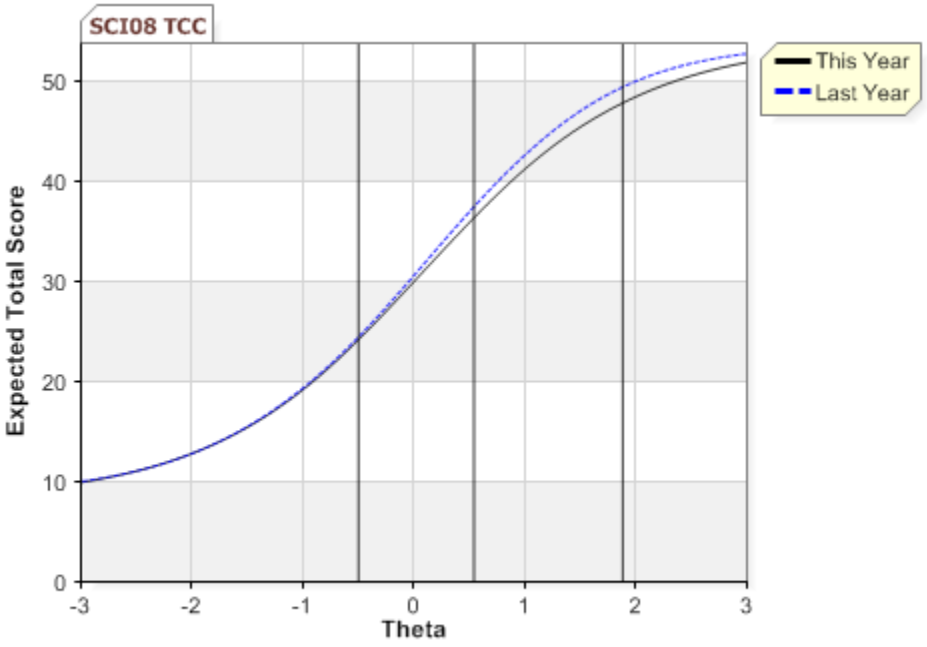

SCI05 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

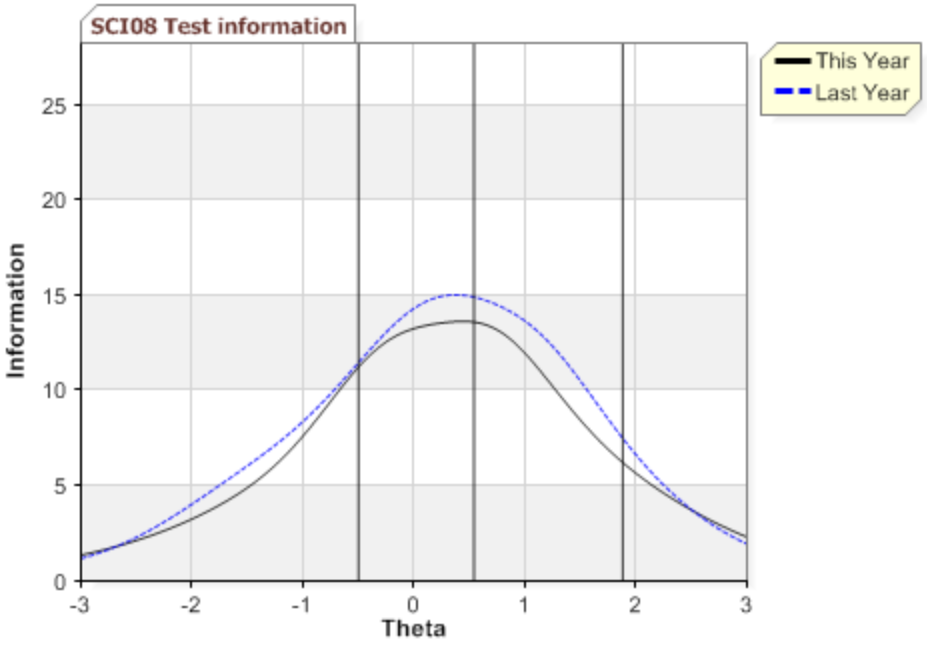
Figure 6-16. 2009 MCAS: IRT Statistics—Science and Technology/Engineering Grade 8






SCI08 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


SCI08 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
-3
-2
-1
0
1
2
3


SCI08 Test information
This Year
Last Year
Information
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

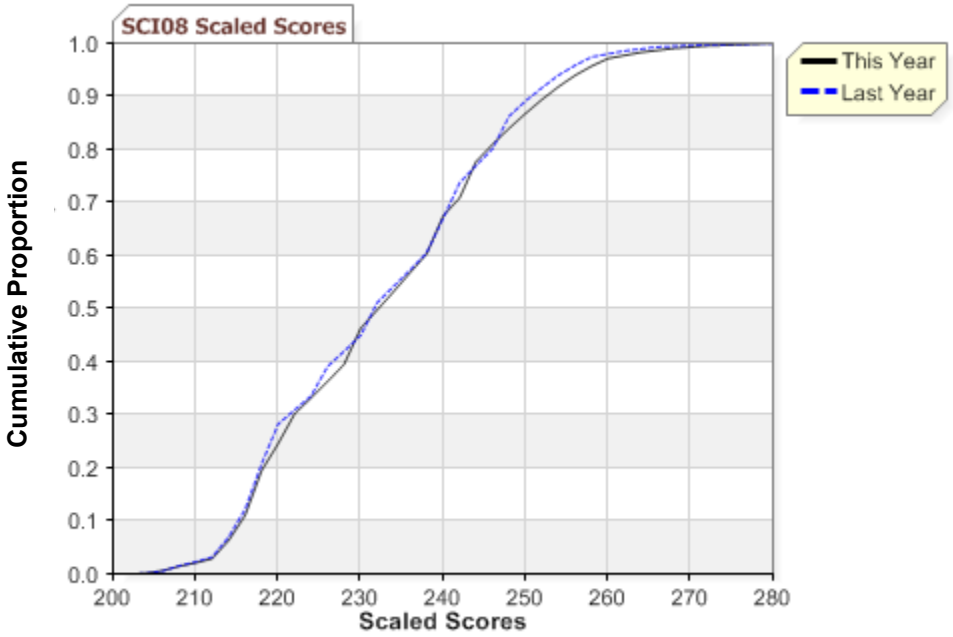
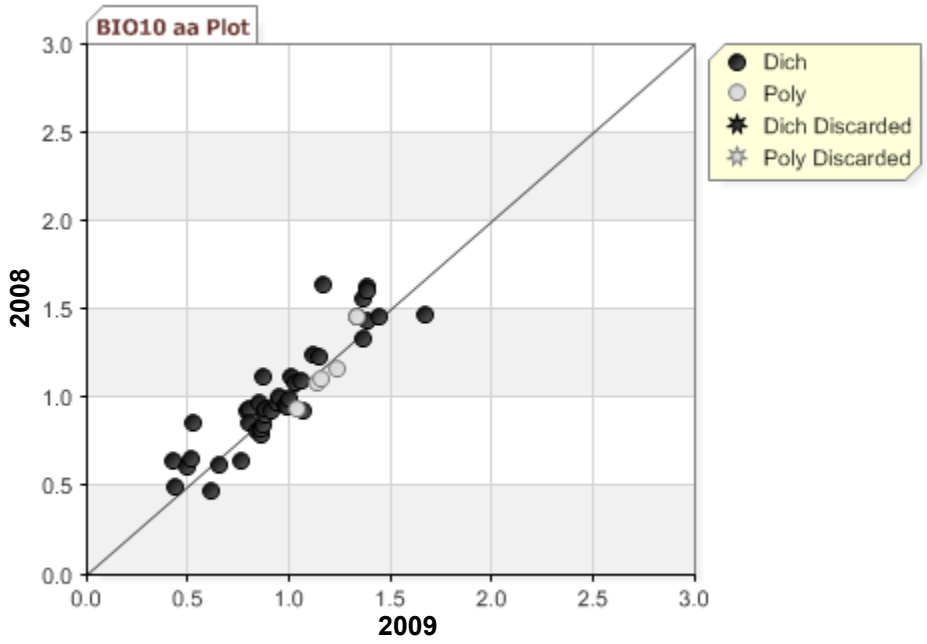
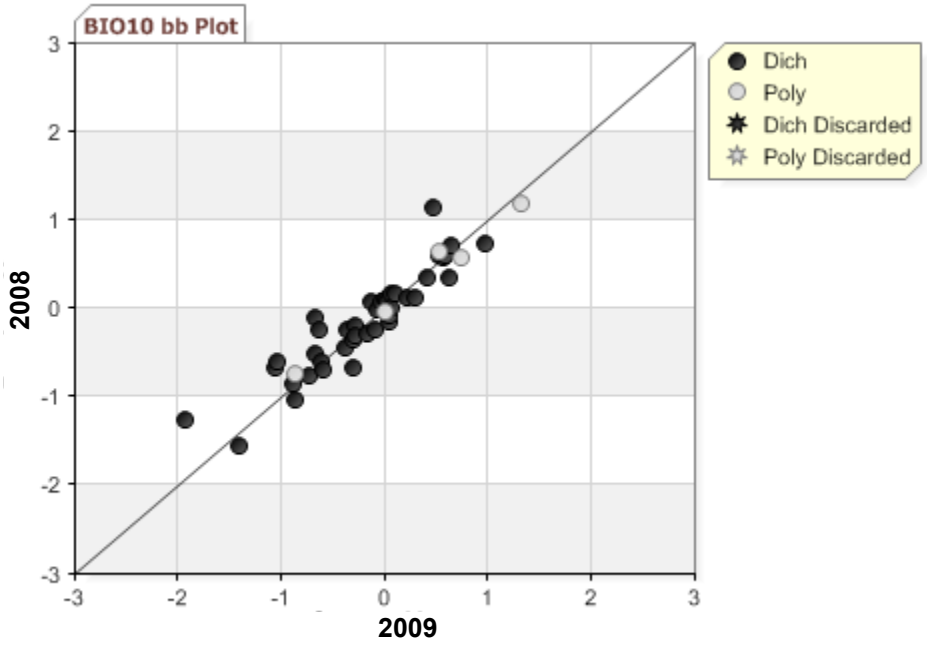
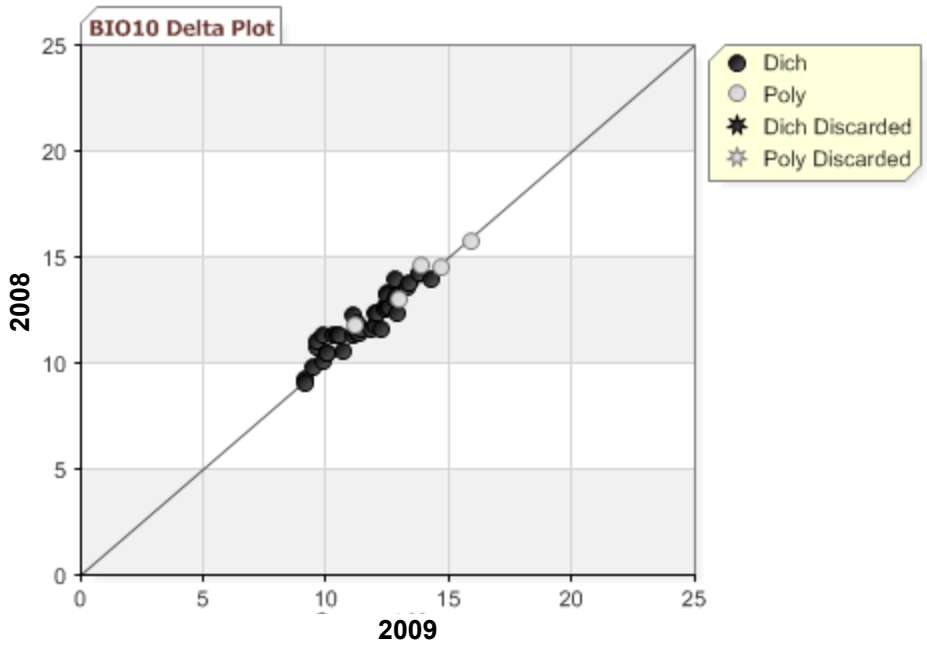
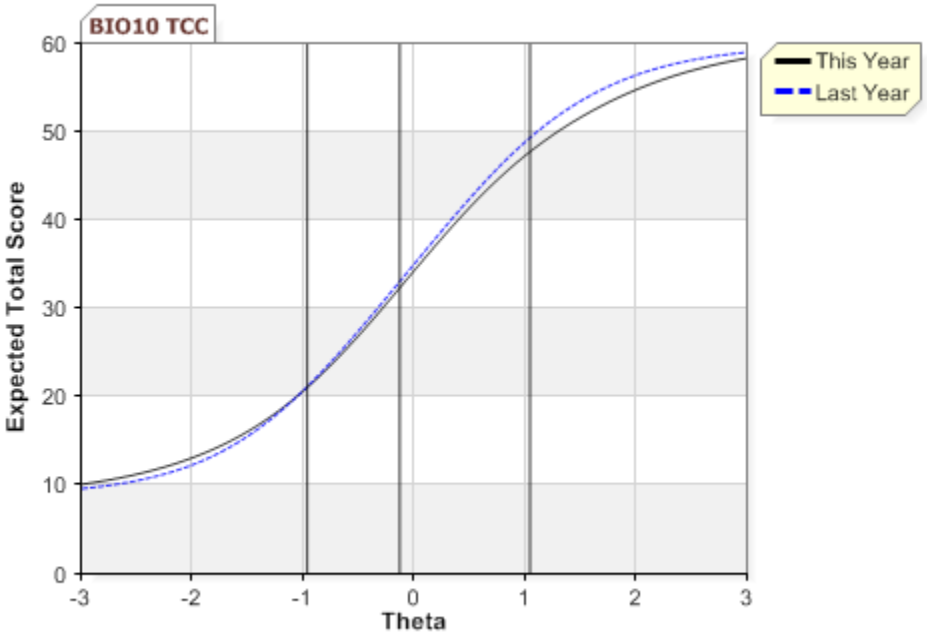

SCI08 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

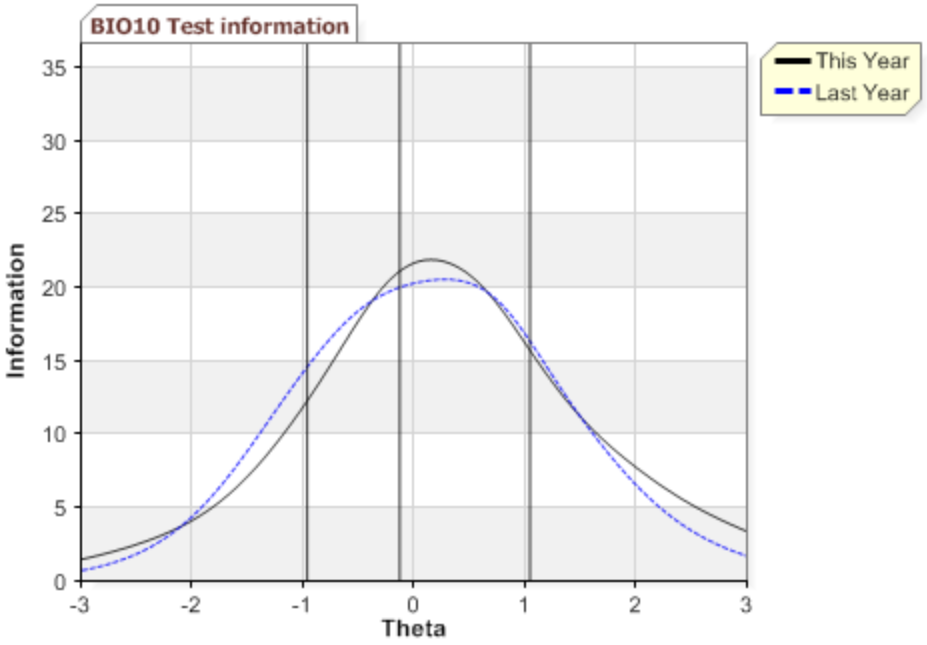
Figure 6-17. 2009 MCAS: IRT Statistics—High School Biology (Grades 9–11)






BIO10 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


BIO10 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
60
-3
-2
-1
0
1
2
3


BIO10 Test information
This Year
Last Year
Information
35
30
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

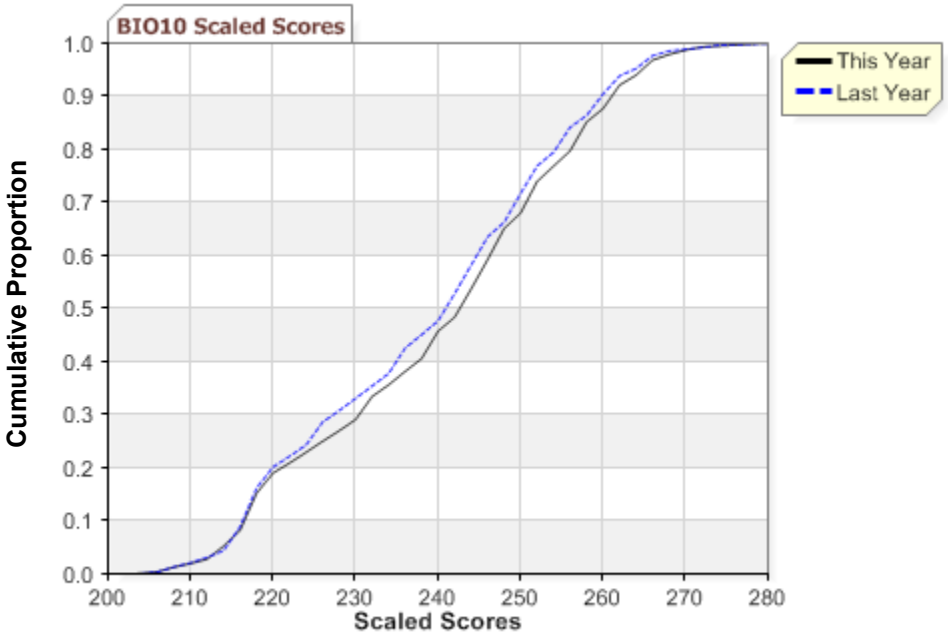
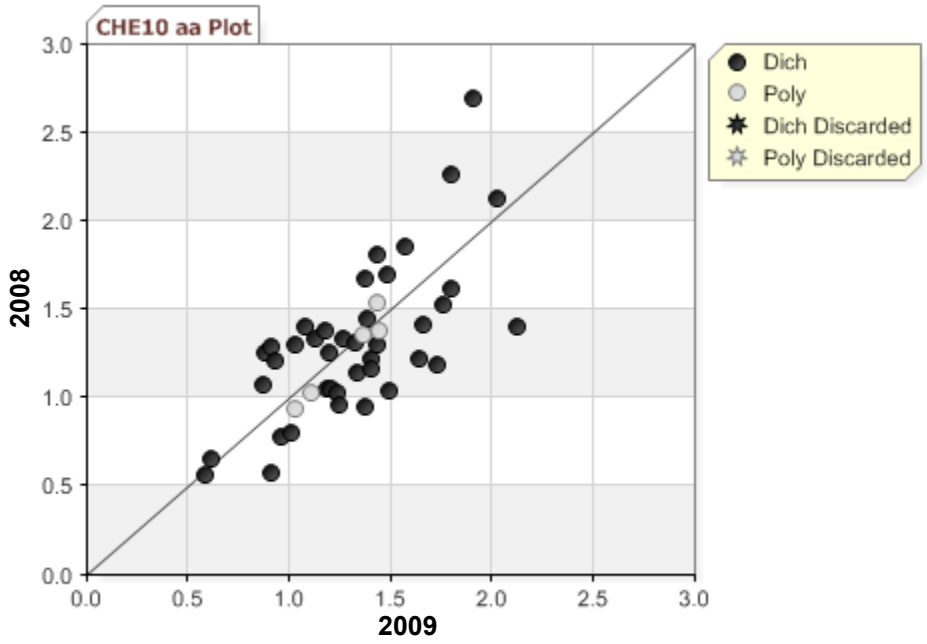
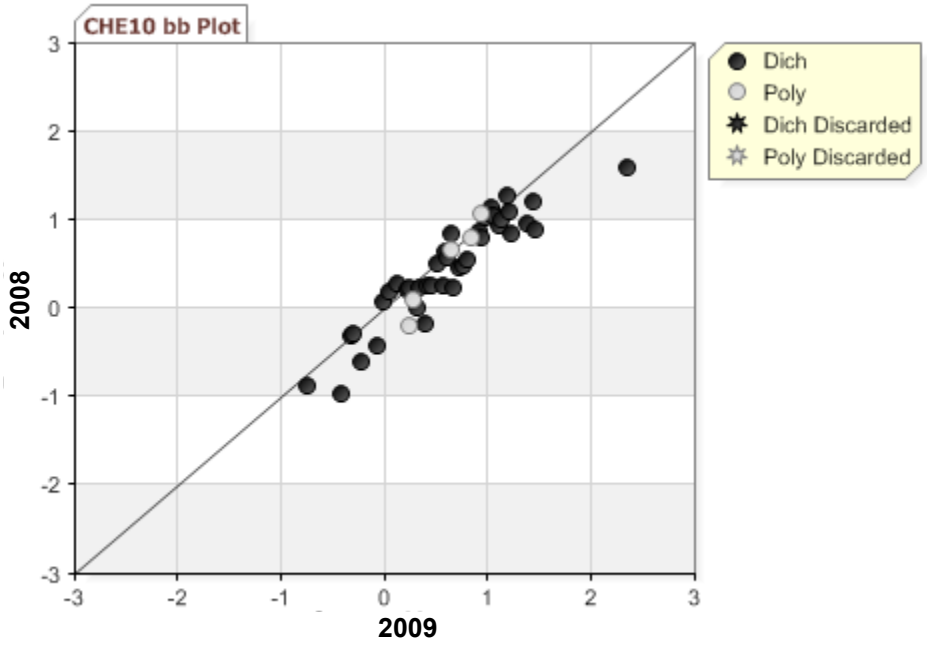
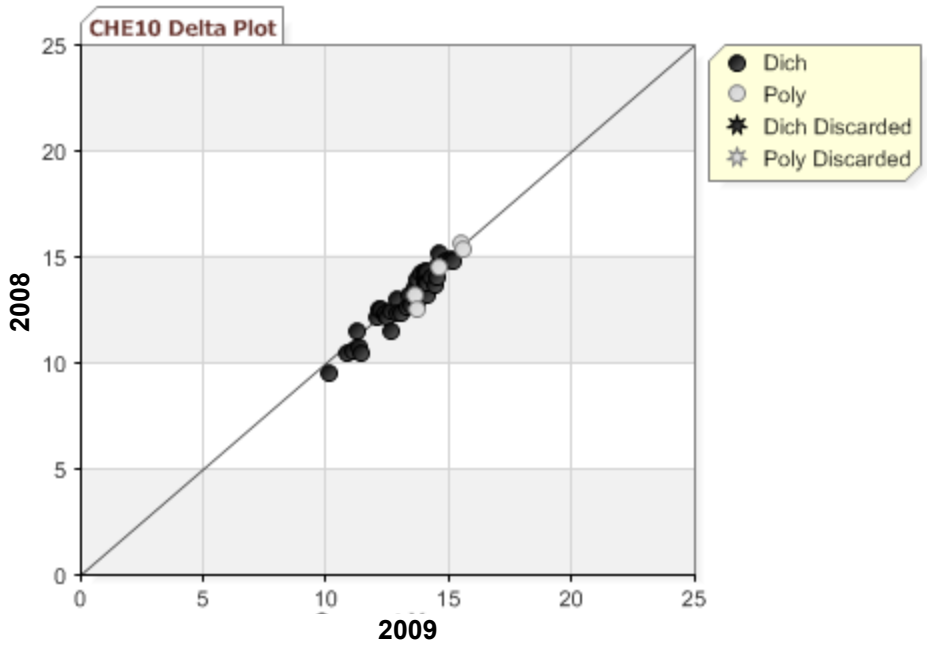
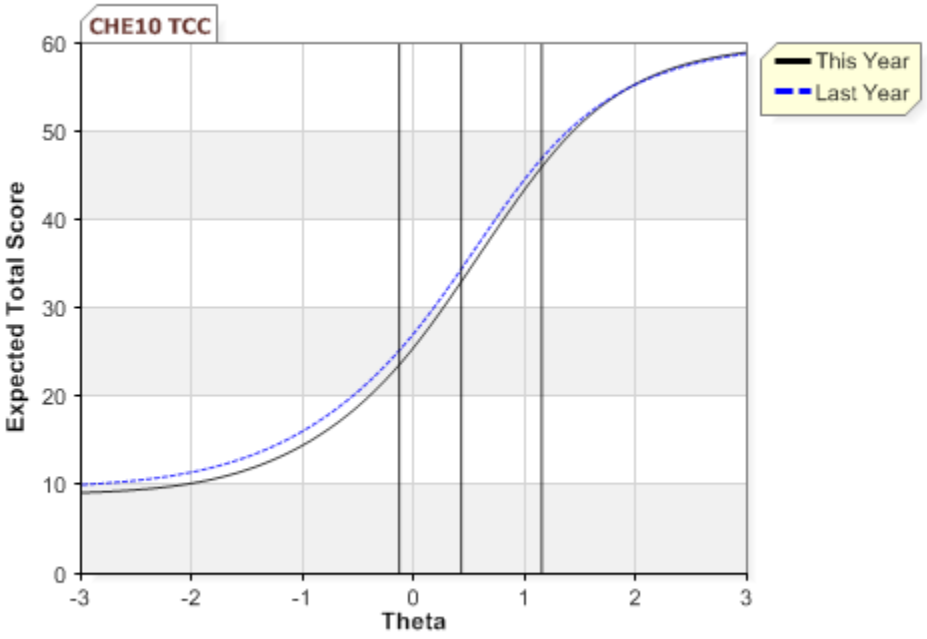

BIO10 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

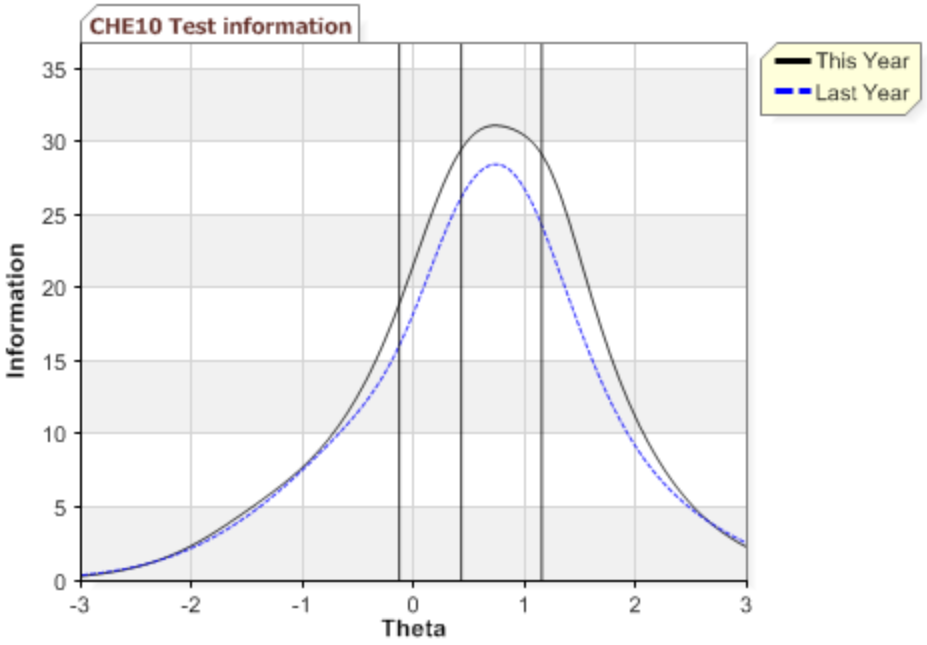
Figure 6-18. 2009 MCAS: IRT Statistics—High School Chemistry (Grades 9–11)






CHE10 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


CHE10 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
60
-3
-2
-1
0
1
2
3


CHE10 Test information
This Year
Last Year
Information
Theta
35
30
25
20
15
10
5
0
-3
-2
-1
0
1
2
3

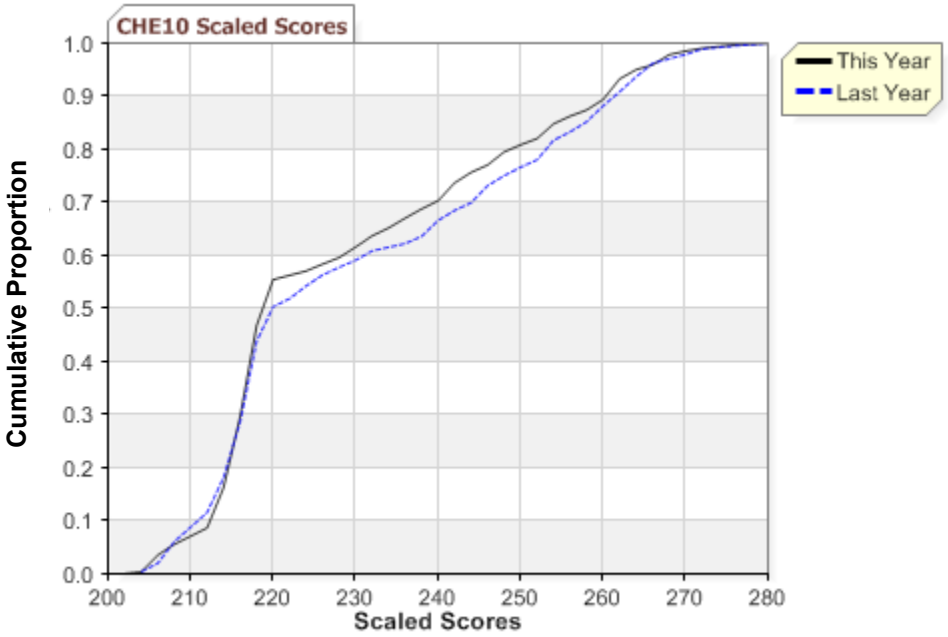
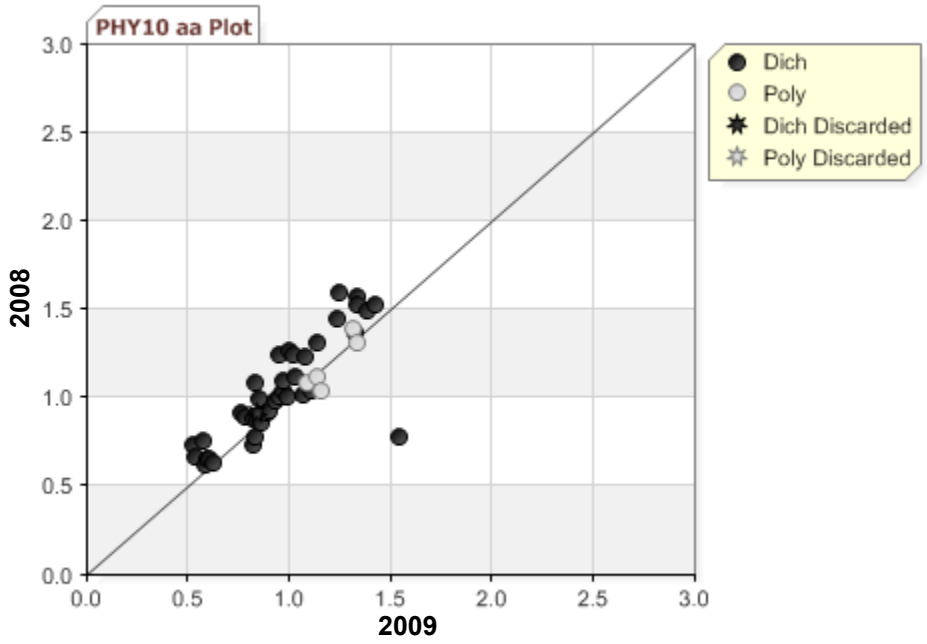
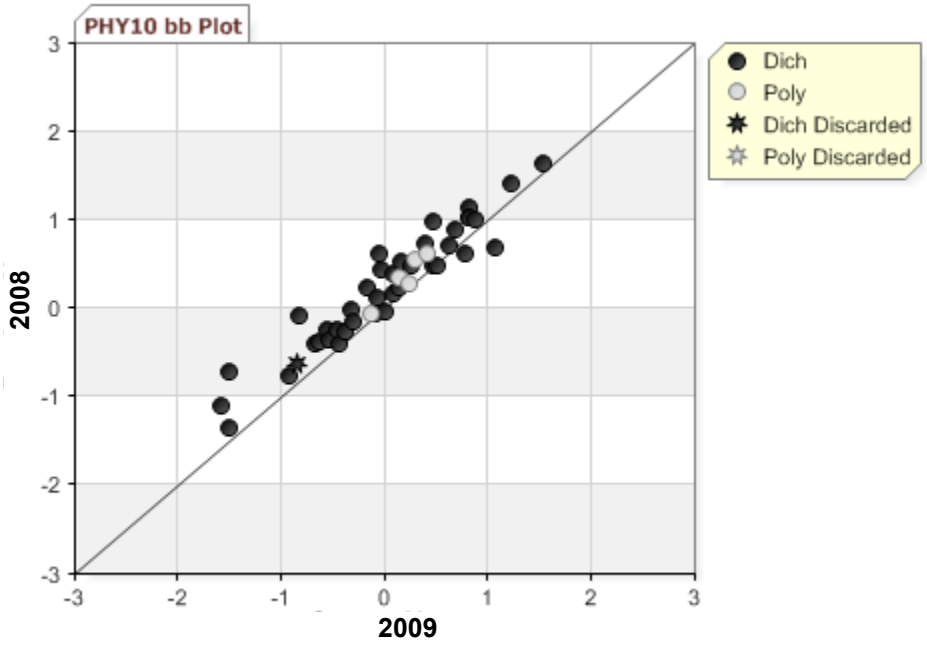
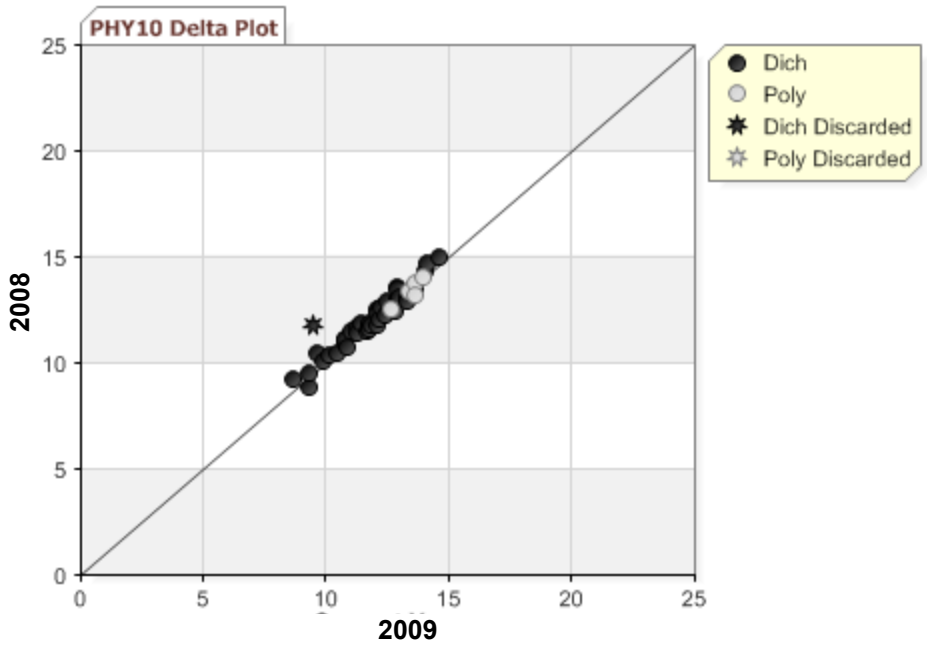
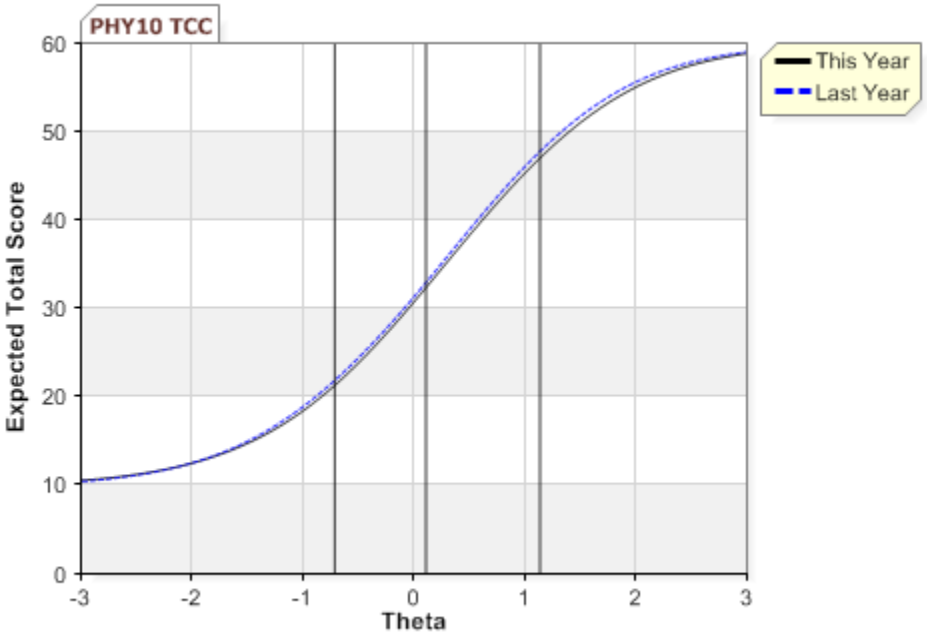

CHE10 Scaled Scores
This Year
Last Year
Cumulative Proportion
Scaled Scores
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280

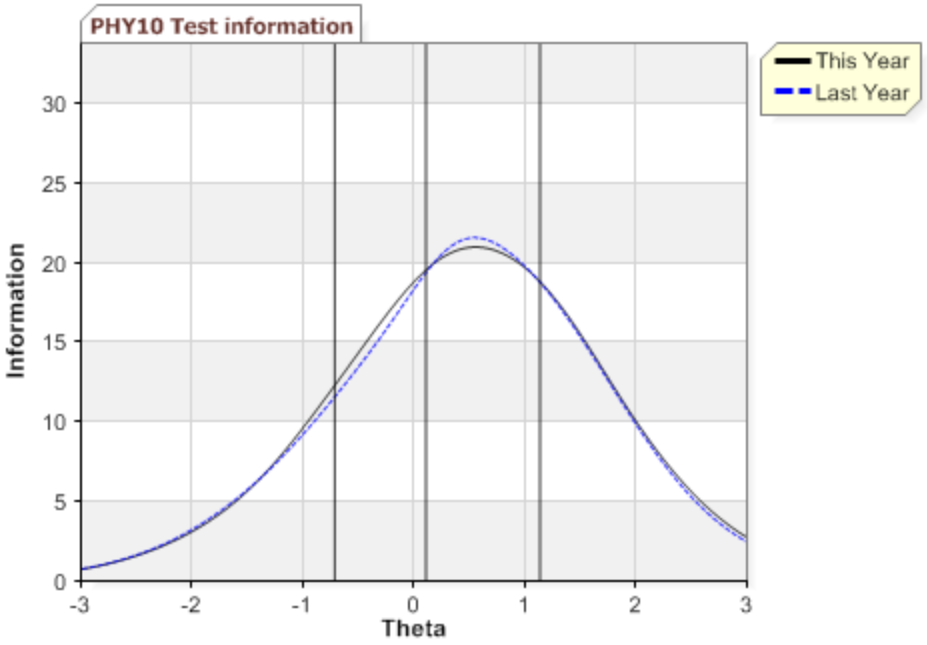
Figure 6-19. 2009 MCAS: IRT Statistics—High School Introductory Physics (Grades 9–11)






PHY10 Delta Plot
Dich
Poly
Dich Discarded
Poly Discarded
2008
2009
0
5
10
15
20
25


PHY10 TCC
This Year
Last Year
Expected Total Score
Theta
0
10
20
30
40
50
60
-3
-2
-1
0
1
2
3


PHY10 Test information
This Year
Last Year
Information
30
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
Theta

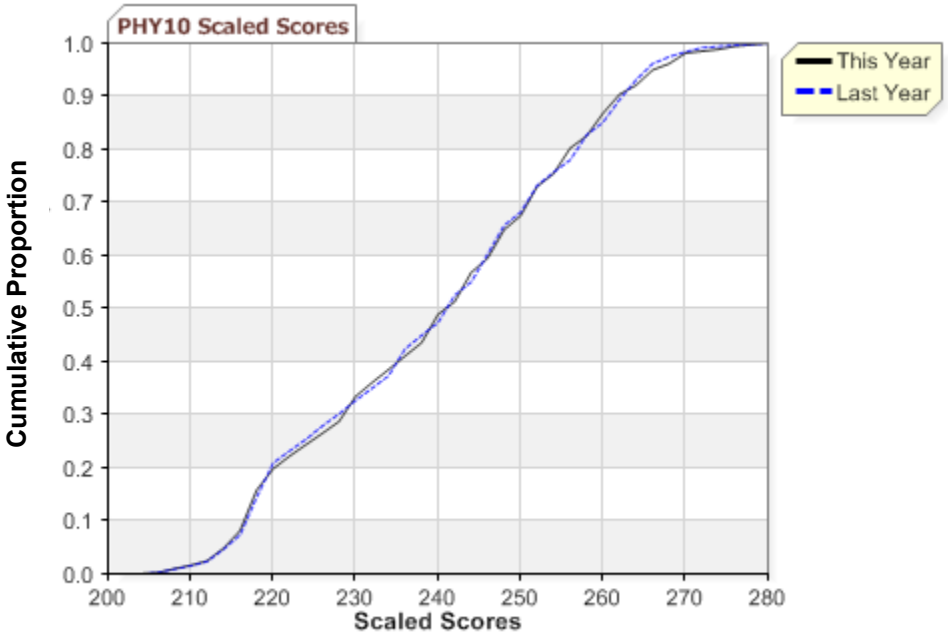
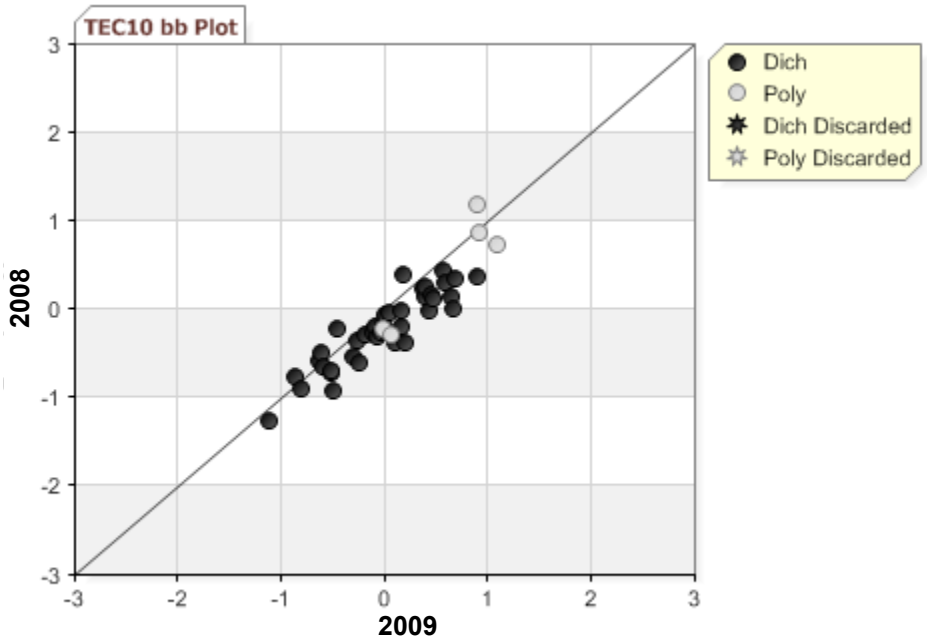
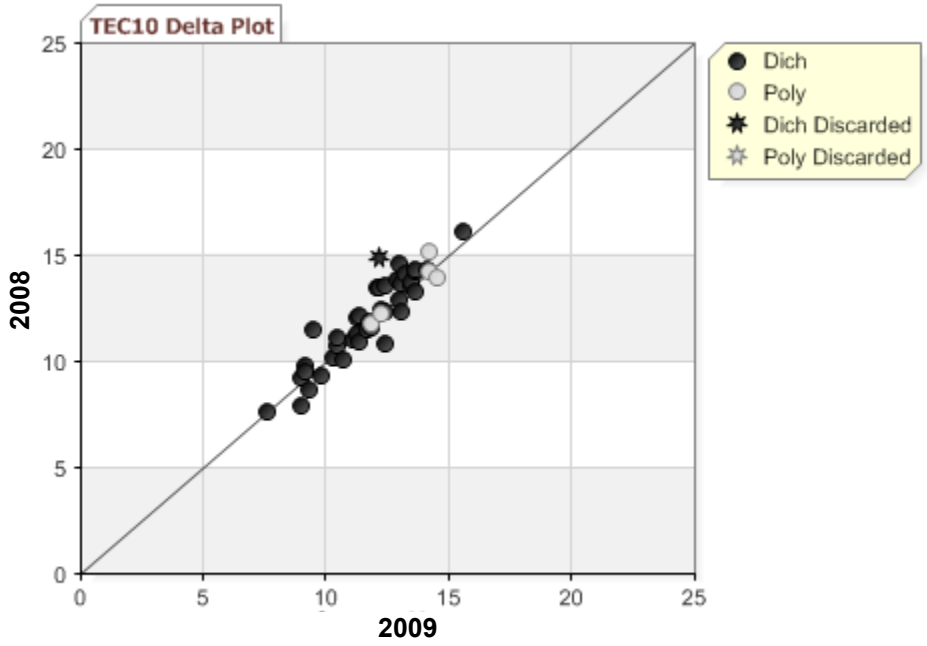
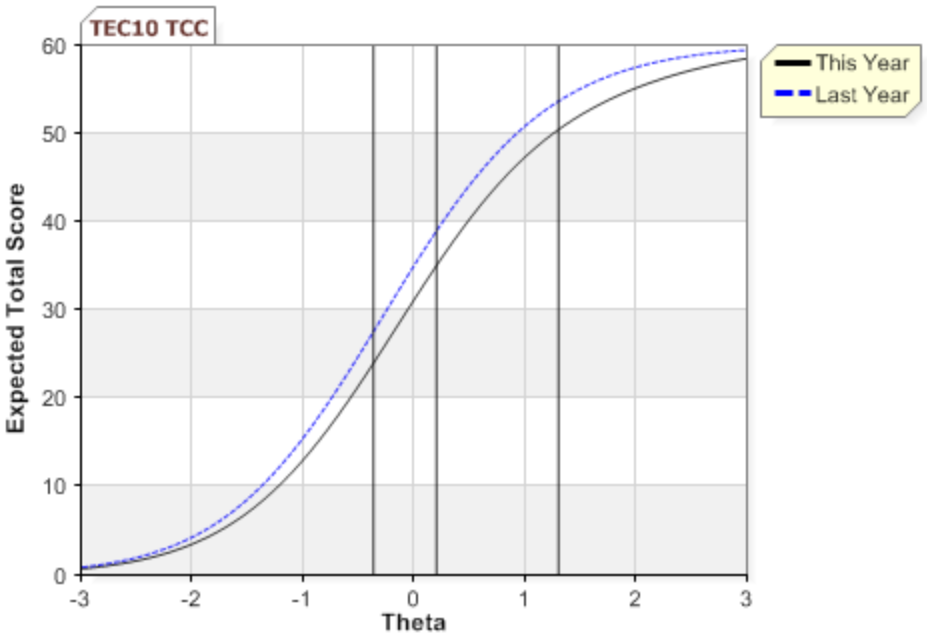
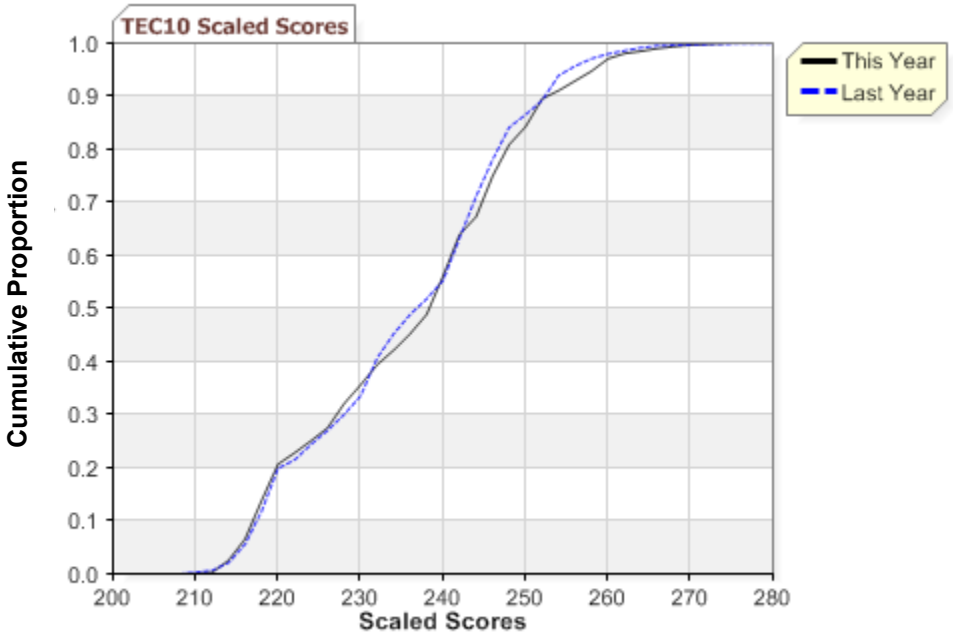

PHY10 Scaled Scores
This Year
Last Year
Cumulative Proportion
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280
Scaled Scores

Figure 6-20. 2009 MCAS: IRT Statistics—High School Technology/Engineering (Grades 9–11)






TEC10 TCC
This Year
Last Year
Expected Total Score
Theta
60
50
40
30
20
10
0
-3
-2
-1
0
1
2
3


TEC10 Scaled Scores
This Year
Last Year
Cumulative Proportion
Scaled Scores
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
200
210
220
230
240
250
260
270
280

6.3 Test Reliability

The *2007 MCAS Technical Report* contains information about the rationale behind test reliability and some methods of measuring it, including a description of the split-half method.

6.3.1 Reliability and Standard Errors of Measurement

Table 6-49 presents descriptive statistics, Cronbach's (1951) alpha (α) coefficient, and raw score standard errors of measurement for each 2009 MCAS test at each grade. Alpha is computed using the following formula:

$$\alpha_{strat} = 1 - \frac{\sum_{j=1}^{k} \sigma_{x_j}^2 (1 - \alpha_j)}{\sigma_x^2}$$

where
i indexes the item,
n is the total number of items,
$\sigma^2(Y_i)$ represents individual item variance, and
σ_x^2 represents the total test variance.

Table 6-34. 2009 MCAS: Test Reliabilities, Descriptive Statistics, and Standard Errors of Measurement
SD = Standard Deviation; Rel = Reliability; SEM = Standard Error of Measurement

Content Area	*Grade Level*	*Number of Students*	*Raw Score Points*	*Min Score*	*Max Score*	*Mean Score*	*SD*	*Rel*	*SEM*
English Language Arts (Composition not included)	3	69,408	48	0	48	34.24	8.249	0.909	2.492
	4	69,185	72	3	71	48.78	10.063	0.895	3.253
	5	70,384	52	0	52	37.40	7.836	0.896	2.533
	6	69,818	52	0	52	38.30	8.053	0.888	2.698
	7	70,473	72	4	72	51.55	9.881	0.892	3.251
	8	72,100	52	2	52	38.15	8.848	0.905	2.722
	10	69,855	72	1	72	54.08	10.199	0.887	3.436
Mathematics	3	69,600	40	0	40	29.88	7.593	0.894	2.475
	4	69,409	54	1	54	38.10	10.399	0.892	3.425
	5	70,497	54	1	54	37.45	11.709	0.912	3.464
	6	69,828	54	1	54	37.90	11.329	0.913	3.336
	7	70,686	54	1	54	36.99	12.216	0.919	3.478
	8	72,042	54	0	54	34.57	12.476	0.917	3.591
	10	69,635	60	0	60	37.36	13.751	0.925	3.764
Science and Technology/ Engineering	5	70,539	54	4	54	34.48	9.028	0.854	3.451
	8	71,982	54	3	54	31.92	9.969	0.873	3.555
Biology	9–11	50,477	60	2	60	35.73	11.448	0.916	3.315
Chemistry	9–11	1,638	60	4	60	32.18	13.457	0.919	3.83
Introductory Physics	9–11	17,722	60	3	60	34.13	12.218	0.91	3.672
Technology/Engineering	9–11	1,971	60	8	57	35.74	9.547	0.859	3.582

6.3.2 Stratified Coefficient Alpha (α)

According to Feldt and Brennan (1989), a prescribed distribution of items over categories (such as different item types) indicates the presumption that at least a small, but important, degree of unique variance is associated with the categories. In contrast, Cronbach's (1951) coefficient α is built on the assumption that there are no such local or clustered dependencies. A stratified version of coefficient α corrects for this problem.

Stratified α is defined as follows:

$$\alpha_{strat} = 1 - \frac{\sum_{j=1}^{k} \sigma_{x_j}^2 (1 - \alpha_j)}{\sigma_x^2}$$

where
j indexes the subtests or categories,
$\sigma_{x_j}^2$ represents the variance of the k individual subtests or categories,
α_j is the unstratified Cronbach's α coefficient for each subtest and
σ_x^2 represents the total test variance.

Stratified α was calculated for each 2009 MCAS grade and content area combination based on item type (multiple-choice versus constructed-response). Results are provided in Table 6-50. Note that N_{mc} refers to the number of multiple-choice items on a given test, while N_{or} denotes the number of open-response items (with number of possible points on OR items in parentheses).

Table 6-35. 2009 MCAS: Test Coefficients Cronbach's α and Stratified α

Content Area	*Grade Level*	*Cronbach's* α	*Cronbach's* α_{mc}	N_{mc}	*Cronbach's* α_{or}	N_{or}	*Stratified* α
English Language Arts	3	0.91	0.90	40	0.60	2 (8)	0.91
	4	0.90	0.88	36	0.85	6 (36)	0.92
	5	0.90	0.89	36	0.75	4 (16)	0.91
	6	0.89	0.87	36	0.82	4 (16)	0.91
	7	0.89	0.87	36	0.86	6 (36)	0.92
	8	0.91	0.90	36	0.85	4 (16)	0.93
	10	0.89	0.86	36	0.85	6 (36)	0.91
Mathematics	3	0.89	0.86	25	0.74	10 (15)	0.90
	4	0.89	0.85	29	0.78	10 (25)	0.90
	5	0.91	0.89	29	0.81	10 (25)	0.92
	6	0.91	0.88	29	0.84	10 (25)	0.92
	7	0.92	0.89	29	0.84	10 (25)	0.93
	8	0.92	0.88	29	0.84	10 (25)	0.92
	10	0.93	0.89	32	0.86	10 (28)	0.93
Science and Technology/Engineering	5	0.85	0.83	34	0.69	5 (20)	0.87
	8	0.87	0.85	34	0.73	5 (20)	0.89
Biology	9–11	0.92	0.89	40	0.81	5 (20)	0.92
Chemistry	9–11	0.92	0.90	40	0.84	5 (20)	0.93
Introductory Physics	9–11	0.91	0.88	40	0.83	5 (20)	0.92
Technology/Engineering	9–11	0.86	0.82	40	0.75	5 (20)	0.87

6.3.3 Reliability of Performance Level Categorization

Details about the determination of statistical accuracy and consistency of classifications are provided in the *2007 Technical Report*, including information regarding the Livingston and Lewis (1995) methods.

Summaries of the accuracy and consistency analyses for the 2009 MCAS administration are provided in Tables 6-36 through 6-55.

The first section of each table shows the overall accuracy and consistency indices, as well as kappa (κ). The overall index is the sum of the diagonal elements of the appropriate contingency table.

The second section shows accuracy and consistency values conditional on performance level. For instance, the conditional accuracy value is 0.808 for the *Needs Improvement* category for grade 4 ELA. This indicates that, of the students whose true scores placed them in the *Needs Improvement* category, 81 percent would be expected to be in the same category if classified according to their actual scores. The corresponding consistency value of 0.755 indicates that 76 percent of the grade 4 students in the *Needs Improvement* category would be expected to score in that category again if a second, parallel test form were administered.

The third section provides data at each cutpoint. These values indicate the accuracy and consistency of the pass or fail decisions, either above or below the associated cutpoint. In addition, false positive and false negative accuracy rates are given. These values are estimates of the proportions of students who were categorized above the cut when their true scores would place them below the cut, and vice versa.

Table 6-36. 2009 MCAS: Accuracy and Consistency
English Language Arts Grade 3

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.763		0.687		0.531
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.830		0.751
	Needs Improvement (NI)		0.818		0.760
	Proficient (P)		0.734		0.692
	Above Proficient (AP)		0.662		0.484
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.973	0.013	0.014	0.962
	NI:P	0.916	0.047	0.038	0.883
	P:AP	0.875	0.096	0.030	0.842

Table 6-37. 2009 MCAS: Accuracy and Consistency
English Language Arts Grade 4

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.795		0.715		0.583
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.797		0.686
	Needs Improvement (NI)		0.808		0.755
	Proficient (P)		0.758		0.678
	Advanced (A)		0.854		0.715
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.961	0.017	0.022	0.945
	NI:P	0.899	0.058	0.043	0.860
	P:A	0.935	0.046	0.020	0.909

Table 6-38. 2009 MCAS: Accuracy and Consistency
English Language Arts Grade 5

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.800		0.724		0.590
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.770		0.629
	Needs Improvement (NI)		0.820		0.771
	Proficient (P)		0.756		0.684
	Advanced (A)		0.866		0.737
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.979	0.008	0.013	0.970
	NI:P	0.901	0.056	0.043	0.863
	P:A	0.920	0.056	0.024	0.890

Table 6-39. 2009 MCAS: Accuracy and Consistency
English Language Arts Grade 6

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.789		0.708		0.572
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.776		0.650
	Needs Improvement (NI)		0.775		0.708
	Proficient (P)		0.764		0.700
	Advanced (A)		0.872		0.738
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.971	0.012	0.017	0.959
	NI:P	0.904	0.054	0.042	0.866
	P:A	0.914	0.062	0.024	0.881

Table 6-40. 2009 MCAS: Accuracy and Consistency
English Language Arts Grade 7

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.812		0.739		0.586
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.762		0.608
	Needs Improvement (NI)		0.783		0.711
	Proficient (P)		0.820		0.773
	Advanced (A)		0.853		0.710
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.980	0.008	0.013	0.971
	NI:P	0.908	0.049	0.043	0.872
	P:A	0.925	0.054	0.022	0.896

Table 6-41. 2009 MCAS: Accuracy and Consistency
English Language Arts Grade 8

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.841		0.779		0.624
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.769		0.629
	Needs Improvement (NI)		0.768		0.686
	Proficient (P)		0.856		0.829
	Advanced (A)		0.878		0.744
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.984	0.006	0.010	0.977
	NI:P	0.934	0.034	0.032	0.908
	P:A	0.922	0.057	0.021	0.894

Table 6-42. 2009 MCAS: Accuracy and Consistency
English Language Arts Grade 10

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.833		0.767		0.636
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Failing (F)		0.762		0.601
	Needs Improvement (NI)		0.800		0.725
	Proficient (P)		0.813		0.765
	Advanced (A)		0.892		0.804
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	F:NI	0.990	0.004	0.006	0.986
	NI:P	0.933	0.034	0.033	0.906
	P:A	0.909	0.059	0.032	0.875

Table 6-43. 2009 MCAS: Accuracy and Consistency
Mathematics Grade 3

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.737		0.648		0.510
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.807		0.729
	Needs Improvement (NI)		0.708		0.624
	Proficient (P)		0.695		0.624
	Above Proficient (AP)		0.831		0.672
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.952	0.024	0.024	0.933
	NI:P	0.903	0.058	0.040	0.866
	P:AP	0.883	0.087	0.031	0.844

Table 6-44. 2009 MCAS: Accuracy and Consistency
Mathematics Grade 4

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.750		0.667		0.518
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.791		0.696
	Needs Improvement (NI)		0.801		0.752
	Proficient (P)		0.659		0.577
	Advanced (A)		0.800		0.625
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.962	0.018	0.020	0.946
	NI:P	0.894	0.065	0.041	0.855
	P:A	0.894	0.079	0.027	0.859

Table 6-45. 2009 MCAS: Accuracy and Consistency
Mathematics Grade 5

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.762		0.678		0.563
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.833		0.772
	Needs Improvement (NI)		0.745		0.668
	Proficient (P)		0.671		0.582
	Advanced (A)		0.863		0.743
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.950	0.026	0.024	0.931
	NI:P	0.912	0.053	0.035	0.878
	P:A	0.899	0.070	0.031	0.864

Table 6-46. 2009 MCAS: Accuracy and Consistency
Mathematics Grade 6

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.770		0.688		0.574
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.820		0.753
	Needs Improvement (NI)		0.734		0.653
	Proficient (P)		0.709		0.629
	Advanced (A)		0.877		0.761
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.951	0.025	0.024	0.931
	NI:P	0.915	0.051	0.035	0.882
	P:A	0.905	0.067	0.028	0.872

Table 6-47. 2009 MCAS: Accuracy and Consistency
Mathematics Grade 7

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.767		0.686		0.571
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.847		0.797
	Needs Improvement (NI)		0.752		0.677
	Proficient (P)		0.717		0.645
	Advanced (A)		0.818		0.660
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.945	0.029	0.026	0.923
	NI:P	0.916	0.051	0.032	0.885
	P:A	0.906	0.069	0.026	0.875

Table 6-48. 2009 MCAS: Accuracy and Consistency
Mathematics Grade 8

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.778		0.698		0.596
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.845		0.797
	Needs Improvement (NI)		0.736		0.650
	Proficient (P)		0.702		0.612
	Advanced (A)		0.877		0.767
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.938	0.034	0.028	0.914
	NI:P	0.920	0.048	0.031	0.890
	P:A	0.920	0.055	0.025	0.890

Table 6-49. 2009 MCAS: Accuracy and Consistency
Mathematics Grade 10

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.824		0.758		0.628
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Failing (F)		0.711		0.587
	Needs Improvement (NI)		0.703		0.610
	Proficient (P)		0.736		0.649
	Advanced (A)		0.937		0.893
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	F:NI	0.963	0.017	0.020	0.949
	NI:P	0.936	0.035	0.029	0.910
	P:A	0.925	0.046	0.030	0.895

Table 6-50. 2009 MCAS: Accuracy and Consistency
Science and Technology/Engineering Grade 5

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.736		0.643		0.490
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.753		0.624
	Needs Improvement (NI)		0.757		0.695
	Proficient (P)		0.653		0.557
	Advanced (A)		0.848		0.685
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.948	0.022	0.030	0.927
	NI:P	0.876	0.075	0.048	0.830
	P:A	0.911	0.066	0.023	0.877

Table 6-51. 2009 MCAS: Accuracy and Consistency
Science and Technology/Engineering Grade 8

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.774		0.689		0.536
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Warning (W)		0.797		0.716
	Needs Improvement (NI)		0.755		0.687
	Proficient (P)		0.788		0.712
	Advanced (A)		0.734		0.448
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	W:NI	0.926	0.037	0.037	0.897
	NI:P	0.891	0.068	0.041	0.849
	P:A	0.957	0.037	0.006	0.941

Table 6-52. 2009 MCAS: Accuracy and Consistency
High School Biology (Grades 9–11)

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.804		0.729		0.615
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Failing (F)		0.824		0.757
	Needs Improvement (NI)		0.750		0.664
	Proficient (P)		0.818		0.760
	Advanced (A)		0.841		0.723
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	F:NI	0.950	0.026	0.024	0.930
	NI:P	0.926	0.042	0.032	0.897
	P:A	0.928	0.047	0.025	0.901

Table 6-53. 2009 MCAS: Accuracy and Consistency
High School Chemistry (Grades 9–11)

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.824		0.755		0.648
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Failing (F)		0.887		0.868
	Needs Improvement (NI)		0.721		0.604
	Proficient (P)		0.743		0.644
	Advanced (A)		0.898		0.806
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	F:NI	0.917	0.053	0.030	0.883
	NI:P	0.944	0.035	0.021	0.922
	P:A	0.962	0.026	0.013	0.947

Table 6-54. 2009 MCAS: Accuracy and Consistency
High School Introductory Physics (Grades 9–11)

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.799		0.721		0.608
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Failing (F)		0.796		0.712
	Needs Improvement (NI)		0.746		0.666
	Proficient (P)		0.807		0.742
	Advanced (A)		0.882		0.772
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	F:NI	0.944	0.027	0.028	0.922
	NI:P	0.915	0.049	0.036	0.881
	P:A	0.940	0.041	0.019	0.917

Table 6-55. 2009 MCAS: Accuracy and Consistency
High School Technology/Engineering (Grades 9–11)

Overall Indices	*Accuracy*		*Consistency*		*Kappa (κ)*
	0.782		0.698		0.542
Indices Conditional on Level	*Performance Level*		*Accuracy*		*Consistency*
	Failing (F)		0.770		0.659
	Needs Improvement (NI)		0.752		0.684
	Proficient (P)		0.808		0.739
	Advanced (A)		0.824		0.608
Indices at Cutpoints		*Accuracy*			*Consistency*
		Accuracy	*False Positives*	*False Negatives*	
	F:NI	0.942	0.026	0.032	0.919
	NI:P	0.886	0.068	0.046	0.842
	P:A	0.955	0.036	0.010	0.936

6.4 Validity

Evidence is presented in detail throughout this document to support inferences of student achievement of the learning standards of the Massachusetts curriculum frameworks, as measured by MCAS, including test development, test alignment, test administration, scoring, equating, item analyses, reliability, scaled scores, performance levels, and reporting. The purpose of this section of the report is to discuss how MCAS ensures the validity of its tests and their results.

6.4.1 Validity Evidence for Standard MCAS Tests

MCAS tests are rigorously examined in reference to the guidelines found in *Standards for Educational and Psychological Testing* (1999), which provide criteria for the evaluation of tests, testing practices, and effects of test use for a broad set of assessments, including alternate assessments.

Standards for Educational and Psychological Testing describes sources of evidence to consider when constructing a validity argument. Examples of standards prescribed by the manual, as well as evidence of how MCAS tests satisfy these standards, are presented below.

- Standard 1.2 (p. 17): "The test developer should set forth clearly how test scores are intended to be interpreted and used."

For the 2009 MCAS administration, the *Guide to Interpreting the Spring 2009 MCAS Reports for Schools and Districts* (www.doe.mass.edu/mcas/results.html) satisfies standard 1.2. The document outlines general guidelines for the interpretation and use of MCAS reports, gives instructions on how to read and interpret specific reports, and provides information on how to make appropriate comparisons and inferences from statistics. Additionally, the *2009 MCAS Parent/Guardian Report* (www.doe.mass.edu/mcas/results.html) provides guidance to parents and guardians regarding interpretation of MCAS results.

- Standard 1.13 (p. 20): "When validity evidence includes statistical analyses of test results, either alone or together with data on other variables, the conditions under which the data were collected should be described in enough detail that users can judge the relevance of the statistical findings to local conditions. Attention should be drawn to any features of a validation data collection that are likely to differ from

typical operational testing conditions and that could plausibly influence test performance."

This standard concerns the degree to which the data collected for validity evidence may be generalized to operational conditions. Most of the statistical evidence of validity for the 2009 MCAS tests (see section 6.4.1.2 on internal structure) was derived from the tests themselves; thus, this evidence is immediately applicable to MCAS. Whenever validity evidence was accrued from a subset of the Massachusetts test-taking population rather than the entire population (e.g., a study of the concordance between MCAS and other instruments, described below), any potential differences between sample and population were thoroughly documented.

- Standard 1.14 (p. 20): "The patterns of association between and among scores on the instrument under study and other variables should be consistent with theoretical expectations."

Massachusetts has accumulated a substantial amount of evidence of the criterion-related validity of MCAS tests. This evidence shows that MCAS test results are correlated strongly with relevant measures of academic achievement. Specific examples may be found in the *2007 MCAS Technical Report*.

Standards for Educational and Psychological Testing (1999) also advocates that evidence in the following three general areas be considered:

- Test content
- Internal structure
- Consequences of testing

Although each source of evidence may speak to a different aspect of validity, they are not distinct types of validity. Instead, each contributes to a body of evidence about the comprehensive validity of score interpretations.

6.4.1.1 *Test Content*

Test content validity is the degree to which MCAS items align to the Massachusetts curriculum framework learning standards for each content area and grade level. Evidence of test content validity is described in greater detail in chapter 2 of this document, "Test Development and Design," and in the *2007 MCAS Technical Report*.

Assessment Development Committees

The primary gauge of the developmental appropriateness of MCAS test items is the review of all items by Massachusetts teachers who serve on MCAS Assessment Development Committees (ADCs). All ADC members have experience teaching students in the content area and grade level for which items are being developed (e.g., grade 5 ELA reading comprehension items are reviewed by Massachusetts teachers who are currently teaching or have recently taught grade 5 reading), so that all items are reviewed by individuals who are best equipped to evaluate the developmental appropriateness of test material.

ADC members serve one-year terms on their respective committees and may re-apply for membership at the end of each term. There is no restriction as to the number of terms a member may serve. The goal of the process is to continually infuse the committee with new members while retaining veteran members. Committee members are required to have content expertise, teaching

experience in the grade and subject matter they are reviewing, and familiarity with the curriculum frameworks. Applications for membership on ADCs request the following:

- Superintendent's signed recommendation
- Current resume
- One- to two-page statement of interest describing why the applicant wishes to serve on a committee and what the applicant can contribute to the committee.

The ESE reviews the applications and determines who will be invited to participate on an ADC.

Approximately 80 percent of the ADC members are female. The composition of the committees is intended to reflect the variety of school districts in Massachusetts. The ESE considers the following when appointing members to the ADCs:

- Geographic distribution—Committee members should represent the length and width of the state from the westernmost districts to the Cape and the Islands.
- Urban/Suburban/Rural distribution—While most districts in the state may fall into the suburban category, it is imperative that urban and rural districts be represented on the committees.
- Economic distribution—The ESE takes care to ensure that districts across the socio-economic continuum receive representation on the ADCs.

A list of the ADC members and their sending districts can be found in Appendix F.

The following steps are taken to review the content of every operational MCAS item:

- Item is provided by Measured Progress (MP) to ESE for review 10 days prior to ADC meeting.
- Item is reviewed by ESE for alignment with Massachusetts curriculum framework and for content accuracy.
- Item is returned to MP with edits.
- Item is reviewed by ADC panelists for alignment, content accuracy, and bias.
- Post-ADC debriefing: item is reviewed by MP and ESE developers.
- Item is presented to Bias and Sensitivity Review Committee for evaluation.
- Item and comments from Bias and Sensitivity Review Committee are reviewed by ESE; decision is made to field test.
- Item is field tested.
- When items are selected to be on the field-test portion of the MCAS, they are submitted to expert reviewers for their feedback. The task of the expert reviewer is to consider the accuracy of the content of the item and to recommend that items be kept as is, edited, or deleted. Each item is reviewed by two independent expert reviewers. All expert reviewers for MCAS are either PhDs or EdDs and are all affiliated with institutions of higher education either in teaching or research positions. Each expert reviewer has been approved by the ESE. Expert review comments are included with the items when they are sent to ADC meetings for statistics reviews.
- Item is reviewed by ADC panelists for statistics (performance), alignment, content, and expert review comments. Panelists make recommendations.
- The Bias and Sensitivity Review Committee review the items and their associated statistics.
- ESE makes final decision to designate item as common, and then item becomes part of that year's test.

Additionally, for the English language arts tests, each reading passage is subjected to a minimum of two readability tests, and the grade level appropriateness of vocabulary within test items is checked against a widely used grade level guide for vocabulary, *EDL Core Vocabularies in Reading, Mathematics, Science, and Social Studies* (Taylor, 1989).

Items and reading passages may be rejected and removed from further consideration at any point in the above process.

Bias and Sensitivity Review Committee

The Bias and Sensitivity Review Committee is comprised of educators and members of the educational community from across the state who assist the ESE in reviewing items for possible bias and sensitivity concerns. They consider all items and passages in terms of gender, race, ethnicity, geography, religion, sexual orientation, culture, and social appropriateness. Members are expected to have some understanding of these issues as well as an understanding of both the MCAS and MEPA testing programs. They receive further training from the ESE. All items are reviewed for bias/sensitivity concerns prior to field testing and a second time with the item statistics. Like the ADCs, The Bias and Sensitivity Review Committee members serve one-year terms and may re-apply for membership upon completion of each term. The Bias and Sensitivity Review Committee member applications must include the following:

- Signed superintendent's recommendation
- Current resume
- One- to two-page statement of interest highlighting which group the applicant feels qualified to represent along with appropriate justification.

While the ESE considers geographic, economic, and urban/suburban/rural distribution in selecting members for this committee, they also consider the groups being represented by the applicants. Appendix F provides a list of all 2009 Bias and Sensitivity Review Committee members.

Bias and Sensitivity Review Committee members meet four times annually in two- to three-day sessions to review passages and items to ensure that students are not disadvantaged by test materials for reasons that are not educationally relevant.

Each item is reviewed two times, once before field testing and again after field testing. Items and passages are checked for conformity to the standards outlined in *Bias Issues in Test Development* (Caporrino & Kerr, 1999). Committee members decide whether to recommend that materials be kept as is, edited, or deleted. The decisions of the Bias and Sensitivity Review Committee are reviewed by the ESE for a final determination.

6.4.1.2 *Internal Structure*

Standard 1.11 of *Standards for Educational and Psychological Testing* (1999) states, "If the rationale for a test use or interpretation depends on premises about the relationships among parts of the test, evidence concerning the internal structure of the test should be provided" (p. 20).

Evidence of the internal structures of MCAS tests is provided through the detailed statistical analyses within this report. Technical characteristics of the internal structures of the assessments are presented in terms of the following:

- Classical item statistics (item difficulty and item-to-total-score correlation, section 6.1.1)
- Differential item functioning analyses (section 6.1.2)

- Item response theory parameters and procedures (section 6.2)
- A variety of reliability coefficients and standard errors of measurement (section 6.3.1)

In addition, psychometricians closely examine theoretically derived and empirically derived item characteristic curves. This allows for the evaluation of item model fit as well as a structural evaluation across all MCAS test items. Redundant analysis performed by the University of Massachusetts at Amherst also supports data structure found through item response theory (IRT) analysis. Each test is equated to the same grade and content area test from the prior year to preserve the meaning of scores over time. Detailed discussions of equating, scaling, and item analyses are provided in sections 4.3 and 6.1 of this report.

6.4.1.3 *Dimensionality Analyses*

Because tests are constructed with multiple content area subcategories and their associated knowledge and skills, the potential exists for a large number of dimensions being invoked beyond the common primary dimension. Generally, the subcategories are highly correlated with each other; therefore, the primary dimension they share typically explains an overwhelming majority of variance in test scores. In fact, the presence of just such a dominant primary dimension is the psychometric assumption that provides the foundation for the unidimensional IRT models used for calibrating, linking, scaling, and equating the MCAS test forms for grades 3 through 8 and high school.

The purpose of dimensionality analysis is to investigate whether violation of the assumption of test unidimensionality is statistically detectable and, if so, (a) the degree to which unidimensionality is violated, and (b) the nature of the multidimensionality. Dimensionality analyses were performed on common items for all MCAS tests administered during the spring 2009 administrations. A total of 20 tests were analyzed, and the results for these analyses are reported in Table 6-71, including a comparison with the results from 2008.

Dimensionality analyses were conducted using the nonparametric IRT-based methods DIMTEST (Stout, 1987; Stout, Froelich, & Gao, 2001) and DETECT (Zhang & Stout, 1999). Both methods use as their basic statistical building block the estimated average conditional covariances for item pairs. A conditional covariance is the covariance between two items conditioned on true score (expected value of observed score) for the rest of the test, and the average conditional covariance is obtained by averaging over all possible conditioning scores. When a test is strictly unidimensional, all estimated conditional covariances are expected to take on values within random noise of zero, indicating statistically independent item responses for examinees with equal expected scores. Nonzero conditional covariances are essentially violations of the principle of local independence, and such local *dependence* implies multidimensionality. Thus, nonrandom patterns of positive and negative conditional covariances are indicative of multidimensionality.

DIMTEST is a hypothesis testing procedure for detecting violations of local independence. The data are first randomly divided into a training sample and a crossvalidation sample. An exploratory analysis of the conditional covariances is conducted on the training sample data to find the cluster of items that displays the greatest evidence of local dependence. The crossvalidation sample is then used to test whether the conditional covariances of the selected cluster of items display local dependence, conditioning on total score on the nonclustered items. The DIMTEST statistic follows a standard normal distribution under the null hypothesis of unidimensionality.

DETECT is an effect size measure of multidimensionality. As with DIMTEST, the data are first randomly divided into a training sample and a crossvalidation sample (these samples are drawn independently of those used with DIMTEST). The training sample is used to find a set of mutually

exclusive and collectively exhaustive clusters of items that best fit a systematic pattern of positive conditional covariances for pairs of items from the same cluster and negative conditional covariances from different clusters. Next, the clusters from the training sample are used with the crossvalidation sample data to average the conditional covariances. The within-cluster conditional covariances are summed, and from this sum the between-cluster conditional covariances are subtracted. The resulting difference is divided by the total number of item pairs, and this average is multiplied by 100 to yield an index of the average violation of local independence for an item pair. DETECT values less than 0.2 indicate very weak multidimensionality (or near unidimensionality), values of 0.2 to 0.4 indicate weak to moderate multidimensionality, values of 0.4 to 1.0 indicate moderate to strong multidimensionality, and values greater than 1.0 indicate very strong multidimensionality.

DIMTEST and DETECT were applied to the common items of the MCAS tests administered during spring 2009 (a total of 20 tests). Each elementary and middle school grade had over 69,000 student examinees per test. For the high school tests, ELA and mathematics each had over 69,000 student examinees, biology had over 50,000, physics had over 18,000, and chemistry and technology/engineering had approximately 2,500 each. Because DIMTEST was limited to using 24,000 students, the training and crossvalidation samples for the tests that had over 24,000 students were limited to 12,000 each, randomly sampled from the total. DETECT, on the other hand, had an upper limit of 500,000 students, so every training sample and crossvalidation sample used all the available data. After randomly splitting the data into training and crossvalidation samples, DIMTEST was applied to each data set to see if the null hypothesis of unidimensionality would be rejected. DETECT was then applied to each data set for which the DIMTEST null hypothesis was rejected in order to estimate the effect size of the multidimensionality.

DIMTEST Analyses

The results of the DIMTEST analyses indicated that the null hypothesis was very strongly rejected for nearly every data set. Specifically, the hypothesis testing *p*-value was less than 0.00005 in 17 out of 20 cases. In the remaining three cases, the grade 3 ELA test rejected at a significance level of 0.0004, the high school technology/engineering test rejected at a significance level of 0.0003, and the high school chemistry test rejected at a *p*-value of 0.035. Even though all the hypothesis tests rejected at level 0.05 (the typical level used for determining statistical rejection), because multiple hypothesis tests were conducted, one could interpret the result for high school chemistry as nonrejection.

Overall, there is a strong tendency toward rejection of the hypothesis of unidimensionality for the MCAS tests. Because strict unidimensionality is an idealization that almost never holds exactly for a given data set, the large number of strong statistical rejections in the DIMTEST results were not surprising. Indeed, because of the very large sample sizes involved in most of the data sets (over 50,000 in 17 of the 20 tests), DIMTEST would be expected to be sensitive to even quite small violations of unidimensionality.

DETECT Analyses

DETECT was used to estimate the effect sizes for the violations of local independence in the cases where DIMTEST rejection of the hypothesis of unidimensionality occurred. Although no further analysis was strictly necessary for high school chemistry because it could be argued to have had nonrejection, for the sake of completeness, the chemistry DETECT results are also included. Table 6-71 displays the multidimensionality effect size estimates from DETECT for both the 2008 and 2009 MCAS administrations.

Table 6-56. 2009 MCAS: Multidimensionality Effect Sizes by Grade and Content Area

Grade	*Content Area*	*Multidimensionality Effect Size*	
		2008	*2009*
3	ELA	0.11	0.11
	Mathematics	0.12	0.14
4	ELA	0.20	0.16
	Mathematics	0.17	0.18
5	ELA	0.13	0.12
	Mathematics	0.18	0.19
	Science and Technology/Engineering	0.16	0.13
6	ELA	0.15	0.14
	Mathematics	0.18	0.12
7	ELA	0.14	0.16
	Mathematics	0.20	0.17
8	ELA	0.15	0.19
	Mathematics	0.10	0.16
	Science and Technology/Engineering	0.18	0.14
High School	ELA (Grade 10)	0.18	0.18
	Mathematics (Grade 10)	0.11	0.17
	Biology (Grades 9–11)	0.10	0.07
	Chemistry (Grades 9–11)	0.16	0.10
	Introductory Physics (Grades 9–11)	0.14	0.14
	Technology/Engineering (Grades 9–11)	0.15	0.16

The DETECT values indicated very weak multidimensionality for all 2009 tests. The ELA test forms (average effect size of about 0.15) and the mathematics test forms (average of about 0.16) tended to show slightly greater multidimensionality than did the STE test forms (average of about 0.12). Also shown in Table 6-71 are the values reported in last year's dimensionality analyses. In 2008, the averages for ELA and mathematics were about 0.15, and the average for STE was about 0.14. Thus, last year's results are very similar to those from this year. It is interesting to note that chemistry, the test whose data resulted in DIMTEST nonrejection, also had one of the lowest DETECT indices.

The way in which DETECT divided the tests into clusters was also investigated to determine whether there were any discernable patterns with respect to the multiple-choice (MC) and constructed-response (CR) item types. Inspection of the DETECT clusters indicated that MC-CR separation generally occurred much more strongly with ELA than with mathematics or STE, a pattern that has been consistent across all three years of dimensionality analyses for the MCAS tests. Specifically, for ELA, every grade except grade 3 had one set of clusters dominated by MC items and another set of clusters dominated by CR items. This particular pattern within ELA has occurred in all three years of the MCAS dimensionality analyses. Of the seven mathematics tests, only grade 7 showed evidence of moderately consistent separation of MC and CR items. Of the six STE tests, the grade 8 test and the high school technology/engineering test had strong MC-CR separation, but no discernable separation occurred for the other tests. In comparison to past years, the only consistent MC-CR separation that has occurred in the mathematics and STE tests has been with high school

technology/engineering. Thus, a tendency is suggested for MC and CR items to sometimes measure statistically separable dimensions, especially in regard to the ELA tests. This has been consistent across all three years of MCAS analyses. However, it is important to emphasize that the degree of violation of unidimensional local independence has been quite similar across the three content areas over the three years of analysis. Also, the sizes of the violations of local independence have been small in all cases. The degree to which these small violations can be attributed to item type differences tends to be greater for ELA than for mathematics or STE. More investigation by content experts would be required to better understand the violations of local independence that are due to sources other than item type.

In summary, for the 2008–2009 analyses, the violations of local independence, as evidenced by the DETECT effect sizes, were very weak in all cases. Thus, these effects do not seem to warrant any changes in test design or scoring. In addition, the magnitudes of the violations of local independence have been consistently low over the years, and the patterns with respect to the MC and CR items have also been consistent, with ELA tending to display more separation than the other two content areas.

6.4.1.4 *Consequences of Testing*

Reporting information is provided in chapter 5 of this report. The Commonwealth has ascertained that reporting structures are consistent with the subdomain structures of its academic content standards, i.e., item interrelationships are consistent with the Massachusetts curriculum frameworks on which the tests are based. MCAS reporting categories display results for items grouped by framework subtopic or content area. Educators also have the flexibility to customize reports for local needs using a data analysis tool provided to each school system.

The consequences of MCAS testing are consistent with the purposes of the MCAS program, which have been widely documented and have remained unchanged since the introduction of the program in 1998. The Commonwealth has specified the purposes of the assessments, delineating the types of uses and decisions most appropriate to each. The purposes of MCAS examinations, common among standard tests and alternate assessments, are to

- evaluate the performance of students, schools, districts, and the state based upon the Massachusetts curriculum framework content standards and the MCAS performance standards;
- improve classroom instruction and student academic achievement by providing data that assist local educators in improving curriculum and instruction;
- relate MCAS test scores to adequate yearly progress (AYP) requirements, in concert with other evidence, to determine NCLB federal funding;
- certify students for eligibility to earn a high school diploma. The state's high school Competency Determination requirement was first applied to the class of 2003 in English language arts and mathematics; students in the classes of 2010 and beyond will also be required to meet the science and technology/engineering requirement for earning a Competency Determination in order to be eligible for a Massachusetts high school diploma.

6.4.2 Validity Evidence for the MCAS-Alt

According to the *2009 Educator's Manual for MCAS-Alt*, the purposes of the MCAS-Alt are to

- include difficult to assess students in assessment and accountability, as required by law;
- determine whether students with significant disabilities are receiving a program of instruction based on the state's academic learning standards;
- measure the extent to which students have learned the academic curriculum;
- use assessment results to provide challenging academic instruction for students with disabilities;
- provide an alternative pathway for some students to earn a Competency Determination in order to be eligible to receive a diploma.

Both content and procedural validity of the MCAS-Alt are discussed in the next sections.

6.4.2.1 *Content Validity*

MCAS-Alt portfolio content is based on the Massachusetts curriculum framework learning standards that describe the concepts, skills, and knowledge that students are expected to learn by the end of each grade from prekindergarten through grade 12.

The *Resource Guide to the Massachusetts Curriculum Frameworks for Students With Disabilities* provides instructional and assessment strategies for teaching students with disabilities the same learning standards as general education students. The *Resource Guide* is intended to promote "access to the general curriculum," as required by law, and to assist educators to plan instruction and assessment for students with significant cognitive disabilities. It was developed by panels of education experts in each content area, including ESE staff, testing contractor staff, higher education faculty, MCAS ADC members, and regular and special educators. Each section was written, reviewed, and validated by panels of content area experts to ensure that each modified standard (entry point) embodied the essence of the grade level learning standard on which it was based.

Specific guidelines help teachers assemble MCAS-Alt portfolios based on academic outcomes in the content area and strand being assessed, while maintaining the flexibility necessary to meet the needs of diverse learners. The requirements for constructing student portfolios necessitate that challenging skills based on grade level content standards are taught in order to produce the needed evidence. It is therefore virtually guaranteed that students are taught academic skills at an appropriate level of complexity. Rigorous scoring procedures hold scorers to high standards of accuracy and consistency using monitoring methods that include frequent double scoring, monitoring, and recalibration to verify and validate portfolio scores. These procedures, along with ESE review of each year's MCAS-Alt results, confirm that the MCAS-Alt is being successfully used for the purposes for which it was intended.

6.4.2.2 *Procedural Validity*

Procedural validity is shown by thorough documentation of the process used to develop the assessment instrument and of the processes of scoring, standard setting, and describing and reporting performance. Although procedural evidence does not guarantee validity of assessment results, the lack of procedural evidence can negatively affect credibility of results.

Procedural validity is determined based on a review of the following questions:

- Who participated in the development process?
- How were decisions made during development?
- Was the plan implemented as discussed?
- After implementation, was the plan reviewed at intervals, and revised as needed?
- Was the development process documented?

Who participated in the development process?
The MCAS-Alt was developed by a group of diverse stakeholders, including representatives from special education, regular education, and higher education, and administrators from urban and nonurban districts, collaboratives, and approved special education private schools. Also included in the development process were psychometricians, education and assessment policy makers, inclusion specialists, attorneys, special education advocates, and the Northeast Regional Resource Center.

External members of the original MCAS-Alt Development Committee were Dr. Ed Roeber, Dr. Sue Bechard, Dr. Kenneth Warlick, Dr. Charles DePascale, and Dr. Jacqui Kearns, many of whom served in key roles in the development and implementation of large scale alternate assessments in Colorado, Illinois, Iowa, Kentucky, Maine, Maryland, Massachusetts, Montana, New Hampshire, New Jersey, New Mexico, New York, Puerto Rico, Rhode Island, South Carolina, Tennessee, Washington, Washington, D.C., and West Virginia.

As the MCAS-Alt is revised and updated to reflect new mandates and greater efficiencies, ESE staff continue to consult recognized experts in the field of alternate assessment for their views and ideas.

How were decisions made during development?
Care was taken to include all stakeholder viewpoints during development and revision of the assessment. While making decisions, developers kept the following guidelines in mind:

- The MCAS-Alt should parallel the standard MCAS tests regarding the content areas and standards required for assessment.
- The MCAS-Alt should provide results that can be used to make valid and reliable decisions.
- The MCAS-Alt should be sufficiently flexible to include a wide range of students.
- The MCAS-Alt should not overly burden the state's teachers.

All discussions and recommendations made by the technical and stakeholder advisory committees are documented and maintained in the public minutes of the statewide MCAS-Alt Advisory Committee, and Technical Advisory Committee meetings.

Was the plan implemented as discussed?
The 2009 MCAS-Alt was administered as stipulated in published materials on implementation, scoring, and reporting. Intensive training was provided for teachers, including

- 32 ESE sponsored training sessions each year,
- online publications and training modules,
- monthly newsletters,
- two Teacher's Network meetings each year (see below for more information),
- a three-week scoring institute emphasizing the professional development of participants.

Materials were delivered to schools within the specified time frame. Portfolios were scored according to the scoring rubric from the *2009 Educator's Manual for MCAS-Alt*, disseminated in the fall of 2008, and the *2009 Guidelines for Scoring Student Portfolios*

(www.doe.mass.edu/mcas/alt/results.html). Scores were analyzed using the 2009 decision rules. Reports were generated in accordance with those rules and shipped to schools. Score appeals were received and reviewed using the procedures outlined in the policy that was posted and sent to schools with the materials in the spring and fall.

After implementation, was the plan reviewed at intervals, and revised as needed?
Both the MCAS-Alt Advisory Committee and the MCAS-Alt Teacher's Network met quarterly to review the status of the MCAS-Alt and to recommend changes, as needed, to the ESE. The Advisory Committee has discussed every change made to the MCAS-Alt since its inception. The Teacher's Network includes about 100 educators directly responsible for administering the MCAS-Alt. This group evaluates the effectiveness of the current policies and advises on future directions.

Was the development process documented?
Minutes of every meeting of the MCAS-Alt Advisory Committee have been recorded and kept on file at the ESE, along with all research reports and other documentation. Additional documentation can be found on the MCAS-Alt website (www.doe.mass.edu/mcas/alt), including the following:

- Definition and purpose of the assessment (see the FAQs in "About the MCAS-Alt")
- Description and rationale of the assessment method (see the FAQs in "About the MCAS-Alt")
- Definition of assessment standards (see the resource guide in "Resources and Training")
- Selection and training of scorers (see "Scoring & Reporting Results")
- Description of scoring procedures and rubrics (see "Scoring & Reporting Results")
- Description of procedures used to determine student level results as well as aggregated results (see "Scoring & Reporting Results")
- State performance and participation results from 2001 through 2008 (see "Scoring & Reporting Results")

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2009 Guidelines for Scoring Student Portfolios. www.doe.mass.edu/mcas/alt/results.html

Guide to Interpreting the Spring 2009 MCAS Reports for Schools and Districts. www.doe.mass.edu/mcas/results.html

Massachusetts Curriculum Frameworks (English Language Arts, History and Social Science, Mathematics, Science and Technology/Engineering). www.doe.mass.edu/frameworks/current.html

MCAS Technical Reports, 1998–2008. www.doe.mass.edu/mcas/tech/?section=techreports

Resource Guide to the Massachusetts Curriculum Frameworks for Students with Disabilities. www.doe.mass.edu/mcas/alt/resources.html [A print copy of this publication may be ordered online at www.mcasservicecenter.com/mcasalt/welcome.asp?ProgramID=6&ServiceID=21.]

Spring 2009 MCAS Tests: Summary of State Results. www.doe.mass.edu/mcas/results.html

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APPENDICES