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**Ohio Graduation Tests
Reading, Mathematics, Writing, Science, and
Social Studies**

March 2008 Administration

Operational Technical Report

American Institutes for Research

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MARCH 2008 ADMINISTRATION

OPERATIONAL TECHNICAL REPORT

AMERICAN INSTITUTES FOR RESEARCH

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Background

The purpose of this report is to summarize the results of statistical and psychometric analyses performed on the operational data from the March 2008 administration of the Ohio Graduation Tests in reading, mathematics, writing, science and social studies. Before summarizing the results of the March 2008 operational assessment, we begin with an overview of the processes involved in designing and administering the Ohio Graduation Tests to provide the necessary context for a more complete understanding of the test results.

Ohio Graduation Tests

The Ohio Graduation Tests represent a system of standards-based achievement tests administered in five subject areas: reading, mathematics, writing, science, and social studies. The testing cycle includes three administrations each year: spring, summer and fall. Students failing to meet the proficient standard in the spring administration can retake the test during a subsequent administration.

Ohio Academic Content Standards Development

The Ohio Academic Content Standards constitute the basis of the Ohio state assessment program; they indicate what students should know and be able to do for every grade and subject area. In 1997, the Ohio Department of Education, in conjunction with the Ohio Board of Regents, convened teams of teachers, parents, and community members for each of the content areas to work toward creating a set of common expectations for each subject. These teams drafted statements that clearly defined learning expectations for each grade level. Prior to state-wide implementation into school curricula, these academic content standards were subjected to an extensive review process. Following an initial draft of the standards, professional organizations with content specialties in the different subject areas had the opportunity to review the standards. Following this phase, the draft academic content standards were reviewed through a series of public engagement activities designed to elicit feedback from stakeholders. The draft academic content standards were then released for public review. The final step consisted of review and adoption of the standards by the Ohio State Board of Education, and integrating them into the state-wide curricula.

The Ohio Academic Content Standards are supported by benchmarks and grade-level indicators, which clarify the standards and provide more specific information regarding the content for which the students are responsible. The reader is directed to the Ohio Department of Education (ODE) Web site (<http://www.ode.state.oh.us/>), which houses the Ohio Academic Content Standards for all grades and subject areas.

Item and Test Specification Development

Following the adoption and integration of the Ohio Academic Content Standards into the school curricula, item and test specifications were developed to make sure that the tests and their items are aligned to the standards, benchmarks, and grade-level indicators they are intended to measure. These item and test specifications identify the item types, quantity, and point values to be included in the assessments. These specifications also include the distribution of items across

content standards, including the number of items and score points required for the measurement of each content standard and benchmark. Specifications for reading tests include rules for identifying and selecting appropriate reading passages. Test specifications also designate test characteristics, such as test and item complexity, in order to guarantee that all graduation tests include items of varying degrees of difficulty. The ODE Web site (<http://www.ode.state.oh.us/>) provides access to test blueprints.

Performance Level Descriptors (PLDs) were developed to aid educators and test developers in understanding the nature of how the academic standards are manifested in student performance. PLDs define the content area knowledge, skills and processes that examinees at a performance level are expected to possess. ODE's descriptions of Limited, Basic, Proficient, Accelerated and Advanced performance are public statements about what and how much Ohio educators want students to know and be able to do by the end of each grade and in each subject area. Thus, the PLDs are intended to provide a clear link between the test content and the Ohio Academic Content Standards and their corresponding performance levels. PLDs for each of the Ohio Graduation Tests are available at the ODE website (<http://www.ode.state.oh.us/>).

Item Development

The next required step is to develop items that measure the academic content standards. All items pass through an extensive review process, including a series of test contractor reviews, internal ODE reviews and Ohio Fairness and Content Advisory Committee reviews, before inclusion first on field test forms and subsequently on operational test forms. Testing contractor content specialists initially write the items which then must pass through several internal review stages, including content, editorial, and senior content reviews. Items that are reviewed and approved internally are then sent to ODE for their review. ODE reviews the items and provides an outcome (Accept as Appears, Accept as Revised, Revise and Resubmit, or Reject) for each item. Testing contractor and ODE staff then discuss the requested revisions and ODE signs off on each item as ready for Ohio Committee review.

Following the completion of the testing contractor and ODE internal item development cycle, ODE convenes two committees: the Fairness and Sensitivity Committee, which consists of Ohio teachers and community members, and the Content Advisory Committee, which is comprised of Ohio teachers from across the state. The Fairness and Sensitivity Committee review ensures that the items remain free from bias or stereotype, while the Content Advisory Committee review determines whether the items are properly aligned to the content standards, benchmarks, and grade-level indicators; accurately measure intended content; and are grade level appropriate. Following approval from both committees, the items are then added to the field test pool so that they can be used on a future field test form.

Field-testing. To construct field test forms, testing contractor content experts work with ODE curriculum and assessment experts to select items from the field test pool to meet the requirements described in the test blueprints. Two different strategies are used to conduct field tests of new items within the Ohio assessment system, the *independent field test* and the *embedded field test*.

When many items are being field-tested to establish an operational item bank, it is common to use an independent field test strategy. Ohio typically employs a common item block design that maximizes the number of items field-tested while providing a strong linkage between independent field test forms.

Once operational forms have been established, it is necessary to continue to replenish the operational item pool in order to adjust for items that have been used and subsequently released to the public. To accomplish this, an *embedded item design* is used in which a small subset of items is field tested as part of the operational form.

The sampling procedure for the field-test forms results in a random sample of students taking each of the graduation tests. For independent field tests, schools are selected within each stratum based on a simple random sample scheme. All classes are selected from each sampled school, and all students within each of the selected classrooms participate in the field test administration. The series of field test technical reports provides a more detailed look at the sampling procedures, including the sampling strata used in the Ohio assessment system and the steps involved in selecting schools for the field test samples.

Item analyses and data review. Following each field test administration, classical and item response theory (IRT) statistical analyses are performed on student response data. The item analyses provide information about the quality of the items. Items are flagged for review for the following reasons:

- Proportion correct value is less than .25 or greater than .95 for multiple-choice items, or greater than .95 for any single score point of a constructed-response item;
- Adjusted biserial/polyserial correlation statistic is less than .25 for multiple-choice or constructed-response items;
- Adjusted biserial correlations for multiple-choice item distractors is greater than .05;
- The proportion of students responding to a distractor exceeds the proportion responding to the keyed response for MC items;
- Mean total score for a lower score point exceeds the mean total score for a higher score point for constructed-response items;
- Omit rate is greater than .05; and
- The item falls into the C category for any differential item functioning (DIF) contrast. The C category indicates evidence of significant DIF and is defined, for dichotomous items, as $MH\chi^2$ is significant and $|\hat{\Delta}_{MH}| \geq 1.5$, and for polytomous items $MH\chi^2$ is significant and $|SMD| / |SD| \geq .25$.

Differential item functioning (DIF) analyses are also conducted on all items included in the field test to detect potential item bias across major ethnic and gender groups. The performance on each item by subgroup members (Black/African American students, Hispanic students, Multi-Ethnic students, and female students) is compared with the performance of the appropriate reference group (White students or male students), resulting in four sets of comparisons:

Black/White, Hispanic/White, Multi-Ethnic/White, and female/male. The purpose of these analyses is to identify items that may favor students in one group over those of similar ability in another.

Items flagged for review on the basis of any of the aforementioned criteria must pass a three-stage data review process to be included in the final item pool from which operational forms are created. As a first level of review, a team of testing contractor psychometricians reviews all flagged items to ensure that the data are accurate, properly analyzed, have correct response keys, and have no obvious problems with the items.

Second, ODE curriculum and assessment specialists review the item statistics and content appropriateness of all flagged items. Additionally, a Fairness and Sensitivity Committee reviews all items flagged on the basis of DIF statistics. Committee members are encouraged to discuss these items using the statistics as a guide, and are asked to make decisions regarding whether flagged items should be excluded from the pool of potential items given their performance in field testing.

Operational Forms Construction

As with test items, operational forms pass through a programmed sequence of review levels before they can be administered. Test development specialists select items from the operational pool to match the test specifications.

After testing contractor content specialists have developed an operational form, the form is submitted to testing contractor psychometricians for review. Psychometricians evaluate each form to determine whether the test form meets specified statistical criteria. Test characteristic curves are evaluated to ensure that test characteristic curve differences meet tolerances to base year operational forms so that test information across the range of test scores is similar across test administrations. Tolerances for form difficulties are also evaluated to ensure that raw scores at the proficiency cut score remain consistent across test administrations. Checks are also performed to make sure that forms meet test specifications for the number of items and points, both overall and by content standard.

After receiving psychometric approval for a proposed operational test form, the form is submitted to a senior test development specialist to ensure that test specifications for distribution of item content and item type are met. Following senior test development specialist review and approval, proposed operational forms are submitted to ODE for review. Any revisions to the form, whether during senior test development or ODE review, require that the form be resubmitted for evaluation by testing contractor psychometricians. Following final ODE approval of an operational form, the form is available for use in an operational assessment.

Standard Setting

Performance standards for the Ohio Graduation Tests were recommended through a series of standard-setting workshops conducted as each test in the system became operational. Detailed descriptions of the procedures and results for each standard-setting workshop are provided in a series of standard-setting technical reports available from ODE.

In each case, the goals of the standard-setting workshop panelists were to:

- make initial placements of recommended cut scores on the Ohio Graduation Tests corresponding to the Performance Level Descriptors for Basic, Proficient, Accelerated and Advanced levels of performance;
- consider agreement and impact data to guide judgments about item difficulty and placement of the bookmarks; and
- make final recommendations to ODE about the appropriate placement of Basic, Proficient, Accelerated and Advanced performance levels for each of the tests.

Following final placement of all recommended cut scores, ODE submitted the recommendations of each panel to the Ohio State Board of Education for their review and adoption.

Equating Procedures

This section briefly describes the process used to estimate item parameters to develop the Ohio Graduation Test scales and how items on subsequent operational test forms are linked to item parameters in the original field test administration.

Historically, parameter estimates for all items included in operational forms are derived from analyses of the initial field test forms. Item parameters estimated from the field test administration are referred to as *item bank parameter estimates*. Procedures outlined in the steps below are used to place student responses from each operational test administration onto the Ohio reporting scale for each subject test.

Step 1: *Centering on the first operational form.* It is ODE’s policy to re-center the bank after the first operational administration of the test so that the initial administration of the test has a mean difficulty of zero. The steps involved in re-centering the bank following the first operational administration are as follows:

- a) Item difficulty values for the first operational administration were estimated using Winsteps. Winsteps employs a joint maximum likelihood approach to estimation (JMLE), which jointly estimates the person and item parameters.
- b) Next, the OGT linking procedure was applied to equate the first operational administration item difficulty values with the item difficulty values estimated from the field test administration. The result of the linking procedure is to place the items on the first operational test on the same scale as those on the field tests.
- c) The simple average of all the item difficulty values in the first operational test form was then computed. The average of these averages yields the new first operational administration *centering constant*.
- d) After applying the first operational administration *centering constant*, by subtracting the *centering constant* from all of the item difficulty values in the bank, all bank items are centered on the first operational form, which has an average difficulty equal to zero.

Subsequent operational test forms do not need to have re-centered item parameters, unlike the first operational test administrations. Nevertheless, for each operational administration, items must be linked to the item bank parameters. The strategy for doing this varies by test administration.

Across all administrations, Ohio employs a pre-equating strategy to facilitate development of nearly equivalent operational forms. However, because item parameter estimates may shift across test administrations, it can be useful, when feasible, to augment the pre-equating methodology with a method for evaluating the applicability of the field test-derived item parameter estimates to each operational assessment. This strategy allows ODE to modify item parameter estimates in the operational assessment in the event that field test values no longer demonstrate acceptable levels of fit to the measurement model. For the spring administration, which includes all grade 10 students, item parameters are estimated on an early return sample of grade 10 students taking the operational test. Operational item parameters are then linked to the OGT scale using the linking procedure described in the following section.

For summer and fall administrations, where operational tests are administered to a highly selected sample of students who have previously failed the OGT, item parameters are not recalibrated following the operational administration. Because item parameters estimated from such a highly selected sample may not be reliable, for the summer and fall administrations of the OGT, bank item parameter estimates are applied directly to produce pre-equated score conversion tables.

Estimation of IRT models. Masters' (1982) Partial Credit Model, an extension of the one parameter Rasch model that allows for graded responses, is used to estimate item parameters for spring administration of the Ohio Graduation Tests.

A stepwise deletion procedure is used to link the set of operationally administered test items back to the reference scale. Following this procedure, one first identifies the linking constant necessary to bring the operational items back to the reference scale. The linking constant is the difference between the average of the average item difficulty estimates from the operational calibration, subtracted from the average of the average item difficulty estimates from the bank item parameter estimates. This linking constant is then applied to all operational test item parameters to place them on the reference scale. The parameter estimates of anchor items are then examined to determine whether any exceed the .3 tolerance level for inclusion as anchor items. At each step, the item with the greatest difference between its linked and reference item parameter estimates is eliminated from the anchor set, provided the difference was greater than .3. A new linking constant is then computed, applied to the operational test item parameters, and the resulting parameter estimates for the remaining anchor items again examined to determine whether any exceeded the .3 tolerance level. This process is repeated until all remaining anchor items meet the tolerance level specifications. Because student responses to the writing prompts are central to the measurement of the writing construct and there are only two essay responses in each writing assessment, any prompt-based items that may have been eliminated as anchor items during the linking process are reintroduced in the final step to compute the linking constant for the writing assessments.

Scaled scores and the Ohio rounding rule. The Ohio Graduation Tests scaled scores represent a linear transformation of the Rasch ability estimates (theta scores), with the Proficient cut score or performance standard set at a scaled score of 400. To transform student scores from the theta metric to the Ohio Graduation Tests scale, the theta value associated with the Proficient level performance standard (CutScore[theta]) was first identified. To determine the scaled scores associated with the other theta values, the following formula is implemented:

$$\text{Scale Score} = 400 + (32 * (\{\text{theta} - \text{CutScore}[\text{theta}]\} / \text{SD}[\text{theta}])) \quad (1)$$

where 400 is the scaled score representing the proficiency standard cut score on the Ohio Graduation Tests, and 32 is a scaling constant applied so that each half-point increase in the raw score on the base form produced at least a 1-point increase in the scaled score. The “theta” represents any level of student ability on the operational form. The CutScore[theta] represents the theta that the panelists determined for the Proficient level cut score from the standard setting workshop. The SD[theta] represents the standard deviation of all the thetas, or logit values. Cut scores for the Basic, Accelerated, and Advanced performance standards can then be located on the scale by finding the theta value associated with the relevant performance level standard. Table 1 presents the theta to scaled score linear transformation equations for each of the Ohio Graduation Tests.

Table 1.
Theta to Scaled Score Linear Transformation Equations

Ohio Graduation Test	Linear Transformation Equation
Reading	$SS = 400 + 32 \times \frac{\theta - (-0.136)}{1.37}$
Mathematics	$SS = 400 + 32 \times \frac{\theta - (-0.069)}{1.27}$
Writing	$SS = 400 + 32 \times \frac{\theta - 0.15115}{1.63}$
Science	$SS = 400 + 32 \times \frac{\theta - 0.123}{1.04}$
Social Studies	$SS = 400 + 32 \times \frac{\theta - 0.062}{1.12}$

For score reporting, if the exact theta value corresponding to a performance standard does not appear in the operational form, then ODE implements a rounding rule to determine the placement of the cut scores on the operational form. To implement the Ohio rounding rule, the two closest theta values (above and below the performance standard theta) are first identified, and then the one nearest to the standard set by panelists is selected. If the theta nearest to the performance standard is below the standard (or smaller in value), then it is rounded up to the theta associated with the performance standard. If the nearest operational test theta is greater than the theta associated with the standard set by the panelists, then that one is selected as the operational test cut score.

For OGT, there are two scaled scores that do not correspond to the theta cuts established during the standard setting workshops. The Basic cut for mathematics is set to 384 instead of the 385 value that results from application of the linear transformation. The critical scaled score for the Basic performance of OGT Math is 384.8567, rounded to 385. In the original operational form in spring 2004, the closest score was 384.192 for the raw score 13.5, instead of 385.72296 for raw score 14. The scaled score should have been rounded up to 385 by Ohio rounding rule, but was left at 384. To keep all the future cut scores consistent, 384 was retained as the official cut for Basic performance on the OGT mathematics test. In the case that there is a 384 scaled score, and that score is not the closest scaled score for Basic cut in OGT math, that score will be manually adjusted to 383.

Also, the Accelerated cut for social studies is set to 429 instead of the 430 value that results from application of the linear transformation. Following the first administration of the Social Studies test in spring 2005, the critical theta for accelerated produces a scaled score of 429.5143, rounded to 430. Raw score 33 produced scaled score 428.8934, and raw score 33.5 led to a scaled score of 430.1566. So, 33 was slightly closer to the critical value than was 33.5. It should have been rounded up to the critical score of 430 by Ohio rounding rule, but raw score 33.5 had a rounded score of 430. So raw score 33 was left at 429 as the cut score for Accelerated performance in OGT social studies. To keep the scales score cut consistent, 429 is retained as the cut score for Accelerated performance in OGT social studies in all the subsequent administration. If there is a scaled score of 429 that is not the closest score to the critical theta, that score will be manually adjusted to 428 in the official score conversion table.

Reporting content standard performance levels. A mid-range band is used to classify student performance level for each of the content standard subscales. For each content standard, the mid-range is defined as a band surrounding the theta score associated with the proficient performance standard on the overall test. Definition of the mid-range also takes into consideration the standard error of the proficient score as measured by the content standard scale. The following steps are used to identify the mid-range:

1. Compute the standard error of measurement (SEM) associated with the proficient theta for items comprising the content standard subscale;
2. Set the lower end of the mid-range band to be the subscale raw score nearest the proficient theta;
3. Set the upper end of the mid-range band to the proficient theta plus one SEM, and then round up to the next subscale raw score;
4. All points within and including the lower and upper end of mid-range band are within the mid-range.

Based on the mid-range, content standard subscale scores are classified into three performance levels. Raw scores falling below the mid-range band are classified as Below Proficient, while raw scores in the area above the mid-range band are defined as Above Proficient. Raw score values within the mid-range band are classified as Near Proficient.

Operational Test Results

The remainder of this report summarizes the operational test results for the March 2008 administration of the Ohio Graduation Tests.

Parameter estimation, equating and scaling for the March 2008 administration of the OGT employed an early return sample of schools. Schools were randomly selected for each stratum of the early return sample. Schools assigned to the early return sample were simply designated for early document processing and scoring. In all other respects, however, test materials from the early return sample are processed in the same way as the remainder of the test population. The early return sample is comprised only of grade 10 students. Students in higher grade levels were excluded from the equating analyses because the sample consists of first-time examinees, and students in higher grades who are still taking the OGT are atypical because most of their classmates have already passed. The March 2008 early return sample comprised 16,228 students from 129 schools, representing 119 districts.

In this report we briefly summarize results from the analysis of the early return sample data. Complete descriptions of the early return sample and analysis results are provided in the Early Return Sample Technical Report available from ODE. Table 2 summarizes the final operational student counts for grade 10 students.

Table 2.
Final Operational Assessment Student Counts

Assessment	Final Operational Assessment Student Counts – Grade 10 Students	
	Public School Students	Non-Public School Students
Reading	134660	13224
Mathematics	135399	13248
Writing	134138	13239
Science	135387	13236
Social Studies	134970	13194

Note: Figures do not include students who used a breach form.

This section of the report is organized into the following parts:

- Classical Item Analysis;
- Rasch/Item Response Theory Analysis;
- Raw Score and Scaled Score Means, Standard Deviations and Frequency Distributions;
- Generalizability Study; and
- Subscale Analysis.

Classical Item Analysis

Traditional item statistics for multiple-choice (MC) and constructed-response (CR) items were calculated based on the early return sample. Appendix A presents item statistics for the operational test items. Item statistics include the proportion of students falling into each score-point category (e.g., 0, 1 for multiple-choice items, 0, 1, 2 for short-answer items, and 0, 1, 2, 3, 4 for extended-response items), as well as the proportion of students with omitted responses. Also presented are *p*-values and average item scores for MC items and CR items, respectively, along with adjusted item-test biserial/polyserial correlations, maximum point values and subscale information.

Table 3 presents a summary of the average differences between field test and early return operational values for item *p*-values/proportion of total points. As the results indicate, *p*-values increased somewhat from field test to operational test administration, indicating that students performed slightly better on the items in the context of the operational administration.

Table 3.
Comparing Early Return Operational and Field Test *p*-values

Test	Average <i>p</i> -Values/Proportion of Total Points		
	Field Test	Operational Test	Difference
Reading	0.65	0.71	0.05
Mathematics	0.64	0.70	0.07
Writing	0.65	0.76	0.12
Science	0.62	0.64	0.02
Social Studies	0.64	0.70	0.06

* Change = Operational value – Field test value.

The tables in Appendix B provide the final operational raw score and scaled score means, standard deviations, and standard errors of measurement, as well as the internal consistency reliability estimates for each test. Results are shown separately for analyses based on Ohio grade 10 public school students, and grade 10 non-public school students. Appendix B also presents internal consistency estimates for gender and ethnic subgroups of the grade 10 public school student sample.

Item Response Theory Analysis

Item parameters for OGT are estimated using Masters' (1982) Partial Credit Model, an extension of the one parameter Rasch model that allows for graded responses. The principal advantage of the Rasch model is the resulting one-to-one correspondence between the number of correct responses and the scaled score produced by the model. We applied Masters' Partial Credit Model to estimate the Rasch model parameters for the calibration and equating samples.

Estimates of the IRT model parameters are produced by Winsteps, publicly available IRT software from Mesa Press (Linacre. 2004). Winsteps employs a joint maximum likelihood approach to estimation (JMLE), which jointly estimates the person and item parameters.

Appendix C presents the item statistics resulting from the free (unanchored) estimation of parameters for operational test items based on the early return sample.

A stepwise deletion procedure is used to link the set of operationally administered test items back to the reference scale. Following this procedure, one first identifies the linking constant necessary to bring the operational items back to the reference scale. The linking constant is the difference between the average of the average item difficulty estimates from the operational calibration, subtracted from the average of the average item difficulty estimates from the bank item parameter estimates. This linking constant is then applied to all operational test item parameters to place them on the reference scale. The parameter estimates of anchor items are then examined to determine whether any exceed the .3 tolerance level for inclusion as anchor items. At each step, the item with the greatest difference between its linked and reference item parameter estimates is eliminated from the anchor set, provided the difference is greater than .3. A new linking constant is then computed, applied to the operational test item parameters, and the resulting parameter estimates for the remaining anchor items again examined to determine whether any exceed the .3 tolerance level. This process is repeated until all remaining anchor items meet the tolerance level specifications. Because student responses to the writing prompts are central to the measurement of the writing construct and there are only two essay responses in each writing assessment, any prompt-based items that may have been eliminated as anchor items during the linking process are reintroduced in the final step to compute the linking constant for the writing assessments. The tables in Appendix D provide comparisons between item parameter estimates that result from the iterative application of the linking constant to the early return samples with parameter estimates obtained from the field test samples and the unanchored calibration and equating samples.

For the reading assessment, application of the .3 rule in the spring 2008 OGT equating analysis resulted in dropping 23 items from the linking analysis, so that only 15 (39%) of the 38 operational test items were included in the calculation of the linking constant. In addition, after several iterations, continued application of the iterative .3 rule appeared to drive the linking constant toward a more extreme linking constant (-.45) than would be suggested by the initial iterations, so that the resulting linking constant appeared to be more heavily influenced by items with less stable parameter estimates. Examination of the spring 2007 equating results indicated a similar effect. In 2007, the initial linking analysis resulted in the identification of linking items that appeared to be overly influenced by items from a single passage, and which resulted in an equating constant of .66 logits. To identify a more “reasonable” linking constant, the linking analysis was performed after first eliminating items from the overly influential passage. This resulted in a final linking constant of .07 for the spring 2007 assessment.

To address this issue for the 2008 administration, ODE opted for an approach that is conceptually consistent with the Ohio .3 rule, but avoids the potential problem of the iterative approach. In this modified Ohio .3 rule, we eliminated as linking items all items with discrepancies of more than .3 between the bank value and the adjusted value resulting from the mean-mean linking. We then allowed the iterative approach to proceed, but no additional items were removed from the linking set. While this approach results in the removal of a large number of items from the calculation of the linking constant, with only 13 of 38 items used to compute the linking constant, this approach better identified linking items that showed less drift between field test and operational test item parameter estimates.

Table 4 below summarizes the number of items used to link the March 2008 operational forms to their appropriate Ohio Graduation Test scales. The percentage of items used to identify the linking constants ranged from 34% in the Reading assessment to 76% the Science test. Table 4 presents the final linking constants used to link each operational administration back to the appropriate OGT scale.

Table 4.
Summary of Items Used to Link March 2008 Operational Tests to Ohio Graduation Test Scales

Test	Summary of Linking Items								
	Content Standard				MC Items	CR Items	Linking Items	Total Items	% Linking Items
Reading	AV	IT	LT	RP					
	2	3	3	5		11	2	13	38
Math	DA	GS	ME	NS	PA				
	5	3	5	4	6	17	6	23	38
Writing	WA	WC	WP						
	2	2	6			5	5	10	15
Science	ES	LS	PS	SP					
	9	6	7	7		24	5	29	38
Social Studies	EG	HI	SG	SO					
	8	9	3	4		23	1	24	38

Appendix E presents the final transformations of raw scores to Rasch ability estimate (in logit measure) to scaled score based on the final set of anchor items. This table also lists the error of estimation for each value, as well as the proficiency level associated with each score point.

Appendix F represents the ability parameters associated with the cut scores for previous and current operational test administrations.

Appendix G presents classification consistency estimates at each of the proficiency classification cut scores on the operational tests and subscale scores. Classification consistency indexes the agreement between the classification resulting from students' observed scores and the classification resulting from scores as projected from a hypothetical independent administration of a parallel test form. Classification consistency estimates are derived following Huynh's (1979) use of the beta-binomial model. Kappa provides an index of classification consistency that is corrected for chance levels of agreement.

For each test, Appendix H presents the percentage of students scoring at each proficiency level, both overall and disaggregated by gender and ethnicity. The tables in Appendix I present the percentage of students scoring at or above each performance standard. Results are presented separately for public and non-public school students in both sets of tables.

Raw and Scaled Scores: Descriptive Statistics

Raw score and scaled score means and standard deviations, and internal consistency reliabilities, are presented in Appendix J, for all grade 10 public school students, as well as by ethnic and gender subgroups. Raw score and scaled score frequency distributions for the final operational sample and by gender are presented in Appendix K, with distributions by ethnicity presented in Appendix L.

Interrater Analysis: G-Study

The goal of the Generalizability Study (G-study) is to identify undesirable judging or rating behavior in the scoring of constructed-response items. Because all student papers were double-scored, a $p \times i \times r$ design will be employed for the fully-crossed design with 2 random facets. The main ingredient of the model is the true score, a random variable X_{pir} defined over the universe of persons (p), items (i) and ratings (r).

It must be emphasized, however, that *rater* reliability cannot be established due to the fact that papers are randomly assigned to raters, and that rater pairs were not selected systematically for blocks of items. Consequently, it is not possible to establish a *connected* subset of double scored elements containing all raters. A solution to this problem has been incorporated into our analysis that was originally used in language assessment: instead of raters treat *ratings* (first and second ratings) as a random facet (Lee, Kantor & Mollaun 2002; Bachman, Lynch & Mason, 1995; Lee, 2001; Lee, Golub-Smith, Payton & Carey, 2001). From a design point of view, the question addressed is whether the first and second ratings are consistent, while the performance of the individual scorer falls out of the scope of the present investigation (Antal, Johnson, Antal, 2004).

The decomposition of the overall variance $\sigma^2(X)$ of X_{pir} is the sum of the above defined variance components:

$$\sigma^2(X) = \sigma_{(p)}^2 + \sigma_{(i)}^2 + \sigma_{(r)}^2 + \sigma_{(pi)}^2 + \sigma_{(pr)}^2 + \sigma_{(ir)}^2 + \sigma_{(pir,e)}^2.$$

The goal in a G-study is to identify those variance components that are larger than the others in this decomposition. The fundamental theorem in classical test theory, and in generalizability theory, is that most variances in the score distribution constitute measurement error. That is why researchers seek a design, which results in the lowest possible overall variance.

While it is impossible to obtain the above defined variance components directly from the model, an ANOVA-type procedure is capable of delivering variance estimates.

The estimated variance components in a G-study reflect the magnitude of error in generalizing from a person's score on a single item to his or her universe score, that is, the person's average score over all items in the universe (Shavelson & Webb, 1991). Variance components are always interpreted relative to the scale of measurement (e.g. the largest variance for a binary scale is different from a 4 point scale). It is common practice to report the percentage of the total variance that each component accounts for. Table 5 shows a typical framework of reporting the results of a G-study.

Table 5.
ANOVA Table for Two-Facet Fully Crossed Random p x i x r Design

<i>Sources of Variation</i>	<i>df</i>	<i>MS</i>	<i>Estimated VCs</i>
Students (p)	df_p	$MS_{(p)}$	$\hat{\sigma}_p^2$
Items (i)	df_i	$MS_{(i)}$	$\hat{\sigma}_i$
Ratings (r)	df_r	$MS_{(r)}$	$\hat{\sigma}_r$
pxi	$df_p \cdot df_i$	$MS_{(pi)}$	$\hat{\sigma}_{pi}^2$
pxr	$df_p \cdot df_r$	$MS_{(pr)}$	$\hat{\sigma}_{pr}^2$
ixr	$df_i \cdot df_r$	$MS_{(ir)}$	$\hat{\sigma}_{ir}^2$
$pxixr$	$df_p \cdot df_i \cdot df_r$	$MS_{(pir)}$	$\hat{\sigma}_{pir,e}^2$

Table 6 presents the variance component means for the fully crossed, two-facet design. For the two-facet analysis, all variance components that incorporate rating performance (excluding the error component) are nearly zero. The person-item interaction component is associated with the largest variability; a consistent finding in generalizability studies of constructed-response items. The person variance component was generally the second largest component in the OGT constructed-response items, followed by item variances.

Table 6.
Variance Components for Two-Facet Fully Crossed G-Study

Test	Number of CR Items	var(p)	var(i)	var(r)	var(pi)	var(pr)	var(ir)	var(pir)	rho2
Reading	6	0.034	0.033	0.000	0.059	0.000	0.000	0.021	0.816
Mathematics	6	0.060	0.006	0.000	0.078	0.000	0.000	0.012	0.920
Writing	5	0.016	0.041	0.000	0.020	0.000	0.000	0.013	0.735
Science	6	0.032	0.010	0.000	0.059	0.000	0.000	0.029	0.758
Social Studies	6	0.034	0.016	0.000	0.058	0.000	0.000	0.033	0.736

Subscale Analysis

Appendix M presents the coefficient alpha reliability, the passing band and the maximum possible score for each subscale. Raw score frequency distributions for each of the subscales are presented in Appendix N.

The tables in Appendix O present the intercorrelations among the content standard subscales for the Ohio Graduation Tests. We note that the intercorrelations among subscales is quite high, and these values are likely attenuated due to the relatively moderate to low internal consistency reliability estimates for these subscales. It is therefore important to use caution when interpreting differences between content standard scores.

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APPENDIX A.

Early Return Sample Item Statistics

Table A1. Early Return Sample Item Statistics – Reading

Position	Max score.	Type	Subscale	r_b	p-Val/ Avg Scr	Proportion of Students at Each Score Point					
						Omit	0	1	2	3	4
1	1	MC	IT	0.60	0.95	0.00	0.05	0.95			
2	1	MC	IT	0.66	0.86	0.00	0.14	0.86			
3	2	SA	IT	0.38	1.08	0.01	0.18	0.53	0.28		
4	1	MC	IT	0.45	0.57	0.00	0.43	0.57			
5	1	MC	AV	0.50	0.74	0.00	0.26	0.74			
6	1	MC	IT	0.79	0.95	0.00	0.05	0.95			
7	1	MC	AV	0.66	0.86	0.00	0.14	0.86			
8	1	MC	RP	0.56	0.69	0.00	0.31	0.69			
9	1	MC	AV	0.53	0.87	0.00	0.13	0.87			
10	1	MC	AV	0.46	0.45	0.00	0.55	0.45			
11	1	MC	RP	0.50	0.86	0.00	0.14	0.86			
12	1	MC	LT	0.60	0.89	0.00	0.11	0.89			
13	1	MC	LT	0.58	0.81	0.00	0.19	0.81			
14	4	ER	LT	0.58	2.10	0.02	0.12	0.15	0.33	0.20	0.17
15	1	MC	RP	0.23	0.52	0.00	0.48	0.52			
16	1	MC	LT	0.47	0.68	0.00	0.32	0.68			
17	1	MC	IT	0.71	0.87	0.00	0.13	0.87			
18	1	MC	RP	0.63	0.89	0.00	0.11	0.89			
19	1	MC	AV	0.38	0.86	0.00	0.14	0.86			
20	1	MC	RP	0.52	0.78	0.00	0.22	0.78			
21	2	SA	RP	0.59	1.75	0.01	0.02	0.20	0.78		
22	1	MC	IT	0.37	0.49	0.00	0.51	0.49			
29	1	MC	IT	0.50	0.63	0.01	0.36	0.63			
30	1	MC	IT	0.62	0.76	0.00	0.23	0.76			
31	4	ER	IT	0.53	1.56	0.04	0.22	0.25	0.23	0.16	0.09
32	1	MC	AV	0.25	0.40	0.00	0.60	0.40			
33	1	MC	AV	0.34	0.59	0.00	0.40	0.59			
34	1	MC	RP	0.55	0.87	0.00	0.13	0.87			
35	1	MC	RP	0.58	0.86	0.01	0.13	0.86			
36	2	SA	IT	0.48	1.19	0.03	0.17	0.43	0.38		
37	1	MC	IT	0.32	0.52	0.01	0.47	0.52			
38	1	MC	IT	0.43	0.77	0.01	0.22	0.77			
39	1	MC	LT	0.30	0.72	0.01	0.27	0.72			
40	1	MC	AV	0.50	0.78	0.01	0.21	0.78			
41	2	SA	LT	0.49	0.81	0.03	0.38	0.38	0.21		
42	1	MC	RP	0.33	0.58	0.01	0.41	0.58			
43	1	MC	LT	0.35	0.53	0.01	0.46	0.53			
44	1	MC	LT	0.59	0.84	0.01	0.15	0.84			

Note: Type: MC= Multiple choice, ER=Extended Response, SA=Short Answer; Subscale: AV=Acquisition of Vocabulary; RP=Reading Process; IT=Information Text; LT=Literary Text

Table A2. Early Return Sample Item Statistics – Mathematics

Position	Max score.	Type	Subscale	r_b	<i>p</i> -Val/ Avg Scr	Proportion of Students at Each Score Point					
						Omit	0	1	2	3	4
1	1	MC	PA	0.45	0.89	0.00	0.11	0.89			
2	1	MC	NS	0.66	0.92	0.00	0.07	0.92			
3	1	MC	DA	0.52	0.92	0.00	0.08	0.92			
4	1	MC	GS	0.36	0.91	0.00	0.09	0.91			
5	2	SA	NS	0.72	1.22	0.01	0.24	0.27	0.48		
6	1	MC	DA	0.49	0.85	0.00	0.15	0.85			
7	1	MC	PA	0.78	0.88	0.00	0.12	0.88			
8	1	MC	DA	0.65	0.79	0.00	0.21	0.79			
9	1	MC	ME	0.37	0.86	0.00	0.13	0.86			
10	1	MC	NS	0.50	0.83	0.00	0.16	0.83			
11	2	SA	PA	0.68	1.23	0.02	0.27	0.20	0.51		
12	1	MC	DA	0.65	0.87	0.00	0.13	0.87			
13	1	MC	GS	0.35	0.71	0.00	0.29	0.71			
14	1	MC	NS	0.67	0.69	0.00	0.30	0.69			
15	1	MC	DA	0.62	0.60	0.00	0.40	0.60			
16	2	SA	ME	0.54	0.99	0.02	0.18	0.61	0.19		
17	1	MC	PA	0.48	0.73	0.00	0.27	0.73			
18	1	MC	DA	0.76	0.73	0.00	0.27	0.73			
19	1	MC	NS	0.56	0.61	0.00	0.39	0.61			
20	1	MC	ME	0.55	0.60	0.00	0.39	0.60			
21	1	MC	PA	0.43	0.61	0.00	0.39	0.61			
22	2	SA	DA	0.53	1.02	0.05	0.26	0.36	0.33		
29	1	MC	ME	0.67	0.60	0.00	0.40	0.60			
30	1	MC	NS	0.58	0.45	0.00	0.54	0.45			
31	1	MC	PA	0.45	0.65	0.00	0.35	0.65			
32	1	MC	DA	0.72	0.61	0.00	0.38	0.61			
33	1	MC	ME	0.70	0.70	0.00	0.30	0.70			
34	4	ER	GS	0.65	1.95	0.03	0.11	0.19	0.41	0.07	0.18
35	1	MC	PA	0.70	0.73	0.00	0.26	0.73			
36	1	MC	ME	0.53	0.64	0.00	0.35	0.64			
37	1	MC	GS	0.53	0.65	0.00	0.35	0.65			
38	1	MC	PA	0.39	0.79	0.00	0.21	0.79			
39	1	MC	DA	0.45	0.78	0.00	0.22	0.78			
40	2	SA	NS	0.68	0.79	0.04	0.40	0.33	0.23		
41	1	MC	PA	0.75	0.78	0.00	0.21	0.78			
42	1	MC	GS	0.70	0.71	0.00	0.29	0.71			
43	1	MC	DA	0.76	0.79	0.00	0.21	0.79			
44	1	MC	ME	0.55	0.70	0.00	0.29	0.70			

Note: Type: MC=Multiple choice, ER=Extended Response, SA=Short Answer; Subscale: NS=Number Sense and Operations; ME=Measurement; DA=Data Analysis and Probability; PA=Patterns, Functions and Algebra; GS=Geometry and Spatial Sense

Table A3. Early Return Sample Item Statistics – Writing

Position	Max score.	Type	Subscale	r_b	<i>p</i> -Val/ Avg Scr	Proportion of Students at Each Score Point							
						Omit	0	1	2	3	4	5	6
1	6	ER	WA	0.58	3.18	0.00	0.00	0.02	0.19	0.45	0.28	0.06	0.00
2	3	ER	WC	0.70	2.74	0.00	0.00	0.02	0.22	0.76			
3	1	MC	WP	0.48	0.88	0.00	0.12	0.88					
4	1	MC	WP	0.51	0.95	0.00	0.05	0.95					
5	1	MC	WP	0.42	0.61	0.00	0.39	0.61					
6	2	SA	WP	0.47	1.77	0.01	0.07	0.07	0.85				
7	1	MC	WP	0.34	0.79	0.00	0.21	0.79					
8	1	MC	WP	0.20	0.64	0.00	0.36	0.64					
9	1	MC	WP	0.42	0.84	0.00	0.16	0.84					
10	1	MC	WP	0.39	0.66	0.00	0.34	0.66					
11	1	MC	WP	0.34	0.89	0.00	0.11	0.89					
12	1	MC	WP	0.46	0.74	0.00	0.26	0.74					
13	1	MC	WP	0.13	0.65	0.00	0.35	0.65					
14	6	ER	WA	0.55	3.33	0.00	0.00	0.01	0.11	0.47	0.35	0.06	0.00
15	3	ER	WC	0.71	2.76	0.00	0.00	0.01	0.20	0.78			

Note: Type: MC=Multiple choice, ER=Extended Response, SA=Short Answer; Subscale: WA=Writing Applications; WC=Writing Conventions; WP=Writing Process

Table A4. Early Return Sample Item Statistics – Science

Position	Max score.	Type	Subscale	r _b	p-Val/ Avg Scr	Proportion of Students at Each Score Point					
						Omit	0	1	2	3	4
1	1	MC	PS	0.57	0.90	0.00	0.09	0.90			
2	1	MC	SP	0.53	0.86	0.00	0.14	0.86			
3	1	MC	LS	0.53	0.84	0.00	0.16	0.84			
4	1	MC	ES	0.55	0.81	0.00	0.19	0.81			
5	1	MC	LS	0.46	0.69	0.00	0.31	0.69			
6	4	ER	ES	0.49	2.77	0.01	0.02	0.08	0.30	0.26	0.33
7	1	MC	PS	0.34	0.43	0.00	0.57	0.43			
8	1	MC	SP	0.53	0.79	0.00	0.21	0.79			
9	1	MC	LS	0.55	0.55	0.00	0.45	0.55			
10	1	MC	LS	0.43	0.67	0.00	0.33	0.67			
11	1	MC	LS	0.59	0.52	0.00	0.48	0.52			
12	2	SA	LS	0.56	1.10	0.02	0.29	0.29	0.40		
13	1	MC	ES	0.46	0.55	0.00	0.45	0.55			
14	1	MC	PS	0.47	0.58	0.00	0.42	0.58			
15	1	MC	ES	0.56	0.74	0.00	0.26	0.74			
16	1	MC	PS	0.45	0.54	0.00	0.46	0.54			
17	1	MC	PS	0.47	0.53	0.00	0.46	0.53			
18	2	SA	SP	0.44	0.76	0.02	0.42	0.36	0.20		
19	1	MC	SP	0.54	0.87	0.00	0.13	0.87			
20	1	MC	ES	0.50	0.55	0.00	0.45	0.55			
21	1	MC	PS	0.35	0.48	0.00	0.52	0.48			
22	1	MC	ES	0.53	0.75	0.00	0.25	0.75			
29	2	SA	PS	0.44	1.04	0.02	0.10	0.72	0.16		
30	1	MC	ES	0.39	0.50	0.00	0.49	0.50			
31	1	MC	PS	0.45	0.82	0.00	0.18	0.82			
32	1	MC	LS	0.42	0.64	0.00	0.36	0.64			
33	1	MC	LS	0.39	0.56	0.00	0.44	0.56			
34	1	MC	LS	0.44	0.59	0.00	0.40	0.59			
35	4	ER	SP	0.50	1.83	0.03	0.18	0.19	0.29	0.17	0.14
36	1	MC	PS	0.52	0.65	0.00	0.35	0.65			
37	1	MC	LS	0.51	0.77	0.00	0.22	0.77			
38	1	MC	ES	0.63	0.59	0.00	0.41	0.59			
39	1	MC	SP	0.67	0.85	0.00	0.15	0.85			
40	2	SA	SP	0.43	1.11	0.03	0.21	0.41	0.35		
41	1	MC	ES	0.44	0.69	0.00	0.31	0.69			
42	1	MC	PS	0.51	0.59	0.00	0.41	0.59			
43	1	MC	LS	0.53	0.65	0.00	0.34	0.65			
44	1	MC	PS	0.40	0.65	0.00	0.34	0.65			

Note: Type: MC=Multiple choice, ER=Extended Response, SA=Short Answer; Subscale: ES=Earth and Space Sciences; LS=Life Sciences; PS=Physical Sciences; SP=Scientific Processes

Table A5. Early Return Sample Item Statistics – Social Studies

Position	Max score.	Type	Subscale	r _b	p-Val/ Avg Scr	Proportion of Students at Each Score Point					
						Omit	0	1	2	3	4
1	1	MC	SG	0.34	0.83	0.00	0.17	0.83			
2	1	MC	EG	0.66	0.79	0.00	0.21	0.79			
3	1	MC	EG	0.45	0.67	0.00	0.32	0.67			
4	1	MC	EG	0.44	0.62	0.00	0.38	0.62			
5	2	SA	SO	0.38	0.57	0.01	0.52	0.36	0.10		
6	1	MC	HI	0.51	0.72	0.00	0.28	0.72			
7	1	MC	SG	0.40	0.63	0.00	0.37	0.63			
8	1	MC	SG	0.53	0.72	0.00	0.28	0.72			
9	1	MC	HI	0.57	0.63	0.00	0.37	0.63			
10	1	MC	EG	0.31	0.78	0.00	0.22	0.78			
11	2	SA	EG	0.64	1.08	0.02	0.29	0.28	0.40		
12	1	MC	EG	0.51	0.77	0.00	0.23	0.77			
13	1	MC	EG	0.63	0.72	0.00	0.27	0.72			
14	1	MC	HI	0.49	0.54	0.00	0.46	0.54			
15	1	MC	HI	0.64	0.69	0.00	0.31	0.69			
16	1	MC	SO	0.55	0.62	0.00	0.38	0.62			
17	4	ER	SG	0.50	1.33	0.02	0.33	0.22	0.27	0.09	0.07
18	1	MC	SG	0.56	0.91	0.00	0.09	0.91			
19	1	MC	SO	0.69	0.94	0.00	0.06	0.94			
20	1	MC	HI	0.49	0.66	0.00	0.34	0.66			
21	1	MC	SO	0.70	0.90	0.00	0.10	0.90			
22	1	MC	SG	0.52	0.92	0.00	0.08	0.92			
29	4	ER	HI	0.61	1.72	0.05	0.24	0.17	0.26	0.10	0.18
30	1	MC	HI	0.56	0.80	0.00	0.20	0.80			
31	1	MC	EG	0.64	0.79	0.00	0.21	0.79			
32	1	MC	EG	0.45	0.70	0.00	0.30	0.70			
33	1	MC	SG	0.54	0.82	0.00	0.18	0.82			
34	1	MC	HI	0.68	0.78	0.00	0.21	0.78			
35	2	SA	HI	0.52	1.25	0.02	0.10	0.50	0.38		
36	1	MC	SO	0.76	0.79	0.00	0.21	0.79			
37	1	MC	EG	0.46	0.55	0.00	0.44	0.55			
38	1	MC	SO	0.74	0.90	0.00	0.10	0.90			
39	2	SA	SG	0.31	0.86	0.02	0.36	0.36	0.25		
40	1	MC	HI	0.53	0.72	0.00	0.28	0.72			
41	1	MC	EG	0.63	0.76	0.00	0.24	0.76			
42	1	MC	EG	0.53	0.82	0.00	0.18	0.82			
43	1	MC	SO	0.69	0.86	0.00	0.13	0.86			
44	1	MC	SO	0.50	0.72	0.00	0.28	0.72			

Note: Type: MC=Multiple choice, ER=Extended Response, SA=Short Answer; Subscale: EG=Economics, Government and Citizenship; HI=History; SG=People in Societies and Geography; SO=Social Studies Skills and Methods

APPENDIX B.

Operational Test Summary Statistics and Operational Internal Consistency Estimates for Subgroups

Table B1.1. Operational Test Summary Statistics – Grade 10 Public School Students

Test Subject	N-count	Operational Summary Statistics – Grade 10 Public School Students								
		Max Obtained Raw Score	Raw Score Mean	Raw Score Standard Deviation	Raw Score SEM	Max Obtained Scaled Score	Scaled Score Mean	Scaled Score Standard Deviation	Scaled Score SEM	Reliability
Reading	134660	48	30.11	8.74	3.00	552	425.09	25.02	8.59	0.88
Mathematics	135399	46	29.16	10.16	2.88	560	428.83	35.35	10.02	0.92
Writing	134138	48	31.58	6.25	2.77	630	424.06	26.60	11.80	0.80
Science	135387	48	28.21	9.41	3.09	590	418.68	32.48	10.66	0.89
Social Studies	134970	48	29.22	9.42	3.00	580	425.09	32.66	10.41	0.90

Note: Figures do not include students who used a breach form.

Table B1.2. Operational Test Summary Statistics – Grade 10 Non-Public School Students

Test Subject	N-count	Operational Summary Statistics – Grade 10 Non-Public School Students								
		Max Obtained Raw Score	Raw Score Mean	Raw Score Standard Deviation	Raw Score SEM	Max Obtained Scaled Score	Scaled Score Mean	Scaled Score Standard Deviation	Scaled Score SEM	Reliability
Reading	13224	48	35.36	6.01	2.79	552	440.14	18.52	8.59	0.78
Mathematics	13248	46	33.76	7.99	2.73	560	444.20	31.04	10.62	0.88
Writing	13239	47	35.23	4.05	2.32	587	440.72	22.24	12.71	0.67
Science	13236	48	32.67	7.26	2.96	590	433.71	26.37	10.76	0.83
Social Studies	13194	48	33.55	6.98	2.84	580	439.56	25.14	10.21	0.83

Note: Figures do not include students who used a breach form.

Table B2.1. Operational Internal Consistency Estimates for Subgroups for Grade 10 Public School Students – Reading

Gender/Ethnicity	Sample Size	Internal Consistency Reliability Estimates (Cronbach's α)				
		Total	AV	IT	LT	RP
All Students	134660	0.88	0.56	0.73	0.62	0.66
Gender						
Female	66334	0.87	0.54	0.71	0.60	0.62
Male	67951	0.89	0.58	0.74	0.63	0.68
Ethnicity						
American Indian	199	0.89	0.60	0.74	0.65	0.66
Asian/Pacific Islander	1650	0.87	0.60	0.70	0.61	0.63
Black/African American	20060	0.88	0.53	0.72	0.61	0.65
Hispanic	2747	0.89	0.57	0.74	0.63	0.67
White	106010	0.87	0.54	0.71	0.60	0.63
Multi-Ethnic	3010	0.88	0.55	0.72	0.61	0.65
Other	134	0.91	0.54	0.78	0.69	0.69

Note. AV – Acquisition of Vocabulary; IT – Informational Text; LT – Literary Text; RP – Reading Process

Table B2.2. Operational Internal Consistency Estimates for Subgroups for Grade 10 Public School Students – Math

		Internal Consistency Reliability Estimates (Cronbach's α)					
Gender/Ethnicity	Sample Size	Total	DA	GS	ME	NS	PA
All Students	135399	0.92	0.76	0.52	0.69	0.73	0.70
Gender							
Female	66810	0.92	0.75	0.51	0.68	0.72	0.68
Male	68203	0.92	0.77	0.53	0.70	0.74	0.71
Ethnicity							
American Indian	201	0.92	0.75	0.56	0.66	0.73	0.70
Asian/Pacific Islander	1666	0.92	0.75	0.47	0.70	0.74	0.68
Black/African American	20471	0.90	0.73	0.48	0.59	0.67	0.67
Hispanic	2791	0.91	0.75	0.51	0.65	0.71	0.66
White	106238	0.91	0.74	0.50	0.67	0.71	0.67
Multi-Ethnic	3035	0.91	0.75	0.52	0.67	0.71	0.68
Other	135	0.92	0.80	0.53	0.70	0.68	0.69

Note. DA= Data Analysis and Probability, GS= Geometry and Spatial Sense, ME= Measurement, NS= Number, Number Sense and Operations, PA= Patterns, Function, and Algebra

Table B2.3. Operational Internal Consistency Estimates for Subgroups for Grade 10 Public School Students – Writing

		Internal Consistency Reliability Estimates (Cronbach's α)			
Gender/Ethnicity	Sample Size	Total	WA	WC	WP
All Students	134138	0.80	0.79	0.78	0.63
Gender					
Female	66052	0.78	0.75	0.74	0.60
Male	67719	0.81	0.79	0.79	0.63
Ethnicity					
American Indian	198	0.83	0.85	0.85	0.68
Asian/Pacific Islander	1647	0.79	0.77	0.81	0.65
Black/African	19811	0.81	0.79	0.78	0.60
Hispanic	2729	0.82	0.80	0.82	0.65
White	105804	0.79	0.78	0.76	0.59
Multi-Ethnic	2989	0.79	0.77	0.74	0.60
Other	127	0.85	0.87	0.88	0.68

Note. WA – Writing Applications; WC – Writing Conventions; WP – Writing Process

Table B2.4 Operational Internal Consistency Estimates for Subgroups for Grade 10 Public School Students – Science

Gender/Ethnicity	Sample Size	Internal Consistency Reliability Estimates (Cronbach's α)				
		Total Science	ES	LS	PS	SP
All Students	135387	0.89	0.66	0.73	0.67	0.63
Gender						
Female	66859	0.88	0.64	0.72	0.63	0.61
Male	68149	0.90	0.69	0.74	0.70	0.64
Ethnicity						
American Indian	199	0.90	0.69	0.73	0.63	0.68
Asian/Pacific Islander	1663	0.89	0.68	0.73	0.69	0.63
Black/African American	20505	0.86	0.58	0.65	0.58	0.63
Hispanic	2769	0.88	0.63	0.70	0.64	0.64
White	106239	0.88	0.64	0.71	0.64	0.59
Multi-Ethnic	3036	0.89	0.63	0.72	0.66	0.63
Other	136	0.90	0.69	0.72	0.70	0.72

Note. ES – Earth Sciences; LS – Life Sciences; PS – Physical Sciences; SP – Scientific Processes.

Table B2.5 Operational Internal Consistency Estimates for Subgroups for Grade 10 Public School Students – Social Studies

		Internal Consistency Reliability Estimates (Cronbach's α)				
Gender/Ethnicity	Sample Size	Total	EG	HI	SG	SO
All Students	134970	0.90	0.75	0.73	0.57	0.69
Gender						
Female	66624	0.89	0.73	0.72	0.54	0.66
Male	67979	0.91	0.77	0.74	0.59	0.72
Ethnicity						
American Indian	198	0.90	0.73	0.74	0.57	0.72
Asian/Pacific Islander	1661	0.89	0.74	0.72	0.53	0.68
Black/African American	20186	0.89	0.71	0.71	0.58	0.69
Hispanic	2782	0.89	0.72	0.73	0.56	0.69
White	106140	0.89	0.74	0.71	0.54	0.67
Multi-Ethnic	3032	0.90	0.73	0.73	0.56	0.70
Other	134	0.90	0.76	0.72	0.57	0.68

Note. EG – Economics, Government & Citizenship Rights and Responsibilities; HI – History; SG – People in Societies and Geography; SO – Social Studies Skills and Methods

APPENDIX C.

Early Return Sample Item Parameter Estimates

Table C1. Early Return Sample Winsteps Item Calibrations – Reading

Num	Score	Count	Measure	SE	Infit	Infit zstd	Outfit	Outfit zstd
1	15414.90	16211.20	-2.21	0.04	0.95	-1.54	0.78	-4.66
2	13924.80	16211.20	-0.91	0.02	0.91	-5.90	0.75	-9.90
3	17538.90	16211.20	0.99	0.01	1.11	9.90	1.11	9.90
4	9205.00	16211.20	0.91	0.02	0.99	-1.52	1.00	0.32
5	11918.60	16211.20	0.01	0.02	0.98	-1.72	0.94	-4.36
6	15428.20	16211.20	-2.23	0.04	0.88	-4.16	0.52	-9.90
7	13898.80	16211.20	-0.90	0.02	0.91	-5.81	0.73	-9.90
8	11123.80	16211.20	0.30	0.02	0.93	-8.66	0.89	-8.75
9	14130.80	16211.20	-1.04	0.03	0.97	-1.54	0.92	-2.93
10	7266.50	16211.20	1.48	0.02	0.95	-8.96	1.03	2.97
11	13970.00	16211.20	-0.94	0.02	0.99	-0.71	0.98	-0.62
12	14483.50	16211.20	-1.28	0.03	0.94	-3.19	0.85	-4.89
13	13171.50	16211.20	-0.52	0.02	0.94	-4.32	0.84	-8.05
14	33956.20	16211.20	1.14	0.01	1.01	1.33	1.01	0.90
15	8400.90	16211.20	1.14	0.02	1.16	9.90	1.22	9.90
16	11018.60	16211.20	0.33	0.02	1.00	-0.45	0.97	-2.34
17	14092.90	16211.20	-1.01	0.03	0.88	-7.45	0.69	-9.90
18	14410.00	16211.20	-1.23	0.03	0.92	-4.39	0.80	-6.97
19	13862.40	16211.20	-0.88	0.02	1.06	3.80	1.13	4.90
20	12639.50	16211.20	-0.28	0.02	0.97	-2.25	0.91	-4.99
21	28426.80	16211.20	-1.20	0.02	0.93	-4.67	0.92	-4.13
22	7870.10	16211.20	1.30	0.02	1.03	5.23	1.09	9.46
29	10263.50	16211.20	0.58	0.02	0.96	-5.17	0.94	-5.66
30	12348.30	16211.20	-0.16	0.02	0.91	-8.66	0.82	-9.90
31	25355.00	16211.20	1.71	0.01	1.05	4.67	1.06	4.90
32	6460.20	16211.20	1.72	0.02	1.10	9.90	1.24	9.90
33	9634.90	16211.20	0.78	0.02	1.08	9.90	1.11	9.90
34	14051.40	16211.20	-0.99	0.02	0.95	-2.78	0.95	-1.78
35	13957.90	16211.20	-0.93	0.02	0.95	-3.45	0.86	-5.56
36	19276.60	16211.20	0.76	0.01	1.04	4.10	1.03	3.30
37	8422.90	16211.20	1.14	0.02	1.08	9.90	1.12	9.90
38	12522.10	16211.20	-0.23	0.02	1.03	2.67	1.05	2.95
39	11672.90	16211.20	0.10	0.02	1.11	9.90	1.18	9.90
40	12620.30	16211.20	-0.27	0.02	0.99	-1.07	0.97	-1.74
41	13121.90	16211.20	1.67	0.01	0.98	-1.67	0.98	-2.04
42	9387.50	16211.20	0.85	0.02	1.08	9.90	1.12	9.90
43	8652.10	16211.20	1.07	0.02	1.05	8.06	1.10	9.90
44	13685.50	16211.20	-0.78	0.02	0.94	-4.30	0.84	-6.87
Mean	13620.68	16211.20	0.00	0.02	0.99	0.13	0.96	-0.45
SD	5501.74	0.00	1.10	0.01	0.07	6.08	0.16	7.10

Table C2. Early Return Sample Winsteps Item Calibrations – Mathematics

Num	Score	Count	Measure	SE	Infit	Infit zstd	Outfit	Outfit zstd
1	14327.00	16162.30	-1.37	0.03	1.03	1.76	1.44	9.37
2	14916.40	16162.30	-1.86	0.03	0.92	-3.58	0.77	-4.88
3	14874.80	16162.30	-1.82	0.03	1.00	-0.16	1.05	0.92
4	14755.40	16162.30	-1.71	0.03	1.10	4.43	1.40	7.62
5	19671.50	16162.30	0.71	0.01	0.92	-7.87	0.92	-4.97
6	13741.70	16162.30	-0.99	0.02	1.04	2.38	1.27	7.42
7	14261.10	16162.30	-1.32	0.03	0.84	-9.54	0.61	-9.90
8	12761.70	16162.30	-0.48	0.02	0.93	-5.96	0.93	-2.97
9	13952.00	16162.30	-1.12	0.03	1.11	6.74	1.48	9.90
10	13448.70	16162.30	-0.82	0.02	1.05	3.64	1.13	4.12
11	19719.50	16162.30	0.73	0.01	1.06	5.18	1.07	3.99
12	14002.80	16162.30	-1.15	0.03	0.93	-4.80	0.82	-5.14
13	11477.90	16162.30	0.06	0.02	1.20	9.90	1.43	9.90
14	11168.90	16162.30	0.18	0.02	0.91	-9.89	0.83	-9.90
15	9660.20	16162.30	0.71	0.02	0.94	-7.19	0.91	-6.98
16	15954.00	16162.30	1.28	0.02	1.04	4.17	1.04	3.75
17	11733.90	16162.30	-0.04	0.02	1.09	8.49	1.11	5.47
18	11717.40	16162.30	-0.03	0.02	0.84	-9.90	0.72	-9.90
19	9838.40	16162.30	0.65	0.02	1.01	1.54	0.99	-0.86
20	9714.90	16162.30	0.70	0.02	1.02	2.10	1.02	1.33
21	9760.90	16162.30	0.68	0.02	1.13	9.90	1.19	9.90
22	16387.70	16162.30	1.20	0.01	1.21	9.90	1.24	9.90
29	9624.60	16162.30	0.73	0.02	0.91	-9.90	0.87	-9.71
30	7275.70	16162.30	1.50	0.02	0.96	-5.80	1.01	0.88
31	10470.40	16162.30	0.43	0.02	1.12	9.90	1.14	8.66
32	9866.50	16162.30	0.64	0.02	0.86	-9.90	0.82	-9.90
33	11233.40	16162.30	0.16	0.02	0.88	-9.90	0.82	-9.90
34	31316.40	16162.30	1.24	0.01	1.11	9.63	1.09	6.94
35	11837.40	16162.30	-0.08	0.02	0.89	-9.90	0.83	-9.07
36	10343.20	16162.30	0.48	0.02	1.04	5.13	1.05	3.05
37	10483.30	16162.30	0.43	0.02	1.04	4.85	0.99	-0.55
38	12684.70	16162.30	-0.44	0.02	1.15	9.90	1.27	9.86
39	12544.50	16162.30	-0.38	0.02	1.10	8.26	1.27	9.90
40	12669.30	16162.30	1.79	0.01	0.90	-9.90	0.85	-9.90
41	12647.60	16162.30	-0.43	0.02	0.85	-9.90	0.74	-9.90
42	11450.40	16162.30	0.07	0.02	0.89	-9.90	0.80	-9.90
43	12686.20	16162.30	-0.44	0.02	0.85	-9.90	0.68	-9.90
44	11343.70	16162.30	0.11	0.02	1.03	3.43	0.96	-2.44
Mean	13061.16	16162.30	0.00	0.02	1.00	-0.60	1.01	-0.36
SD	4016.62	0.00	0.95	0.00	0.11	7.71	0.22	7.70

Table C3. Early Return Sample Winsteps Item Calibrations – Writing

Num	Score	Count	Measure	SE	Infit	Infit zstd	Outfit	Outfit zstd
1	48685.00	15308.00	1.63	0.01	0.81	-9.90	0.81	-9.90
2	41876.10	15308.00	-1.70	0.02	0.80	-9.90	0.67	-9.90
3	13467.00	15308.00	-0.80	0.03	0.98	-1.04	0.93	-1.78
4	14561.30	15308.00	-1.90	0.04	0.98	-0.75	0.86	-2.42
5	9314.70	15308.00	1.09	0.02	0.99	-1.94	1.02	1.17
6	27116.70	15308.00	-0.28	0.02	1.14	6.91	1.55	9.24
7	12039.20	15308.00	0.02	0.02	1.07	5.95	1.17	6.03
8	9765.20	15308.00	0.94	0.02	1.19	9.90	1.35	9.90
9	12835.80	15308.00	-0.39	0.02	1.02	1.32	1.05	1.63
10	10042.70	15308.00	0.83	0.02	1.02	2.97	1.07	3.56
11	13586.30	15308.00	-0.88	0.03	1.06	3.22	1.23	5.18
12	11371.50	15308.00	0.32	0.02	0.98	-2.26	0.96	-1.73
13	9993.40	15308.00	0.85	0.02	1.26	9.90	1.60	9.90
14	51024.80	15308.00	1.78	0.01	0.88	-9.90	0.88	-9.90
15	42217.70	15308.00	-1.50	0.02	0.80	-9.90	0.67	-9.90
Mean	21859.83	15308.00	0.00	0.02	1.00	-0.36	1.05	0.07
SD	15759.52	0.00	1.19	0.01	0.14	7.07	0.28	7.39

Table C4. Early Return Sample Winsteps Item Calibrations – Science

Num	Score	Count	Measure	SE	Infit	Infit zstd	Outfit	Outfit zstd
1	14752.70	16305.10	-1.85	0.03	0.92	-3.83	0.84	-4.76
2	13957.90	16305.10	-1.33	0.02	0.96	-2.68	0.85	-5.98
3	13727.60	16305.10	-1.20	0.02	0.96	-3.02	0.87	-5.62
4	13214.10	16305.10	-0.95	0.02	0.95	-4.24	0.88	-6.22
5	11174.20	16305.10	-0.16	0.02	1.01	0.83	0.98	-1.77
6	45149.60	16305.10	-0.26	0.01	1.19	9.90	1.22	9.90
7	6991.10	16305.10	1.12	0.02	1.07	9.90	1.12	9.90
8	12824.60	16305.10	-0.78	0.02	0.96	-3.31	0.89	-6.31
9	9014.90	16305.10	0.52	0.02	0.92	-9.90	0.91	-9.90
10	10848.60	16305.10	-0.05	0.02	1.02	2.98	1.05	4.04
11	8527.70	16305.10	0.67	0.02	0.89	-9.90	0.89	-9.90
12	17863.70	16305.10	0.58	0.01	1.01	0.74	1.00	0.01
13	8890.70	16305.10	0.56	0.02	0.99	-1.77	0.99	-1.34
14	9422.70	16305.10	0.40	0.02	0.98	-2.43	0.97	-2.97
15	12105.60	16305.10	-0.49	0.02	0.93	-7.16	0.88	-7.82
16	8839.90	16305.10	0.57	0.02	1.00	-0.62	0.99	-0.76
17	8697.20	16305.10	0.62	0.02	0.98	-2.67	0.99	-1.32
18	12329.50	16305.10	1.34	0.01	1.08	7.83	1.08	6.72
19	14136.30	16305.10	-1.43	0.02	0.95	-3.43	0.90	-3.91
20	8987.40	16305.10	0.53	0.02	0.96	-5.82	0.96	-4.61
21	7847.60	16305.10	0.87	0.02	1.06	9.90	1.11	9.90
22	12219.40	16305.10	-0.53	0.02	0.95	-4.85	0.94	-3.58
29	17003.20	16305.10	0.57	0.02	1.00	-0.38	0.99	-0.50
30	8227.60	16305.10	0.75	0.02	1.04	6.69	1.06	7.08
31	13416.90	16305.10	-1.04	0.02	1.00	0.08	1.01	0.28
32	10362.10	16305.10	0.11	0.02	1.03	3.59	1.02	1.99
33	9170.70	16305.10	0.48	0.02	1.05	7.44	1.08	8.18
34	9651.60	16305.10	0.33	0.02	1.01	1.49	1.02	1.87
35	29907.60	16305.10	0.97	0.01	1.25	9.90	1.26	9.90
36	10626.60	16305.10	0.02	0.02	0.96	-5.78	0.96	-3.92
37	12628.80	16305.10	-0.69	0.02	0.97	-3.18	0.92	-4.51
38	9605.30	16305.10	0.34	0.02	0.87	-9.90	0.83	-9.90
39	13897.40	16305.10	-1.29	0.02	0.88	-8.24	0.72	-9.90
40	18112.00	16305.10	0.51	0.01	1.12	9.90	1.13	9.90
41	11261.00	16305.10	-0.19	0.02	1.02	1.95	1.00	-0.23
42	9583.20	16305.10	0.35	0.02	0.96	-6.03	0.95	-5.45
43	10669.00	16305.10	0.01	0.02	0.95	-6.28	0.92	-7.56
44	10665.80	16305.10	0.01	0.02	1.04	5.11	1.07	5.54
Mean	12797.68	16305.10	0.00	0.02	1.00	-0.45	0.98	-0.88
SD	6736.42	0.00	0.79	0.00	0.08	6.10	0.11	6.34

Table C5. Early Return Sample Winsteps Item Calibrations – Social Studies

Num	Score	Count	Measure	SE	Infit	Infit zstd	Outfit	Outfit zstd
1	13436.30	16243.40	-0.72	0.02	1.11	7.58	1.26	9.66
2	12804.90	16243.40	-0.42	0.02	0.90	-9.24	0.80	-9.90
3	10954.60	16243.40	0.30	0.02	1.05	6.22	1.02	1.65
4	10007.20	16243.40	0.62	0.02	1.05	6.63	1.06	5.21
5	9202.20	16243.40	2.38	0.01	1.18	9.90	1.21	9.90
6	11750.80	16243.40	0.01	0.02	1.01	0.84	0.93	-4.44
7	10293.90	16243.40	0.52	0.02	1.09	9.90	1.10	7.69
8	11611.40	16243.40	0.07	0.02	0.99	-1.19	0.94	-3.64
9	10193.20	16243.40	0.55	0.02	0.95	-7.16	0.92	-7.28
10	12728.50	16243.40	-0.38	0.02	1.13	9.90	1.34	9.90
11	17601.70	16243.40	1.03	0.01	0.94	-6.24	0.92	-6.72
12	12481.70	16243.40	-0.28	0.02	1.00	0.27	0.99	-0.60
13	11765.90	16243.40	0.01	0.02	0.91	-9.84	0.82	-9.90
14	8715.60	16243.40	1.02	0.02	0.99	-2.11	1.01	0.51
15	11251.00	16243.40	0.20	0.02	0.90	-9.90	0.83	-9.90
16	10013.90	16243.40	0.61	0.02	0.96	-5.45	0.93	-6.23
17	21614.70	16243.40	1.98	0.01	1.21	9.90	1.29	9.90
18	14757.00	16243.40	-1.56	0.03	0.95	-2.47	0.95	-1.26
19	15217.00	16243.40	-2.01	0.03	0.87	-5.06	0.72	-6.25
20	10764.10	16243.40	0.37	0.02	1.01	1.53	0.97	-2.59
21	14656.60	16243.40	-1.48	0.03	0.88	-6.41	0.71	-8.69
22	14908.20	16243.40	-1.70	0.03	0.95	-2.15	1.12	2.75
29	27849.10	16243.40	1.47	0.01	1.09	8.52	1.10	7.09
30	12915.90	16243.40	-0.47	0.02	0.97	-2.86	0.91	-4.27
31	12774.20	16243.40	-0.40	0.02	0.92	-7.46	0.82	-9.55
32	11422.40	16243.40	0.13	0.02	1.05	5.39	1.02	1.58
33	13333.60	16243.40	-0.66	0.02	0.96	-2.86	1.05	1.94
34	12729.30	16243.40	-0.38	0.02	0.89	-9.90	0.76	-9.90
35	20338.90	16243.40	0.41	0.01	1.01	1.26	1.02	2.12
36	12780.30	16243.40	-0.40	0.02	0.82	-9.90	0.67	-9.90
37	9000.70	16243.40	0.93	0.02	1.02	2.48	1.03	3.35
38	14673.40	16243.40	-1.49	0.03	0.85	-7.77	0.66	-9.90
39	14015.90	16243.40	1.53	0.01	1.33	9.90	1.49	9.90
40	11654.10	16243.40	0.05	0.02	0.99	-1.14	0.95	-3.21
41	12268.00	16243.40	-0.19	0.02	0.92	-8.10	0.83	-9.90
42	13299.90	16243.40	-0.65	0.02	0.98	-1.32	0.95	-1.93
43	14037.00	16243.40	-1.05	0.02	0.88	-7.64	0.75	-9.15
44	11634.40	16243.40	0.06	0.02	1.01	1.12	1.00	-0.18
Mean	13196.25	16243.40	0.00	0.02	0.99	-0.92	0.97	-1.64
SD	3655.17	0.00	0.99	0.01	0.10	6.68	0.19	6.86

APPENDIX D.

Comparing Field Test, Early Return, and Linked Early Return Item Parameter Estimates

Table D1. Comparing Field Test, Early Return, and Linked Early Return Sample Item Parameter Estimates – Reading

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Final Linked
1	-2.21	-1.73	-2.24		-2.26
2	-0.91	-1.26	-0.93		-0.96
3	0.99	0.63	0.97		0.94
4	0.91	0.73	0.88	0.86	0.86
5	0.01	-0.30	-0.01	-0.04	-0.04
6	-2.23	-1.90	-2.25		-2.28
7	-0.90	-0.82	-0.92	-0.94	-0.94
8	0.30	-0.01	0.27	0.25	0.25
9	-1.04	-0.51	-1.06		-1.09
10	1.48	1.83	1.46		1.43
11	-0.94	-0.71	-0.96	-0.99	-0.99
12	-1.28	-0.99	-1.30		-1.33
13	-0.52	-0.50	-0.54	-0.56	-0.56
14	1.14	1.19	1.11	1.09	1.09
15	1.14	1.65	1.12		1.10
16	0.33	0.75	0.31		0.29
17	-1.01	-1.48	-1.04		-1.06
18	-1.23	-1.30	-1.25	-1.27	-1.27
19	-0.88	-1.43	-0.90		-0.92
20	-0.28	0.04	-0.30		-0.32
21	-1.20	0.15	-1.22		-1.25
22	1.30	0.90	1.28		1.25
29	0.58	1.25	0.56		0.53
30	-0.16	0.40	-0.18		-0.20
31	1.71	1.95	1.69	1.66	1.66
32	1.72	0.65	1.70		1.67
33	0.78	-0.30	0.75		0.73
34	-0.99	-0.38	-1.01		-1.04
35	-0.93	-1.16	-0.95	-0.98	-0.98
36	0.76	1.36	0.74		0.71
37	1.14	1.20	1.12	1.09	1.09
38	-0.23	0.45	-0.25		-0.27
39	0.10	-0.97	0.08		0.06
40	-0.27	-0.96	-0.29		-0.32

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Final Linked
41	1.67	0.22	1.65		1.63
42	0.85	0.56	0.83	0.80	0.80
43	1.07	1.15	1.05	1.02	1.02
44	-0.78	-1.18	-0.80		-0.82
Mean	0.00	-0.02	-0.02	0.15	-0.05
Std. Dev.	1.10	1.07	1.10	1.00	1.10
Constants			0.02	0.05	

Table D2. Comparing Field Test, Early Return, and Linked Early Return Sample Item Parameter Estimates – Mathematics

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Step 3 Adjusted	Step 4 Adjusted	Step 5 Adjusted	Step 6 Adjusted	Step 7 Adjusted	Step 8 Adjusted	Step 9 Adjusted	Step 10 Adjusted	Step 11 Adjusted	Step 12 Adjusted	Step 13 Adjusted	Step 14 Adjusted	Step 15 Adjusted	Step 16 Adjusted	Final Linked
1	-1.37	-1.38	-1.37	-1.39	-1.42	-1.44	-1.46	-1.44	-1.42	-1.40	-1.38	-1.36	-1.34	-1.32	-1.34	-1.35	-1.34	-1.35	-1.35
2	-1.86	-1.03	-1.86	-1.89															-1.84
3	-1.82	-1.49	-1.82	-1.85	-1.87	-1.89	-1.91	-1.89	-1.87	-1.85	-1.83	-1.81	-1.79	-1.77	-1.79	-1.80	-1.79		-1.80
4	-1.71	-1.48	-1.71	-1.74	-1.76	-1.78	-1.80	-1.78	-1.76	-1.74	-1.72	-1.70	-1.68	-1.66	-1.68	-1.69	-1.68	-1.69	-1.69
5	0.71	0.74	0.71	0.69	0.66	0.64	0.62	0.64	0.66	0.68	0.70	0.72	0.74	0.76	0.74	0.73	0.74	0.73	0.73
6	-0.99	-0.73	-0.99	-1.01	-1.04	-1.06	-1.08	-1.06	-1.04	-1.02	-1.00	-0.98	-0.96	-0.94	-0.96	-0.97	-0.96	-0.97	-0.97
7	-1.32	-0.69	-1.32	-1.35	-1.37														-1.30
8	-0.48	-0.08	-0.48	-0.50	-0.53	-0.55	-0.57	-0.55	-0.53	-0.51	-0.49	-0.47	-0.45	-0.43	-0.45				-0.46
9	-1.12	-0.26	-1.12																-1.10
10	-0.82	-0.39	-0.83	-0.85	-0.87	-0.89	-0.91	-0.89	-0.87	-0.85	-0.83	-0.81	-0.79	-0.78					-0.80
11	0.73	0.80	0.73	0.71	0.68	0.67	0.65	0.66	0.68	0.71	0.72	0.74	0.76	0.78	0.77	0.75	0.77	0.75	0.75
12	-1.15	-0.55	-1.15	-1.17	-1.20	-1.22													-1.13
13	0.06	0.22	0.06	0.04	0.01	-0.01	-0.03	-0.01	0.01	0.03	0.05	0.07	0.09	0.11	0.09	0.08	0.09	0.08	0.08
14	0.18	0.35	0.18	0.15	0.13	0.11	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.21	0.20	0.21	0.20	0.20
15	0.71	0.12	0.71	0.69	0.66	0.65	0.63	0.64	0.66	0.69									0.73
16	1.28	1.25	1.28	1.25	1.23	1.21	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.31	1.30	1.31	1.30	1.30
17	-0.04	-0.04	-0.04	-0.06	-0.09	-0.11	-0.13	-0.11	-0.09	-0.07	-0.05	-0.03	-0.01	0.01	-0.01	-0.02	-0.01	-0.02	-0.02
18	-0.03	-0.24	-0.03	-0.06	-0.08	-0.10	-0.12	-0.10	-0.08	-0.06	-0.04	-0.02	0.00	0.02	0.00	-0.01	0.00	-0.01	-0.01
19	0.65	0.58	0.65	0.63	0.60	0.58	0.57	0.58	0.60	0.62	0.64	0.66	0.68	0.70	0.69	0.67	0.69	0.67	0.67
20	0.70	-0.01	0.69	0.67	0.65	0.63	0.61												0.71

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Step 3 Adjusted	Step 4 Adjusted	Step 5 Adjusted	Step 6 Adjusted	Step 7 Adjusted	Step 8 Adjusted	Step 9 Adjusted	Step 10 Adjusted	Step 11 Adjusted	Step 12 Adjusted	Step 13 Adjusted	Step 14 Adjusted	Step 15 Adjusted	Step 16 Adjusted	Final Linked
21	0.68	0.52	0.68	0.65	0.63	0.61	0.59	0.61	0.63	0.65	0.67	0.69	0.71	0.73	0.71	0.70	0.71	0.70	0.70
22	1.20	1.42	1.20	1.17	1.15	1.13	1.11	1.13	1.15	1.17	1.19	1.21	1.23	1.25	1.23	1.22	1.23	1.22	1.22
29	0.73	0.99	0.72	0.70	0.68	0.66	0.64	0.66	0.68	0.70	0.72	0.74	0.75	0.77	0.76	0.74	0.76	0.74	0.74
30	1.50	0.79	1.50	1.47	1.45	1.43	1.41	1.43											1.52
31	0.43	-0.26	0.43	0.41	0.38	0.37	0.35	0.36	0.38										0.45
32	0.64	0.83	0.64	0.62	0.59	0.58	0.56	0.57	0.59	0.62	0.63	0.65	0.67	0.69	0.68	0.66	0.68	0.66	0.66
33	0.16	0.11	0.15	0.13	0.11	0.09	0.07	0.09	0.11	0.13	0.15	0.16	0.18	0.20	0.19	0.17	0.19	0.17	0.17
34	1.24	1.42	1.23	1.21	1.19	1.17	1.15	1.17	1.19	1.21	1.23	1.25	1.27	1.28	1.27	1.25	1.27	1.26	1.26
35	-0.08	-0.61	-0.08	-0.11	-0.13	-0.15	-0.17	-0.15	-0.13	-0.11	-0.09	-0.07							-0.06
36	0.48	0.34	0.48	0.45	0.43	0.41	0.39	0.41	0.43	0.45	0.47	0.49	0.51	0.53	0.51	0.50	0.51	0.50	0.50
37	0.43	0.11	0.43	0.40	0.38	0.36	0.34	0.36	0.38	0.40	0.42	0.44	0.46	0.48	0.46	0.45			0.45
38	-0.44	-0.41	-0.45	-0.47	-0.49	-0.51	-0.53	-0.51	-0.49	-0.47	-0.45	-0.43	-0.41	-0.40	-0.41	-0.43	-0.41	-0.42	-0.42
39	-0.38	-0.58	-0.38	-0.41	-0.43	-0.45	-0.47	-0.45	-0.43	-0.41	-0.39	-0.37	-0.35	-0.33	-0.35	-0.36	-0.35	-0.36	-0.36
40	1.79	1.60	1.79	1.77	1.74	1.72	1.70	1.72	1.74	1.76	1.78	1.80	1.82	1.84	1.82	1.81	1.82	1.81	1.81
41	-0.43	-0.61	-0.43	-0.45	-0.48	-0.49	-0.51	-0.50	-0.48	-0.46	-0.44	-0.42	-0.40	-0.38	-0.39	-0.41	-0.39	-0.41	-0.41
42	0.07	-0.49	0.07	0.05	0.02	0.00	-0.02	0.00	0.02	0.04	0.06								0.09
43	-0.44	-0.92	-0.45	-0.47	-0.49	-0.51	-0.53	-0.51	-0.49	-0.47	-0.45	-0.44	-0.42						-0.43
44	0.11	-0.03	0.11	0.09	0.06	0.05	0.03	0.04	0.06	0.09	0.10	0.12	0.14	0.16	0.15	0.13	0.15	0.13	0.13
Mean	0.00	0.00	0.00	0.01	0.03	0.05	0.07	0.07	0.05	0.06	0.06	0.08	0.10	0.14	0.16	0.17	0.18	0.25	0.02
Std. Dev.	0.95	0.80	0.95	0.94	0.90	0.88	0.86	0.87	0.85	0.86	0.87	0.88	0.90	0.91	0.91	0.92	0.94	0.86	0.95
Constants			0.00	0.03	0.05	0.07	0.09	0.07	0.05	0.03	0.01	-0.01	-0.03	-0.05	-0.03	-0.02	-0.03	-0.02	

Table D3. Comparing Field Test, Early Return, and Linked Early Return Sample Item Parameter Estimates – Writing

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Step 3 Adjusted	Step 4 Adjusted	Step 5 Adjusted	Step 6 Adjusted	Step 7 Adjusted	Step 8 Adjusted	Putting WA/WC Item(s) Back	Final Linked
1	1.63	1.50	1.57	1.47	1.37	1.31	1.36	1.42	1.48	1.53	1.53	1.72
2	-1.70	-0.37	-1.76								-1.70	-1.61
3	-0.80	-0.75	-0.86	-0.96	-1.05	-1.11	-1.06	-1.00	-0.94	-0.89	-0.89	-0.70
4	-1.90	-0.81	-1.96	-2.06								-1.81
5	1.09	0.71	1.03	0.93	0.84	0.78	0.83	0.89	0.95	1.00	1.00	1.19
6	-0.28	-0.34	-0.34	-0.44	-0.54	-0.59	-0.54	-0.49	-0.42	-0.37	-0.37	-0.18
7	0.02	0.20	-0.04	-0.14	-0.24	-0.29	-0.24	-0.19	-0.13	-0.08	-0.08	0.12
8	0.94	0.13	0.87	0.78	0.68	0.62	0.67					1.03
9	-0.39	-0.94	-0.45	-0.55	-0.65	-0.71	-0.66	-0.60	-0.54			-0.30
10	0.83	0.06	0.77	0.67	0.58	0.52	0.57	0.63				0.93
11	-0.88	-0.93	-0.95	-1.04	-1.14	-1.20	-1.15	-1.09	-1.03	-0.98	-0.98	-0.79
12	0.32	0.05	0.26	0.16	0.06	0.00	0.05	0.11	0.17	0.22	0.22	0.41
13	0.85	-0.01	0.79	0.69	0.60	0.54						0.95
14	1.78	1.68	1.72	1.62	1.52	1.47	1.52	1.57	1.63	1.68	1.68	1.88
15	-1.50	-1.09	-1.56	-1.66	-1.75						-1.50	-1.40
Mean	0.00	-0.06	-0.06	-0.04	0.02	0.11	0.12	0.12	0.13	0.26	-0.11	0.10
Std. Dev.	1.19	0.85	1.19	1.13	1.01	0.90	0.93	0.96	1.00	1.04	1.21	1.19
Constants			0.06	0.16	0.26	0.31	0.26	0.21	0.15	0.10	-0.10	

In accordance with ODE policy, extended response (ER) items will be included in the computation of the linking constant even when one or both of the ER items fail to meet the .3 tolerance for inclusion as linking items.

Following standard application of the .3 rule, any writing ER items previously removed from the linking set are placed back into the linking and a new equating constant is computed.

Table D4. Comparing Field Test, Early Return, and Linked Early Return Sample Item Parameter Estimates – Science

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Step 3 Adjusted	Step 4 Adjusted	Step 5 Adjusted	Step 6 Adjusted	Step 7 Adjusted	Step 8 Adjusted	Step 9 Adjusted	Step 10 Adjusted	Final Linked
1	-1.85	-1.30	-1.79										-1.72
2	-1.33	-1.09	-1.27	-1.28	-1.27	-1.26	-1.24	-1.23	-1.22	-1.21	-1.20		-1.19
3	-1.20	-0.97	-1.14	-1.15	-1.14	-1.13	-1.12	-1.11	-1.10	-1.09	-1.08		-1.06
4	-0.95	-0.92	-0.89	-0.90	-0.89	-0.88	-0.87	-0.85	-0.84	-0.83	-0.82		-0.81
5	-0.16	0.12	-0.10	-0.11	-0.10	-0.08	-0.07	-0.06	-0.05	-0.04	-0.03		-0.02
6	-0.26	-0.19	-0.20	-0.21	-0.20	-0.19	-0.18	-0.16	-0.15	-0.14	-0.13		-0.12
7	1.12	0.80	1.18	1.17	1.18	1.19							1.26
8	-0.78	-0.58	-0.72	-0.73	-0.72	-0.70	-0.69	-0.68	-0.67	-0.66	-0.65		-0.64
9	0.52	0.74	0.58	0.57	0.58	0.59	0.61	0.62	0.63	0.64	0.65	0.66	0.66
10	-0.05	-0.40	0.01	0.00	0.01								0.09
11	0.67	0.38	0.73	0.71	0.73	0.74	0.75						0.80
12	0.58	0.35	0.64	0.63	0.64	0.65	0.67	0.68	0.69				0.72
13	0.56	0.86	0.62	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.69	0.70	0.70
14	0.40	0.39	0.46	0.45	0.46	0.47	0.48	0.49	0.50	0.52	0.53	0.54	0.54
15	-0.49	-0.31	-0.43	-0.44	-0.43	-0.42	-0.41	-0.39	-0.38	-0.37	-0.36		-0.35
16	0.57	0.65	0.63	0.62	0.63	0.65	0.66	0.67	0.68	0.69	0.70	0.71	0.71
17	0.62	0.38	0.68	0.66	0.68	0.69	0.70	0.71					0.75
18	1.34	1.40	1.40	1.39	1.40	1.41	1.43	1.44	1.45	1.46	1.47	1.48	1.48
19	-1.43	-1.30	-1.37	-1.38	-1.37	-1.36	-1.35	-1.34	-1.33	-1.32	-1.30		-1.29
20	0.53	0.70	0.59	0.58	0.59	0.60	0.61	0.62	0.63	0.65	0.66	0.67	0.67
21	0.87	0.68	0.93	0.91	0.93	0.94	0.95	0.96	0.97	0.98	0.99		1.00
22	-0.53	-0.41	-0.47	-0.48	-0.47	-0.46	-0.45	-0.44	-0.43	-0.42	-0.41		-0.39
29	0.57	0.92	0.63	0.62	0.63	0.65	0.66	0.67	0.68	0.69	0.70	0.71	0.71
30	0.75	0.88	0.82	0.80	0.81	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.89
31	-1.04	-1.01	-0.98	-1.00	-0.98	-0.97	-0.96	-0.95	-0.94	-0.93	-0.92		-0.91
32	0.11	0.29	0.17	0.16	0.17	0.18	0.19	0.20	0.21	0.23	0.24	0.25	0.25
33	0.48	0.07	0.54	0.52									0.61
34	0.33	0.38	0.39	0.38	0.39	0.40	0.41	0.42	0.43	0.45	0.46	0.47	0.47
35	0.97	0.84	1.03	1.01	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.10	1.10

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Step 3 Adjusted	Step 4 Adjusted	Step 5 Adjusted	Step 6 Adjusted	Step 7 Adjusted	Step 8 Adjusted	Step 9 Adjusted	Step 10 Adjusted	Final Linked
36	0.02	0.13	0.09	0.07	0.08	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.16
37	-0.69	-0.58	-0.63	-0.65	-0.63	-0.62	-0.61	-0.60	-0.59	-0.58	-0.57	-0.56	
38	0.34	0.61	0.40	0.39	0.40	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.48
39	-1.29	-1.21	-1.23	-1.25	-1.23	-1.22	-1.21	-1.20	-1.19	-1.18	-1.17	-1.16	
40	0.51	0.44	0.57	0.56	0.57	0.58	0.59	0.60	0.61	0.62	0.64	0.65	0.65
41	-0.19	0.10	-0.12	-0.14	-0.13	-0.11	-0.10	-0.09	-0.08	-0.07	-0.06	-0.05	
42	0.35	0.40	0.41	0.40	0.41	0.42	0.43	0.45	0.46	0.47	0.48	0.49	0.49
43	0.01	-0.20	0.07	0.06	0.07	0.08	0.09	0.11	0.12	0.13			0.15
44	0.01	0.26	0.07	0.06	0.07	0.08	0.10	0.11	0.12	0.13	0.14	0.15	0.15
Mean	0.00	0.06	0.06	0.10	0.10	0.11	0.09	0.08	0.07	0.07	0.07	0.05	0.14
Std. Dev.	0.79	0.72	0.79	0.74	0.74	0.75	0.74	0.74	0.75	0.75	0.76	0.76	0.79
Constants			-0.06	-0.05	-0.06	-0.07	-0.08	-0.09	-0.10	-0.12	-0.13	-	

Table D5. Comparing Field Test, Early Return, and Linked Early Return Sample Item Parameter Estimates – Social Studies

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Step 3 Adjusted	Step 4 Adjusted	Step 5 Adjusted	Step 6 Adjusted	Step 7 Adjusted	Step 8 Adjusted	Step 9 Adjusted	Step 10 Adjusted	Step 11 Adjusted	Step 12 Adjusted	Step 13 Adjusted	Step 14 Adjusted	Step 15 Adjusted	Final Linked
1	-0.72	-0.81	-0.71	-0.69	-0.71	-0.69	-0.68	-0.66	-0.65	-0.66	-0.68	-0.69	-	-	-	-	-0.76	
2	-0.42	-0.24	-0.41	-0.39	-0.41	-0.39	-0.38	-0.36	-0.35	-0.36	-0.38	-0.39	-	-	-	-	-0.46	
3	0.30	0.16	0.30	0.32	0.31	0.32	0.34	0.35	0.37	0.35	0.34	0.33	0.31	0.30	0.28	0.27	0.26	0.26
4	0.62	0.61	0.62	0.64	0.62	0.64	0.66	0.67	0.68	0.67	0.66	0.64	0.63	0.61	0.60	0.59	0.57	0.57
5	2.38	1.78	2.38	2.40	2.39													2.34
6	0.01	-0.20	0.02	0.04	0.02	0.04	0.05	0.07	0.08	0.07	0.05	0.04	0.02	0.01	0.00	-	-	-0.03
7	0.52	0.24	0.53	0.55	0.53	0.55	0.56	0.58	0.59	0.58	0.56	0.55	0.53	0.52	0.51	0.49	0.48	0.48
8	0.07	0.47	0.07	0.09	0.07	0.09	0.11	0.12	0.13	0.12	0.11	0.09	0.08					0.02
9	0.55	0.44	0.56	0.58	0.56	0.58	0.60	0.61	0.62	0.61	0.60	0.58	0.57	0.55	0.54	0.53	0.51	0.51
10	-0.38	0.09	-0.38	-0.36	-0.38	-0.36	-0.34	-0.33	-0.31	-0.33								-0.43
11	1.03	0.47	1.03	1.05	1.03	1.05												0.98
12	-0.28	0.17	-0.27	-0.25	-0.27	-0.25	-0.24	-0.22	-0.21	-0.22	-0.24	-0.24	-0.25					-0.32
13	0.01	0.21	0.01	0.03	0.01	0.03	0.05	0.06	0.08	0.06	0.05	0.03	0.02	0.00	-	-	-	-0.04
14	1.02	1.10	1.02	1.04	1.03	1.04	1.06	1.07	1.09	1.07	1.06	1.05	1.03	1.02	1.00	0.99	0.98	0.98
15	0.20	0.04	0.20	0.22	0.20	0.22	0.24	0.25	0.26	0.25	0.24	0.22	0.21	0.19	0.18	0.17	0.15	0.15
16	0.61	0.94	0.62	0.64	0.62	0.64	0.65	0.67	0.68	0.67	0.65	0.64	0.62	0.61	0.60			0.57
17	1.98	1.61	1.98	2.00	1.98	2.00	2.02	2.03										1.93
18	-1.56	-1.26	-1.56	-1.54	-1.56	-1.54	-1.52	-1.51	-1.50	-1.51	-1.52	-1.54	-	-	-	-	-	-1.61
19	-2.01	-1.68	-2.01	-1.99	-2.01	-1.99	-1.97	-1.96	-1.94	-1.96	-1.97	-1.99	-	-	-			-2.06
20	0.37	0.34	0.37	0.39	0.37	0.39	0.41	0.42	0.43	0.42	0.41	0.39	0.38	0.36	0.35	0.34	0.32	0.32

Item Position	Operational	Average Bank	Step 1 Adjusted	Step 2 Adjusted	Step 3 Adjusted	Step 4 Adjusted	Step 5 Adjusted	Step 6 Adjusted	Step 7 Adjusted	Step 8 Adjusted	Step 9 Adjusted	Step 10 Adjusted	Step 11 Adjusted	Step 12 Adjusted	Step 13 Adjusted	Step 14 Adjusted	Step 15 Adjusted	Final Linked
21	-1.48	-0.83	-1.48	-1.46														-1.52
22	-1.70	-1.22	-1.69	-1.67	-1.69	-1.67	-1.66	-1.64	-1.63									-1.74
29	1.47	1.92	1.48	1.50	1.48	1.50	1.51	1.53	1.54	1.53	1.51							1.43
30	-0.47	-0.36	-0.46	-0.44	-0.46	-0.44	-0.43	-0.41	-0.40	-0.41	-0.43	-0.44	-0.44	-0.44	-0.44	-0.44	-0.44	-0.51
31	-0.40	-0.15	-0.40	-0.38	-0.40	-0.38	-0.36	-0.35	-0.33	-0.35	-0.36	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.45
32	0.13	-0.17	0.14	0.16	0.14	0.16	0.17	0.19	0.20	0.19	0.17	0.16	0.15	0.13	0.12	0.10	0.09	0.09
33	-0.66	-0.73	-0.66	-0.64	-0.66	-0.64	-0.62	-0.61	-0.60	-0.61	-0.62	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.71
34	-0.38	-0.43	-0.38	-0.36	-0.38	-0.36	-0.34	-0.33	-0.31	-0.33	-0.34	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.43
35	0.41	0.33	0.42	0.44	0.42	0.44	0.45	0.47	0.48	0.47	0.45	0.44	0.43	0.41	0.40	0.38	0.37	0.37
36	-0.40	-0.29	-0.40	-0.38	-0.40	-0.38	-0.36	-0.35	-0.34	-0.35	-0.36	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.45
37	0.93	0.50	0.94	0.96	0.94	0.96	0.97											0.89
38	-1.49	-1.43	-1.49	-1.47	-1.49	-1.47	-1.45	-1.44	-1.43	-1.44	-1.45	-1.47	-1.47	-1.47	-1.47	-1.47	-1.47	-1.54
39	1.53	0.81	1.53															1.48
40	0.05	-0.17	0.05	0.07	0.06	0.07	0.09	0.10	0.12	0.10	0.09	0.08	0.06	0.05	0.03	0.02	0.01	0.01
41	-0.19	-0.24	-0.18	-0.17	-0.18	-0.17	-0.15	-0.13	-0.12	-0.13	-0.15	-0.15	-0.16	-0.16	-0.16	-0.16	-0.16	-0.23
42	-0.65	-0.92	-0.64	-0.62	-0.64	-0.62	-0.61	-0.59	-0.58	-0.59	-0.61	-0.62	-0.62	-0.62	-0.62	-0.62	-0.62	-0.69
43	-1.05	-1.03	-1.05	-1.03	-1.04	-1.03	-1.01	-1.00	-0.98	-1.00	-1.01	-1.02	-1.02	-1.02	-1.02	-1.02	-1.02	-1.09
44	0.06	0.08	0.06	0.08	0.06	0.08	0.10	0.11	0.12	0.11	0.10	0.08	0.07	0.05	0.04	0.03	0.01	0.01
Mean	0.00	0.00	0.00	-0.02	0.00	-0.05	-0.06	-0.08	-0.13	-0.10	-0.10	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.04
Std. Dev.	0.99	0.84	0.99	0.97	0.95	0.87	0.86	0.86	0.78	0.74	0.76	0.70	0.72	0.73	0.65	0.64	0.58	0.99
Constants			0.00	-0.02	-0.01	-0.02	-0.04	-0.05	-0.07	-0.05	-0.04	-0.03	-0.01	0.00	0.02	0.03	0.04	

APPENDIX E.

Raw Score to Scaled Score Conversion Table

Table E1. Final Raw Score to Scaled Score Conversion Table – Reading

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
0.0	-6.23	2.59	258	1	Limited
0.5	-5.01	1.43	286	1	Limited
1.0	-4.29	1.03	303	1	Limited
1.5	-3.86	0.85	313	1	Limited
2.0	-3.54	0.75	320	1	Limited
2.5	-3.29	0.67	326	1	Limited
3.0	-3.08	0.62	331	1	Limited
3.5	-2.90	0.58	336	1	Limited
4.0	-2.74	0.55	339	1	Limited
4.5	-2.59	0.53	343	1	Limited
5.0	-2.46	0.50	346	1	Limited
5.5	-2.33	0.49	349	1	Limited
6.0	-2.22	0.47	351	1	Limited
6.5	-2.11	0.46	354	1	Limited
7.0	-2.01	0.44	356	1	Limited
7.5	-1.91	0.43	358	1	Limited
8.0	-1.82	0.42	361	1	Limited
8.5	-1.73	0.42	363	1	Limited
9.0	-1.65	0.41	365	1	Limited
9.5	-1.57	0.40	367	1	Limited
10.0	-1.49	0.39	368	1	Limited
10.5	-1.41	0.39	370	1	Limited
11.0	-1.34	0.38	372	1	Limited
11.5	-1.27	0.38	374	1	Limited
12.0	-1.19	0.37	375	1	Limited
12.5	-1.13	0.37	377	1	Limited
13.0	-1.06	0.37	378	1	Limited
13.5	-0.99	0.36	380	1	Limited
14.0	-0.93	0.36	382	1	Limited
14.5	-0.86	0.36	383	2	Basic
15.0	-0.80	0.35	384	2	Basic
15.5	-0.74	0.35	386	2	Basic
16.0	-0.68	0.35	387	2	Basic
16.5	-0.62	0.35	389	2	Basic
17.0	-0.56	0.34	390	2	Basic
17.5	-0.50	0.34	392	2	Basic
18.0	-0.44	0.34	393	2	Basic
18.5	-0.38	0.34	394	2	Basic
19.0	-0.33	0.34	396	2	Basic
19.5	-0.27	0.34	397	2	Basic
20.0	-0.21	0.33	398	2	Basic
20.5	-0.16	0.33	400	3	Proficient
21.0	-0.10	0.33	401	3	Proficient
21.5	-0.05	0.33	402	3	Proficient
22.0	0.01	0.33	403	3	Proficient
22.5	0.06	0.33	405	3	Proficient

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
23.0	0.12	0.33	406	3	Proficient
23.5	0.17	0.33	407	3	Proficient
24.0	0.22	0.33	408	3	Proficient
24.5	0.28	0.33	410	3	Proficient
25.0	0.33	0.33	411	3	Proficient
25.5	0.39	0.33	412	3	Proficient
26.0	0.44	0.33	413	3	Proficient
26.5	0.49	0.33	415	3	Proficient
27.0	0.55	0.33	416	3	Proficient
27.5	0.60	0.33	417	3	Proficient
28.0	0.66	0.33	419	3	Proficient
28.5	0.71	0.33	420	3	Proficient
29.0	0.77	0.33	421	3	Proficient
29.5	0.82	0.33	422	3	Proficient
30.0	0.88	0.33	424	3	Proficient
30.5	0.93	0.33	425	3	Proficient
31.0	0.99	0.34	426	3	Proficient
31.5	1.05	0.34	428	3	Proficient
32.0	1.10	0.34	429	4	Accelerated
32.5	1.16	0.34	430	4	Accelerated
33.0	1.22	0.34	432	4	Accelerated
33.5	1.28	0.34	433	4	Accelerated
34.0	1.34	0.35	434	4	Accelerated
34.5	1.40	0.35	436	4	Accelerated
35.0	1.46	0.35	437	4	Accelerated
35.5	1.52	0.35	439	4	Accelerated
36.0	1.58	0.36	440	4	Accelerated
36.5	1.65	0.36	442	4	Accelerated
37.0	1.72	0.37	443	4	Accelerated
37.5	1.78	0.37	445	4	Accelerated
38.0	1.85	0.38	446	4	Accelerated
38.5	1.92	0.38	448	5	Advanced
39.0	2.00	0.39	450	5	Advanced
39.5	2.07	0.39	452	5	Advanced
40.0	2.15	0.40	453	5	Advanced
40.5	2.24	0.41	455	5	Advanced
41.0	2.32	0.42	457	5	Advanced
41.5	2.41	0.43	460	5	Advanced
42.0	2.51	0.45	462	5	Advanced
42.5	2.61	0.46	464	5	Advanced
43.0	2.72	0.48	467	5	Advanced
43.5	2.84	0.50	470	5	Advanced
44.0	2.98	0.53	473	5	Advanced
44.5	3.12	0.56	476	5	Advanced
45.0	3.29	0.60	480	5	Advanced
45.5	3.49	0.65	485	5	Advanced
46.0	3.72	0.72	490	5	Advanced
46.5	4.02	0.83	497	5	Advanced

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
47.0	4.44	1.01	507	5	Advanced
47.5	5.14	1.42	523	5	Advanced
48.0	6.36	2.59	552	5	Advanced

Table E2. Final Raw Score to Scaled Score Conversion Table – Mathematics

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
0.0	-6.00	2.59	251	1	Limited
0.5	-4.78	1.43	281	1	Limited
1.0	-4.06	1.03	299	1	Limited
1.5	-3.63	0.85	310	1	Limited
2.0	-3.31	0.74	318	1	Limited
2.5	-3.07	0.67	325	1	Limited
3.0	-2.86	0.62	330	1	Limited
3.5	-2.68	0.58	334	1	Limited
4.0	-2.52	0.55	338	1	Limited
4.5	-2.38	0.52	342	1	Limited
5.0	-2.25	0.50	345	1	Limited
5.5	-2.12	0.48	348	1	Limited
6.0	-2.01	0.47	351	1	Limited
6.5	-1.91	0.45	354	1	Limited
7.0	-1.81	0.44	356	1	Limited
7.5	-1.71	0.43	359	1	Limited
8.0	-1.62	0.42	361	1	Limited
8.5	-1.54	0.41	363	1	Limited
9.0	-1.45	0.40	365	1	Limited
9.5	-1.37	0.40	367	1	Limited
10.0	-1.30	0.39	369	1	Limited
10.5	-1.22	0.38	371	1	Limited
11.0	-1.15	0.38	373	1	Limited
11.5	-1.08	0.37	374	1	Limited
12.0	-1.01	0.37	376	1	Limited
12.5	-0.95	0.36	378	1	Limited
13.0	-0.88	0.36	380	1	Limited
13.5	-0.82	0.35	381	1	Limited
14.0	-0.76	0.35	383	1	Limited
14.5	-0.67	0.35	384	2	Basic
15.0	-0.63	0.35	386	2	Basic
15.5	-0.57	0.34	387	2	Basic
16.0	-0.52	0.34	389	2	Basic
16.5	-0.46	0.34	390	2	Basic
17.0	-0.40	0.34	392	2	Basic
17.5	-0.35	0.33	393	2	Basic
18.0	-0.29	0.33	394	2	Basic
18.5	-0.24	0.33	396	2	Basic
19.0	-0.18	0.33	397	2	Basic
19.5	-0.13	0.33	399	2	Basic
20.0	-0.07	0.33	400	3	Proficient
20.5	-0.02	0.33	401	3	Proficient
21.0	0.03	0.32	403	3	Proficient
21.5	0.08	0.32	404	3	Proficient
22.0	0.14	0.32	405	3	Proficient
22.5	0.19	0.32	407	3	Proficient
23.0	0.24	0.32	408	3	Proficient

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
23.5	0.29	0.32	409	3	Proficient
24.0	0.35	0.32	410	3	Proficient
24.5	0.40	0.32	412	3	Proficient
25.0	0.45	0.32	413	3	Proficient
25.5	0.50	0.32	414	3	Proficient
26.0	0.56	0.33	416	3	Proficient
26.5	0.61	0.33	417	3	Proficient
27.0	0.66	0.33	418	3	Proficient
27.5	0.72	0.33	420	3	Proficient
28.0	0.77	0.33	421	3	Proficient
28.5	0.83	0.33	423	3	Proficient
29.0	0.88	0.33	424	3	Proficient
29.5	0.94	0.34	425	4	Accelerated
30.0	0.99	0.34	427	4	Accelerated
30.5	1.05	0.34	428	4	Accelerated
31.0	1.11	0.34	430	4	Accelerated
31.5	1.17	0.35	431	4	Accelerated
32.0	1.23	0.35	433	4	Accelerated
32.5	1.29	0.35	434	4	Accelerated
33.0	1.36	0.36	436	4	Accelerated
33.5	1.42	0.36	438	4	Accelerated
34.0	1.49	0.36	439	4	Accelerated
34.5	1.55	0.37	441	4	Accelerated
35.0	1.62	0.37	443	4	Accelerated
35.5	1.69	0.38	444	5	Advanced
36.0	1.77	0.39	446	5	Advanced
36.5	1.84	0.39	448	5	Advanced
37.0	1.92	0.40	450	5	Advanced
37.5	2.00	0.40	452	5	Advanced
38.0	2.08	0.41	454	5	Advanced
38.5	2.17	0.42	456	5	Advanced
39.0	2.26	0.43	459	5	Advanced
39.5	2.35	0.44	461	5	Advanced
40.0	2.45	0.45	464	5	Advanced
40.5	2.56	0.47	466	5	Advanced
41.0	2.67	0.48	469	5	Advanced
41.5	2.79	0.50	472	5	Advanced
42.0	2.93	0.53	475	5	Advanced
42.5	3.07	0.56	479	5	Advanced
43.0	3.24	0.60	483	5	Advanced
43.5	3.43	0.65	488	5	Advanced
44.0	3.66	0.72	494	5	Advanced
44.5	3.96	0.83	502	5	Advanced
45.0	4.38	1.01	512	5	Advanced
45.5	5.08	1.42	530	5	Advanced
46.0	6.30	2.59	560	5	Advanced

Table E3. Final Raw Score to Scaled Score Conversion Table – Writing

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
0.0	-6.72	3.54	265	1	Limited
0.5	-5.51	1.94	289	1	Limited
1.0	-4.81	1.38	303	1	Limited
1.5	-4.40	1.13	311	1	Limited
2.0	-4.11	0.99	316	1	Limited
2.5	-3.87	0.89	321	1	Limited
3.0	-3.68	0.81	325	1	Limited
3.5	-3.52	0.76	328	1	Limited
4.0	-3.37	0.72	331	1	Limited
4.5	-3.25	0.68	333	1	Limited
5.0	-3.13	0.65	336	1	Limited
5.5	-3.02	0.63	338	1	Limited
6.0	-2.92	0.61	340	1	Limited
6.5	-2.82	0.59	342	1	Limited
7.0	-2.73	0.57	343	1	Limited
7.5	-2.65	0.56	345	1	Limited
8.0	-2.57	0.55	347	1	Limited
8.5	-2.49	0.54	348	1	Limited
9.0	-2.41	0.53	350	1	Limited
9.5	-2.34	0.52	351	1	Limited
10.0	-2.26	0.52	353	1	Limited
10.5	-2.19	0.51	354	1	Limited
11.0	-2.12	0.51	355	1	Limited
11.5	-2.05	0.51	357	1	Limited
12.0	-1.98	0.50	358	1	Limited
12.5	-1.91	0.50	360	1	Limited
13.0	-1.84	0.50	361	1	Limited
13.5	-1.77	0.50	362	1	Limited
14.0	-1.70	0.50	364	1	Limited
14.5	-1.63	0.50	365	1	Limited
15.0	-1.56	0.50	366	1	Limited
15.5	-1.49	0.50	368	1	Limited
16.0	-1.42	0.50	369	1	Limited
16.5	-1.35	0.50	371	1	Limited
17.0	-1.28	0.50	372	1	Limited
17.5	-1.20	0.50	373	1	Limited
18.0	-1.13	0.50	375	1	Limited
18.5	-1.05	0.50	376	1	Limited
19.0	-0.97	0.50	378	2	Basic
19.5	-0.90	0.50	379	2	Basic
20.0	-0.83	0.50	381	2	Basic
20.5	-0.75	0.50	382	2	Basic
21.0	-0.67	0.50	384	2	Basic
21.5	-0.59	0.50	385	2	Basic
22.0	-0.52	0.50	387	2	Basic
22.5	-0.44	0.50	388	2	Basic
23.0	-0.36	0.49	390	2	Basic

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
23.5	-0.28	0.49	391	2	Basic
24.0	-0.20	0.50	393	2	Basic
24.5	-0.12	0.50	395	2	Basic
25.0	-0.04	0.50	396	2	Basic
25.5	0.04	0.50	398	2	Basic
26.0	0.15	0.50	400	3	Proficient
26.5	0.20	0.50	401	3	Proficient
27.0	0.29	0.51	403	3	Proficient
27.5	0.37	0.51	404	3	Proficient
28.0	0.46	0.52	406	3	Proficient
28.5	0.55	0.52	408	3	Proficient
29.0	0.64	0.53	410	3	Proficient
29.5	0.73	0.54	411	3	Proficient
30.0	0.83	0.54	413	3	Proficient
30.5	0.92	0.55	415	3	Proficient
31.0	1.02	0.56	417	3	Proficient
31.5	1.13	0.57	419	3	Proficient
32.0	1.23	0.58	421	3	Proficient
32.5	1.34	0.59	423	3	Proficient
33.0	1.46	0.61	426	3	Proficient
33.5	1.58	0.62	428	3	Proficient
34.0	1.70	0.63	430	4	Accelerated
34.5	1.83	0.65	433	4	Accelerated
35.0	1.96	0.67	436	4	Accelerated
35.5	2.10	0.69	438	4	Accelerated
36.0	2.25	0.71	441	4	Accelerated
36.5	2.41	0.73	444	4	Accelerated
37.0	2.57	0.76	448	4	Accelerated
37.5	2.75	0.78	451	4	Accelerated
38.0	2.93	0.81	455	4	Accelerated
38.5	3.13	0.84	458	4	Accelerated
39.0	3.33	0.88	462	4	Accelerated
39.5	3.56	0.91	467	4	Accelerated
40.0	3.79	0.94	471	4	Accelerated
40.5	4.04	0.98	476	5	Advanced
41.0	4.31	1.02	482	5	Advanced
41.5	4.59	1.07	487	5	Advanced
42.0	4.91	1.12	493	5	Advanced
42.5	5.25	1.19	500	5	Advanced
43.0	5.64	1.28	508	5	Advanced
43.5	6.09	1.37	517	5	Advanced
44.0	6.59	1.44	526	5	Advanced
44.5	7.12	1.44	537	5	Advanced
45.0	7.62	1.40	547	5	Advanced
45.5	8.11	1.38	556	5	Advanced
46.0	8.58	1.39	566	5	Advanced
46.5	9.09	1.46	575	5	Advanced
47.0	9.68	1.64	587	5	Advanced

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
47.5	10.54	2.15	604	5	Advanced
48.0	11.85	3.73	630	5	Advanced

Table E4. Final Raw Score to Scaled Score Conversion Table – Science

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
0.0	-5.87	2.59	216	1	Limited
0.5	-4.65	1.43	253	1	Limited
1.0	-3.94	1.02	275	1	Limited
1.5	-3.52	0.84	288	1	Limited
2.0	-3.21	0.73	297	1	Limited
2.5	-2.97	0.66	305	1	Limited
3.0	-2.77	0.61	311	1	Limited
3.5	-2.59	0.57	316	1	Limited
4.0	-2.44	0.54	321	1	Limited
4.5	-2.30	0.51	325	1	Limited
5.0	-2.18	0.49	329	1	Limited
5.5	-2.06	0.47	333	1	Limited
6.0	-1.96	0.45	336	1	Limited
6.5	-1.85	0.44	339	1	Limited
7.0	-1.76	0.43	342	1	Limited
7.5	-1.67	0.42	345	1	Limited
8.0	-1.59	0.41	347	1	Limited
8.5	-1.50	0.40	350	1	Limited
9.0	-1.43	0.39	352	1	Limited
9.5	-1.35	0.39	355	1	Limited
10.0	-1.28	0.38	357	1	Limited
10.5	-1.21	0.37	359	1	Limited
11.0	-1.14	0.37	361	1	Limited
11.5	-1.07	0.36	363	1	Limited
12.0	-1.01	0.36	365	1	Limited
12.5	-0.94	0.35	367	1	Limited
13.0	-0.88	0.35	369	1	Limited
13.5	-0.82	0.35	371	2	Basic
14.0	-0.76	0.34	373	2	Basic
14.5	-0.70	0.34	375	2	Basic
15.0	-0.65	0.34	376	2	Basic
15.5	-0.59	0.33	378	2	Basic
16.0	-0.53	0.33	380	2	Basic
16.5	-0.48	0.33	381	2	Basic
17.0	-0.42	0.33	383	2	Basic
17.5	-0.37	0.33	385	2	Basic
18.0	-0.32	0.32	386	2	Basic
18.5	-0.27	0.32	388	2	Basic
19.0	-0.22	0.32	390	2	Basic
19.5	-0.16	0.32	391	2	Basic
20.0	-0.11	0.32	393	2	Basic
20.5	-0.06	0.32	394	2	Basic
21.0	-0.01	0.31	396	2	Basic
21.5	0.03	0.31	397	2	Basic
22.0	0.08	0.31	399	2	Basic
22.5	0.13	0.31	400	3	Proficient
23.0	0.18	0.31	402	3	Proficient

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
23.5	0.23	0.31	403	3	Proficient
24.0	0.28	0.31	405	3	Proficient
24.5	0.33	0.31	406	3	Proficient
25.0	0.37	0.31	408	3	Proficient
25.5	0.42	0.31	409	3	Proficient
26.0	0.47	0.31	411	3	Proficient
26.5	0.52	0.31	412	3	Proficient
27.0	0.56	0.31	414	3	Proficient
27.5	0.61	0.31	415	3	Proficient
28.0	0.66	0.31	417	3	Proficient
28.5	0.71	0.31	418	3	Proficient
29.0	0.76	0.31	420	3	Proficient
29.5	0.81	0.31	421	3	Proficient
30.0	0.86	0.31	423	3	Proficient
30.5	0.91	0.32	424	3	Proficient
31.0	0.96	0.32	426	4	Accelerated
31.5	1.01	0.32	427	4	Accelerated
32.0	1.06	0.32	429	4	Accelerated
32.5	1.11	0.32	430	4	Accelerated
33.0	1.16	0.33	432	4	Accelerated
33.5	1.22	0.33	434	4	Accelerated
34.0	1.27	0.33	435	4	Accelerated
34.5	1.33	0.33	437	4	Accelerated
35.0	1.38	0.34	439	4	Accelerated
35.5	1.44	0.34	441	4	Accelerated
36.0	1.50	0.35	442	4	Accelerated
36.5	1.59	0.35	445	5	Advanced
37.0	1.62	0.36	446	5	Advanced
37.5	1.69	0.36	448	5	Advanced
38.0	1.75	0.37	450	5	Advanced
38.5	1.82	0.37	452	5	Advanced
39.0	1.89	0.38	454	5	Advanced
39.5	1.97	0.39	457	5	Advanced
40.0	2.04	0.40	459	5	Advanced
40.5	2.12	0.41	462	5	Advanced
41.0	2.21	0.42	464	5	Advanced
41.5	2.30	0.43	467	5	Advanced
42.0	2.39	0.45	470	5	Advanced
42.5	2.50	0.46	473	5	Advanced
43.0	2.61	0.48	476	5	Advanced
43.5	2.73	0.50	480	5	Advanced
44.0	2.86	0.53	484	5	Advanced
44.5	3.01	0.56	489	5	Advanced
45.0	3.18	0.61	494	5	Advanced
45.5	3.38	0.66	500	5	Advanced
46.0	3.62	0.73	508	5	Advanced
46.5	3.93	0.84	517	5	Advanced
47.0	4.36	1.02	530	5	Advanced

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
47.5	5.07	1.43	552	5	Advanced
48.0	6.29	2.59	590	5	Advanced

Table E5. Final Raw Score to Scaled Score Conversion Table – Social Studies

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
0.0	-6.06	2.59	225	1	Limited
0.5	-4.84	1.43	260	1	Limited
1.0	-4.12	1.03	281	1	Limited
1.5	-3.69	0.85	293	1	Limited
2.0	-3.37	0.74	302	1	Limited
2.5	-3.12	0.67	309	1	Limited
3.0	-2.92	0.62	315	1	Limited
3.5	-2.74	0.58	320	1	Limited
4.0	-2.58	0.55	325	1	Limited
4.5	-2.43	0.52	329	1	Limited
5.0	-2.30	0.50	332	1	Limited
5.5	-2.18	0.48	336	1	Limited
6.0	-2.07	0.47	339	1	Limited
6.5	-1.96	0.45	342	1	Limited
7.0	-1.86	0.44	345	1	Limited
7.5	-1.77	0.43	348	1	Limited
8.0	-1.68	0.42	350	1	Limited
8.5	-1.59	0.41	353	1	Limited
9.0	-1.50	0.40	355	1	Limited
9.5	-1.42	0.40	358	1	Limited
10.0	-1.35	0.39	360	1	Limited
10.5	-1.27	0.39	362	1	Limited
11.0	-1.20	0.38	364	1	Limited
11.5	-1.13	0.37	366	1	Limited
12.0	-1.06	0.37	368	1	Limited
12.5	-0.99	0.37	370	1	Limited
13.0	-0.92	0.36	372	1	Limited
13.5	-0.86	0.36	374	1	Limited
14.0	-0.79	0.36	376	1	Limited
14.5	-0.73	0.35	377	1	Limited
15.0	-0.67	0.35	379	1	Limited
15.5	-0.61	0.35	381	1	Limited
16.0	-0.55	0.34	383	2	Basic
16.5	-0.49	0.34	384	2	Basic
17.0	-0.43	0.34	386	2	Basic
17.5	-0.37	0.34	388	2	Basic
18.0	-0.32	0.34	389	2	Basic
18.5	-0.26	0.34	391	2	Basic
19.0	-0.20	0.33	392	2	Basic
19.5	-0.15	0.33	394	2	Basic
20.0	-0.09	0.33	396	2	Basic
20.5	-0.04	0.33	397	2	Basic
21.0	0.01	0.33	399	2	Basic
21.5	0.07	0.33	400	3	Proficient
22.0	0.12	0.33	402	3	Proficient
22.5	0.18	0.33	403	3	Proficient
23.0	0.23	0.33	405	3	Proficient

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
23.5	0.28	0.33	406	3	Proficient
24.0	0.33	0.33	408	3	Proficient
24.5	0.39	0.32	409	3	Proficient
25.0	0.44	0.32	411	3	Proficient
25.5	0.49	0.32	412	3	Proficient
26.0	0.55	0.32	414	3	Proficient
26.5	0.60	0.32	415	3	Proficient
27.0	0.65	0.32	417	3	Proficient
27.5	0.70	0.32	418	3	Proficient
28.0	0.76	0.33	420	3	Proficient
28.5	0.81	0.33	421	3	Proficient
29.0	0.86	0.33	423	3	Proficient
29.5	0.92	0.33	424	3	Proficient
30.0	0.97	0.33	426	3	Proficient
30.5	1.02	0.33	427	3	Proficient
31.0	1.10	0.33	429	4	Accelerated
31.5	1.13	0.33	431	4	Accelerated
32.0	1.19	0.33	432	4	Accelerated
32.5	1.24	0.34	434	4	Accelerated
33.0	1.30	0.34	435	4	Accelerated
33.5	1.36	0.34	437	4	Accelerated
34.0	1.42	0.34	439	4	Accelerated
34.5	1.48	0.34	440	4	Accelerated
35.0	1.54	0.35	442	4	Accelerated
35.5	1.60	0.35	444	4	Accelerated
36.0	1.66	0.35	446	5	Advanced
36.5	1.72	0.36	447	5	Advanced
37.0	1.79	0.36	449	5	Advanced
37.5	1.85	0.37	451	5	Advanced
38.0	1.92	0.37	453	5	Advanced
38.5	1.99	0.38	455	5	Advanced
39.0	2.07	0.38	457	5	Advanced
39.5	2.14	0.39	459	5	Advanced
40.0	2.22	0.40	462	5	Advanced
40.5	2.30	0.41	464	5	Advanced
41.0	2.39	0.42	466	5	Advanced
41.5	2.48	0.43	469	5	Advanced
42.0	2.57	0.44	472	5	Advanced
42.5	2.67	0.46	475	5	Advanced
43.0	2.78	0.48	478	5	Advanced
43.5	2.90	0.50	481	5	Advanced
44.0	3.03	0.52	485	5	Advanced
44.5	3.17	0.55	489	5	Advanced
45.0	3.34	0.59	494	5	Advanced
45.5	3.53	0.64	499	5	Advanced
46.0	3.76	0.72	506	5	Advanced
46.5	4.05	0.82	514	5	Advanced
47.0	4.46	1.00	526	5	Advanced

Raw Score	Theta	S.E.	Scaled Score	Performance Level	Proficiency
47.5	5.16	1.42	546	5	Advanced
48.0	6.36	2.58	580	5	Advanced

APPENDIX F.

Ability Measures at Raw Score Cuts

Table F1. Ability Measures at Raw Score Cuts

		Basic		Proficient		Accelerated		Advanced		
		Raw Score	Theta	Scaled Score	Raw Score	Theta	Scaled Score	Raw Score	Theta	Scaled Score
Reading	Standard Setting		-0.85	383		-0.14	400		1.12	429
	March 2004	13.5	-0.85	383	20.0	-0.11	401	31.5	1.11	429
	March 2005	12.0	-0.83	384	18.0	-0.14	400	32.0	1.09	429
	March 2006	13.5	-0.84	383	19.5	-0.14	400	33.5	1.14	430
	March 2007	13.0	-0.88	386	20.0	-0.11	401	33.0	1.11	429
	March 2008	14.5	-0.85*	383	20.5	-0.14*	400*	32.0	1.12*	429
Mathematics	Standard Setting		-0.67	384[†]		-0.07	400		0.93	425
	March 2004	13.5	-0.70	384	19.0	-0.09	400*	30.0	0.91	425
	March 2005	12.5	-0.69	384	18.0	-0.07	400	27.5	0.91	425
	March 2006	13.5	-0.65	385	18.0	-0.07	400	26.5	0.90	425*
	March 2007	13.0	-0.64	386	17.5	-0.09	400	27.5	0.94	425
	March 2008	14.5	-0.67*	384	20.0	-0.07	400	29.5	0.94	425
Writing	Standard Setting		-0.97	378		0.15	400		1.67	430
	March 2008	19.0	-0.97*	378	26.0	0.15*	400*	34.0	1.70	430
Science	Standard Setting		-0.82	371		0.12	400		0.93	425
	March 2005	14.5	-0.79	372	23.5	0.14	400	32.0	0.95	425
	March 2006	12.5	-0.80	372	21.5	0.11	400	30.5	0.93	425
	March 2007	13.5	-0.79	372	21.0	0.12	400	28.0	0.93	425
	March 2008	13.5	-0.82	371*	22.5	0.13	400	31.0	0.96	426
Social Studies	Standard Setting		-0.56	382		0.06	400		1.10	429[†]
	March 2005	15.0	-0.58	382	21.5	0.07	400	33.0	1.07	429
	March 2006	14.5	-0.59	382*	20.5	0.06	400	31.0	1.12	430
	March 2007	15.5	-0.57	382	21.0	0.05	400	30.0	1.09	429
	March 2008	16.0	-0.55	383	21.5	0.07	400	31.0	1.10	429

*Value rounded up per Ohio rounding rule

[†]The basic cut score for math and the accelerated cut score for social studies do not result from the application of the scaled score linear transformation.

APPENDIX G.

Early Return Sample Proficiency Classification Consistency Rates

Table G1. Early Return Sample Proficiency Classification Consistency Rates – Reading

Proficiency Level Classification	Accuracy	$\kappa_{\text{Consistency}}$
Reading – Total		
Basic	.99	.61
Proficient	.95	.70
Accelerated	.88	.76
Advanced	.90	.72
Reading – Acquisition of Vocabulary (AV)		
At	.90	.46
Above	.78	.54
Reading – Reading Process (RP)		
At	.89	.55
Above	.80	.58
Reading – Informational Text (IT)		
At	.92	.57
Above	.85	.63
Reading – Literary Text (LT)		
At	.92	.53
Above	.83	.61

Table G2. Early Return Sample Proficiency Classification Consistency Rates – Mathematics

Proficiency Level Classification	Accuracy	$\kappa_{\text{Consistency}}$
Mathematics – Total		
Basic	.97	.74
Proficient	.95	.79
Accelerated	.91	.81
Advanced	.91	.80
Mathematics – Number, Number Sense, and Operations (NS)		
At	.90	.62
Above	.84	.68
Mathematics – Measurement (ME)		
At	.89	.55
Above	.81	.61
Mathematics – Geometry and Spatial Sense (GS)		
At	.88	.54
Above	.80	.60
Mathematics – Patterns, Functions, and Algebra (PA)		
At	.91	.64
Above	.85	.67
Mathematics – Data Analysis and Probability (DA)		
At	.91	.65
Above	.85	.68

Table G3. Early Return Sample Proficiency Classification Consistency Rates – Writing

Proficiency Level Classification	Accuracy	$\kappa_{\text{Consistency}}$
Writing – Total		
Basic	.99	.37
Proficient	.93	.54
Accelerated	.81	.62
Advanced	.92	.50
Writing – Writing Applications (WA)		
At	.83	.38
Above	.72	.44
Writing – Writing Conventions (WC)		
At	.92	.62
Above	.82	.63
Writing – Writing Process (WP)		
At	.93	.50
Above	.84	.57

Table G4. Early Return Sample Proficiency Classification Consistency Rates – Science

Proficiency Level Classification	Accuracy	$\kappa_{\text{Consistency}}$
Science – Total		
Basic	.98	.67
Proficient	.92	.76
Accelerated	.89	.78
Advanced	.91	.75
Science – Earth and Space Sciences (ES)		
At	.87	.61
Above	.82	.64
Science – Life Sciences (LS)		
At	.88	.65
Above	.84	.67
Science – Physical Sciences (PS)		
At	.85	.56
Above	.80	.59
Science – Scientific Processes (SP)		
At	.87	.57
Above	.80	.61

Table G5. Early Return Sample Proficiency Classification Consistency Rates – Social Studies

Proficiency Level Classification	Accuracy	$\kappa_{\text{Consistency}}$
Social Studies – Total		
Basic	.97	.71
Proficient	.94	.75
Accelerated	.89	.78
Advanced	.90	.77
Social Studies – Economics and Government (EG)		
At	.90	.66
Above	.85	.69
Social Studies – Societies and Geography (SG)		
At	.86	.49
Above	.77	.54
Social Studies – History (HI)		
At	.90	.67
Above	.86	.70
Social Studies – Skills and Methods (SO)		
At	.85	.52
Above	.77	.54

APPENDIX H.

Operational Percentage of Students At Each Performance Level

Table H1.1 Operational Percentage of Grade 10 Public School Students At Each Test Performance Level – Reading

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	6.55	8.38	35.21	31.98	17.88
Female	4.59	7.13	33.61	32.98	21.69
Male	8.40	9.53	36.73	31.11	14.23
American Indian	10.05	11.56	37.19	27.64	13.57
Asian/Pacific Islander	3.09	5.76	27.88	31.58	31.70
Black/African American	15.04	17.53	44.00	18.05	5.37
Hispanic	12.34	13.80	39.79	25.15	8.92
White	4.72	6.39	33.40	35.02	20.47
Multi-Ethnic	6.98	10.23	39.20	29.24	14.35
Other	20.90	14.93	33.58	21.64	8.96

Table H1.2 Operational Percentage of Grade 10 Non-Public School Students At Each Test Performance Level – Reading

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	0.68	1.54	20.59	41.65	35.54
Female	0.32	1.09	18.41	39.31	40.86
Male	1.01	1.95	22.71	44.00	30.34
American Indian	0.00	0.00	18.92	59.46	21.62
Asian/Pacific Islander	2.24	4.10	18.66	36.19	38.81
Black/African American	2.82	5.74	41.66	33.54	16.24
Hispanic	1.23	1.64	29.10	45.08	22.95
White	0.40	1.00	17.95	42.48	38.17
Multi-Ethnic	0.61	2.74	24.92	44.38	27.36
Other	1.36	0.68	24.49	40.14	33.33

Table H2.1 Operational Percentage of Grade 10 Public School Students At Each Test Performance Level – Mathematics

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	10.68	10.36	24.33	20.75	33.88
Female	10.07	10.89	25.99	21.21	31.84
Male	11.14	9.79	22.69	20.35	36.02
American Indian	17.41	6.97	32.84	20.40	22.39
Asian/Pacific Islander	4.32	3.84	15.55	15.73	60.56
Black/African American	27.23	20.70	29.09	13.39	9.57
Hispanic	16.95	17.02	29.67	17.52	18.85
White	7.18	8.12	23.24	22.46	39.00
Multi-Ethnic	12.98	13.67	29.16	18.85	25.34
Other	31.85	16.30	28.89	6.67	16.30

Table H2.2 Operational Percentage of Grade 10 Non-Public School Students At Each Test Performance Level – Mathematics

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	2.23	4.57	19.01	24.27	49.93
Female	2.26	5.46	21.33	24.55	46.41
Male	2.21	3.64	16.75	24.17	53.23
American Indian	0.00	2.70	24.32	24.32	48.65
Asian/Pacific Islander	0.37	1.86	9.67	15.99	72.12
Black/African American	11.43	15.04	31.75	22.60	19.17
Hispanic	2.47	7.00	32.10	24.69	33.74
White	1.24	3.33	17.42	24.43	53.57
Multi-Ethnic	3.64	7.58	22.73	28.48	37.58
Other	4.08	4.08	16.33	23.81	51.70

Table H3.1 Operational Percentage of Grade 10 Public School Students At Each Test Performance Level – Writing

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	4.23	10.91	40.28	42.27	2.31
Female	2.20	7.22	36.32	50.85	3.41
Male	6.16	14.43	44.12	34.04	1.25
American Indian	8.08	11.11	46.97	31.82	2.02
Asian/Pacific Islander	2.55	7.16	29.45	53.67	7.16
Black/African American	9.52	21.59	47.81	20.62	0.45
Hispanic	9.23	17.48	43.61	28.91	0.77
White	3.05	8.61	38.79	46.89	2.66
Multi-Ethnic	4.42	13.32	44.43	36.03	1.81
Other	21.26	14.96	38.58	25.20	0.00

Table H3.2 Operational Percentage of Grade 10 Non-Public School Students At Each Test Performance Level – Writing

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	0.51	1.83	24.51	67.83	5.32
Female	0.14	0.92	17.92	73.45	7.57
Male	0.86	2.71	30.96	62.42	3.06
American Indian	0.00	10.81	29.73	48.65	10.81
Asian/Pacific Islander	2.23	4.09	24.54	62.83	6.32
Black/African American	2.47	6.08	46.30	44.09	1.06
Hispanic	0.00	2.50	33.33	60.83	3.33
White	0.28	1.28	21.72	71.03	5.69
Multi-Ethnic	0.30	2.13	35.87	57.75	3.95
Other	0.68	1.36	28.57	61.22	8.16

Table H4.1 Operational Percentage of Grade 10 Public School Students At Each Test Performance Level – Science

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	7.85	19.50	28.24	21.41	23.00
Female	7.41	21.56	30.67	20.96	19.41
Male	8.17	17.39	25.89	21.92	26.62
American Indian	13.57	19.60	31.66	19.10	16.08
Asian/Pacific Islander	4.21	12.87	21.05	22.37	39.51
Black/African American	21.74	37.50	26.68	9.48	4.61
Hispanic	14.55	29.69	28.96	15.67	11.12
White	4.84	15.63	28.62	23.96	26.96
Multi-Ethnic	9.68	23.32	30.63	19.96	16.40
Other	25.00	32.35	16.91	16.18	9.56

Table H4.2 Operational Percentage of Grade 10 Non-Public School Students At Each Test Performance Level – Science

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	1.31	8.05	25.97	29.50	35.16
Female	1.18	9.73	29.24	29.25	30.60
Male	1.43	6.43	22.72	29.65	39.76
American Indian	0.00	10.81	21.62	29.73	37.84
Asian/Pacific Islander	1.87	8.99	21.35	23.60	44.19
Black/African American	6.78	25.97	35.21	21.57	10.48
Hispanic	1.66	13.69	37.76	23.24	23.65
White	0.71	5.89	24.47	30.67	38.26
Multi-Ethnic	1.82	11.25	32.52	24.62	29.79
Other	2.08	6.25	21.53	36.11	34.03

Table H5.1 Operational Percentage of Grade 10 Public School Students At Each Test Performance Level – Social Studies

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	10.64	10.98	29.25	20.18	28.95
Female	9.26	11.93	31.76	20.14	26.90
Male	11.88	9.98	26.79	20.28	31.08
American Indian	11.62	15.66	31.31	19.70	21.72
Asian/Pacific Islander	4.46	6.68	20.29	18.72	49.85
Black/African American	23.17	19.10	33.12	13.83	10.78
Hispanic	17.94	15.82	33.57	16.61	16.07
White	7.95	9.26	28.41	21.60	32.78
Multi-Ethnic	12.47	11.91	33.15	19.36	23.12
Other	26.12	18.66	33.58	9.70	11.94

Table H5.2 Operational Percentage of Grade 10 Non-Public School Students At Each Test Performance Level – Social Studies

	Limited	Basic	Proficient	Accelerated	Advanced
Overall	1.68	4.11	24.93	26.00	43.28
Female	1.37	4.68	27.81	25.08	41.06
Male	1.96	3.52	22.10	26.85	45.57
American Indian	0.00	0.00	35.14	27.03	37.84
Asian/Pacific Islander	4.20	4.20	19.08	20.23	52.29
Black/African American	6.19	11.94	38.90	21.40	21.57
Hispanic	1.65	5.35	35.39	25.93	31.69
White	1.12	3.14	23.06	26.68	46.00
Multi-Ethnic	3.34	6.99	26.14	27.36	36.17
Other	2.05	3.42	23.29	23.29	47.95

APPENDIX I.

Operational Percent of Students At or Above Each Performance Level

Table I1.1 Operational Percentage of Grade 10 Public School Students At or Above Each Test Performance Level – Reading

	Basic	Proficient	Accelerated	Advanced
Overall	93.45	85.07	49.86	17.88
Female	95.41	88.29	54.67	21.69
Male	91.60	82.07	45.35	14.23
American Indian	89.95	78.39	41.21	13.57
Asian/Pacific Islander	96.91	91.15	63.27	31.70
Black/African American	84.96	67.43	23.42	5.37
Hispanic	87.66	73.86	34.07	8.92
White	95.28	88.89	55.49	20.47
Multi-Ethnic	93.02	82.79	43.59	14.35
Other	79.10	64.18	30.60	8.96

Table I1.2 Operational Percentage of Grade 10 Non-Public School Students At or Above Each Test Performance Level – Reading

	Basic	Proficient	Accelerated	Advanced
Overall	99.32	97.78	77.19	35.54
Female	99.68	98.59	80.18	40.86
Male	98.99	97.04	74.34	30.34
American Indian	100.00	100.00	81.08	21.62
Asian/Pacific Islander	97.76	93.66	75.00	38.81
Black/African American	97.18	91.44	49.78	16.24
Hispanic	98.77	97.13	68.03	22.95
White	99.60	98.60	80.65	38.17
Multi-Ethnic	99.39	96.66	71.73	27.36
Other	98.64	97.96	73.47	33.33

Table I2.1 Operational Percentage of Grade 10 Public School Students At or Above Each Performance Level – Math

	Basic	Proficient	Accelerated	Advanced
Overall	89.32	78.96	54.63	33.88
Female	89.93	79.04	53.05	31.84
Male	88.86	79.06	56.37	36.02
American Indian	82.59	75.62	42.79	22.39
Asian/Pacific Islander	95.68	91.84	76.29	60.56
Black/African American	72.77	52.06	22.97	9.57
Hispanic	83.05	66.03	36.37	18.85
White	92.82	84.70	61.47	39.00
Multi-Ethnic	87.02	73.34	44.18	25.34
Other	68.15	51.85	22.96	16.30

Table I2.2 Operational Percentage of Grade 10 Non-Public School Students At or Above Each Performance Level – Math

	Basic	Proficient	Accelerated	Advanced
Overall	97.77	93.21	74.20	49.93
Female	97.74	92.28	70.96	46.41
Male	97.79	94.15	77.40	53.23
American Indian	100.00	97.30	72.97	48.65
Asian/Pacific Islander	99.63	97.77	88.10	72.12
Black/African American	88.57	73.53	41.78	19.17
Hispanic	97.53	90.53	58.44	33.74
White	98.76	95.42	78.00	53.57
Multi-Ethnic	96.36	88.79	66.06	37.58
Other	95.92	91.84	75.51	51.70

Table I3.1 Operational Percentage of Grade 10 Public School Students At or Above Each Test Performance Level – Writing

	Basic	Proficient	Accelerated	Advanced
Overall	95.77	84.86	44.58	2.31
Female	97.80	90.58	54.26	3.41
Male	93.84	79.42	35.29	1.25
American Indian	91.92	80.81	33.84	2.02
Asian/Pacific Islander	97.45	90.29	60.84	7.16
Black/African American	90.48	68.89	21.08	0.45
Hispanic	90.77	73.29	29.68	0.77
White	96.95	88.34	49.55	2.66
Multi-Ethnic	95.58	82.27	37.84	1.81
Other	78.74	63.78	25.20	0.00

Table I3.2 Operational Percentage of Grade 10 Non-Public School Students At or Above Each Test Performance Level – Writing

	Basic	Proficient	Accelerated	Advanced
Overall	99.49	97.66	73.15	5.32
Female	99.86	98.94	81.02	7.57
Male	99.14	96.43	65.47	3.06
American Indian	100.00	89.19	59.46	10.81
Asian/Pacific Islander	97.77	93.68	69.14	6.32
Black/African American	97.53	91.45	45.15	1.06
Hispanic	100.00	97.50	64.17	3.33
White	99.72	98.44	76.72	5.69
Multi-Ethnic	99.70	97.57	61.70	3.95
Other	99.32	97.96	69.39	8.16

Table I4.1 Operational Percentage of Grade 10 Public School Students At or Above Each Test Performance Level – Science

	Basic	Proficient	Accelerated	Advanced
Overall	92.15	72.65	44.41	23.00
Female	92.59	71.03	40.36	19.41
Male	91.83	74.44	48.55	26.62
American Indian	86.43	66.83	35.18	16.08
Asian/Pacific Islander	95.79	82.92	61.88	39.51
Black/African American	78.26	40.77	14.08	4.61
Hispanic	85.45	55.76	26.80	11.12
White	95.16	79.53	50.91	26.96
Multi-Ethnic	90.32	67.00	36.36	16.40
Other	75.00	42.65	25.74	9.56

Table I4.2 Operational Percentage of Grade 10 Non-Public School Students At or Above Each Test Performance Level – Science

	Basic	Proficient	Accelerated	Advanced
Overall	98.69	90.63	64.66	35.16
Female	98.82	89.09	59.85	30.60
Male	98.57	92.14	69.41	39.76
American Indian	100.00	89.19	67.57	37.84
Asian/Pacific Islander	98.13	89.14	67.79	44.19
Black/African American	93.22	67.25	32.04	10.48
Hispanic	98.34	84.65	46.89	23.65
White	99.29	93.39	68.93	38.26
Multi-Ethnic	98.18	86.93	54.41	29.79
Other	97.92	91.67	70.14	34.03

Table I5.1 Operational Percentage of Grade 10 Public School Students At or Above Each Test Performance Level – Social Studies

	Basic	Proficient	Accelerated	Advanced
Overall	89.36	78.38	49.13	28.95
Female	90.74	78.81	47.05	26.90
Male	88.12	78.15	51.35	31.08
American Indian	88.38	72.73	41.41	21.72
Asian/Pacific Islander	95.54	88.86	68.57	49.85
Black/African American	76.83	57.73	24.61	10.78
Hispanic	82.06	66.25	32.67	16.07
White	92.05	82.79	54.38	32.78
Multi-Ethnic	87.53	75.63	42.48	23.12
Other	73.88	55.22	21.64	11.94

Table I5.2 Operational Percentage of Grade 10 Non-Public School Students At or Above Each Test Performance Level – Social Studies

	Basic	Proficient	Accelerated	Advanced
Overall	98.32	94.22	69.29	43.28
Female	98.63	93.95	66.14	41.06
Male	98.04	94.52	72.42	45.57
American Indian	100.00	100.00	64.86	37.84
Asian/Pacific Islander	95.80	91.60	72.52	52.29
Black/African American	93.81	81.87	42.97	21.57
Hispanic	98.35	93.00	57.61	31.69
White	98.88	95.74	72.68	46.00
Multi-Ethnic	96.66	89.67	63.53	36.17
Other	97.95	94.52	71.23	47.95

APPENDIX J.

Operational Summary Statistics by Gender and Ethnicity

Table J1. Operational Grade 10 Public School Student Summary Statistics by Gender and Ethnicity: Reading

	N	α	Raw Score		Scaled Score	
			Mean	SD	Mean	SD
Total	134660	0.88	30.11	8.74	425.09	25.02
Female	66334	0.87	31.25	8.37	428.44	24.23
Male	67951	0.89	29.04	8.93	421.93	25.31
American Indian	199	0.89	27.95	9.14	418.85	25.49
Asian/Pacific Islander	1650	0.87	33.09	8.30	434.16	24.82
Black/African American	20060	0.88	24.51	8.89	409.32	24.94
Hispanic	2747	0.89	26.63	9.15	415.22	25.62
White	106010	0.87	31.31	8.21	428.44	23.68
Multi-Racial	3010	0.88	29.17	8.68	422.41	24.66
Other	134	0.91	24.49	10.15	409.30	28.83

Table J2. Operational Grade 10 Public School Student Summary Statistics by Gender and Ethnicity: Math

	N	α	Raw Score		Scaled Score	
			Mean	SD	Mean	SD
Total	135399	0.92	29.16	10.16	428.83	35.35
Female	66810	0.92	28.90	9.94	427.77	34.26
Male	68203	0.92	29.46	10.35	430.05	36.30
American Indian	201	0.92	26.46	10.25	418.88	32.99
Asian/Pacific Islander	1666	0.92	35.08	9.12	452.96	39.30
Black/African American	20471	0.90	21.41	9.39	403.36	29.14
Hispanic	2791	0.91	25.02	9.86	414.75	31.51
White	106238	0.91	30.81	9.53	434.19	34.04
Multi-Racial	3035	0.91	27.02	10.05	421.67	33.87
Other	135	0.92	21.96	10.52	406.15	36.64

Table J3. Operational Grade 10 Public School Student Summary Statistics by Gender and Ethnicity: Writing

	N	α	Raw Score		Scaled Score	
			Mean	SD	Mean	SD
Total	134138	0.80	31.58	6.25	424.06	26.60
Female	66052	0.78	33.01	5.49	430.30	25.37
Male	67719	0.81	30.21	6.60	418.09	26.34
American Indian	198	0.83	29.78	7.52	417.21	29.91
Asian/Pacific Islander	1647	0.79	33.66	6.04	434.99	29.76
Black/African American	19811	0.81	27.95	6.87	408.88	25.27
Hispanic	2729	0.82	28.98	7.22	413.31	27.44
White	105804	0.79	32.35	5.80	427.28	25.62
Multi-Racial	2989	0.79	30.84	6.19	420.61	25.68
Other	127	0.85	26.60	8.79	404.94	31.28

Table J4. Operational Grade 10 Public School Student Summary Statistics by Gender and Ethnicity: Science

	N	α	Raw Score		Scaled Score	
			Mean	SD	Mean	SD
Total	135387	0.89	28.21	9.41	418.68	32.48
Female	66859	0.88	27.57	9.10	416.44	31.11
Male	68149	0.90	28.89	9.64	421.03	33.56
American Indian	199	0.90	26.05	9.73	410.89	33.39
Asian/Pacific Islander	1663	0.89	32.03	9.16	432.75	33.56
Black/African American	20505	0.86	20.70	8.55	393.30	28.98
Hispanic	2769	0.88	24.07	9.33	404.63	31.57
White	106239	0.88	29.83	8.78	424.11	30.52
Multi-Racial	3036	0.89	26.61	9.26	413.18	31.52
Other	136	0.90	21.74	10.37	396.53	35.94

Table J5. Operational Grade 10 Public School Student Summary Statistics by Gender and Ethnicity: Social Studies

	N	α	Raw Score		Scaled Score	
			Mean	SD	Mean	SD
Total	134970	0.90	29.22	9.42	425.09	32.66
Female	66624	0.89	29.09	9.08	424.66	31.40
Male	67979	0.91	29.40	9.73	425.67	33.78
American Indian	198	0.90	27.41	9.48	418.87	32.46
Asian/Pacific Islander	1661	0.89	33.68	8.79	441.52	32.75
Black/African American	20186	0.89	23.54	9.25	405.72	31.30
Hispanic	2782	0.89	25.61	9.41	412.75	31.89
White	106140	0.89	30.43	8.99	429.18	31.37
Multi-Racial	3032	0.90	27.98	9.38	420.81	32.34
Other	134	0.90	23.01	9.67	403.92	32.60

APPENDIX K.

Operational Frequency Distributions Overall and by Gender

Table K1. Operational Grade 10 Public School Student Frequency Distributions by Gender and for Total Population – Reading

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
0.0	258	0	0.00	1	0.00	1	0.00
0.5	286	0	0.00	0	0.00	0	0.00
1.0	303	2	0.00	3	0.00	5	0.00
1.5	313	0	0.00	0	0.00	0	0.00
2.0	320	11	0.02	24	0.04	36	0.03
2.5	326	3	0.00	3	0.00	6	0.00
3.0	331	10	0.02	26	0.04	36	0.03
3.5	336	2	0.00	5	0.01	7	0.01
4.0	339	28	0.04	74	0.11	102	0.08
4.5	343	7	0.01	4	0.01	11	0.01
5.0	346	48	0.07	129	0.19	178	0.13
5.5	349	23	0.03	25	0.04	48	0.04
6.0	351	75	0.11	171	0.25	247	0.18
6.5	354	25	0.04	65	0.10	90	0.07
7.0	356	128	0.19	308	0.45	444	0.33
7.5	358	50	0.08	91	0.13	142	0.11
8.0	361	176	0.27	401	0.59	579	0.43
8.5	363	75	0.11	115	0.17	190	0.14
9.0	365	204	0.31	455	0.67	664	0.49
9.5	367	104	0.16	181	0.27	287	0.21
10.0	368	246	0.37	524	0.77	782	0.58
10.5	370	135	0.20	226	0.33	361	0.27
11.0	372	231	0.35	507	0.75	746	0.55
11.5	374	168	0.25	247	0.36	418	0.31
12.0	375	299	0.45	511	0.75	817	0.61
12.5	377	182	0.27	254	0.37	442	0.33
13.0	378	317	0.48	466	0.69	790	0.59
13.5	380	204	0.31	347	0.51	554	0.41
14.0	382	291	0.44	542	0.80	842	0.63
14.5	383	250	0.38	378	0.56	633	0.47
15.0	384	340	0.51	573	0.84	918	0.68
15.5	386	264	0.40	388	0.57	659	0.49
16.0	387	377	0.57	565	0.83	947	0.70
16.5	389	302	0.46	426	0.63	734	0.55
17.0	390	427	0.64	603	0.89	1037	0.77
17.5	392	372	0.56	453	0.67	829	0.62
18.0	393	448	0.68	666	0.98	1121	0.83
18.5	394	393	0.59	531	0.78	929	0.69
19.0	396	519	0.78	649	0.96	1179	0.88
19.5	397	448	0.68	547	0.80	1003	0.74
20.0	398	587	0.88	697	1.03	1291	0.96

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
20.5	400	502	0.76	564	0.83	1071	0.80
21.0	401	646	0.97	784	1.15	1437	1.07
21.5	402	533	0.80	672	0.99	1209	0.90
22.0	403	693	1.04	844	1.24	1544	1.15
22.5	405	587	0.88	738	1.09	1331	0.99
23.0	406	777	1.17	871	1.28	1659	1.23
23.5	407	740	1.12	809	1.19	1553	1.15
24.0	408	876	1.32	927	1.36	1808	1.34
24.5	410	733	1.11	829	1.22	1575	1.17
25.0	411	931	1.40	1131	1.66	2071	1.54
25.5	412	812	1.22	946	1.39	1761	1.31
26.0	413	1000	1.51	1146	1.69	2151	1.60
26.5	415	898	1.35	1033	1.52	1939	1.44
27.0	416	1151	1.74	1251	1.84	2411	1.79
27.5	417	990	1.49	1175	1.73	2176	1.62
28.0	419	1246	1.88	1326	1.95	2579	1.92
28.5	420	1098	1.66	1227	1.81	2331	1.73
29.0	421	1378	2.08	1472	2.17	2856	2.12
29.5	422	1174	1.77	1372	2.02	2550	1.89
30.0	424	1421	2.14	1513	2.23	2939	2.18
30.5	425	1233	1.86	1329	1.96	2572	1.91
31.0	426	1487	2.24	1589	2.34	3086	2.29
31.5	428	1391	2.10	1409	2.07	2805	2.08
32.0	429	1655	2.49	1698	2.50	3360	2.50
32.5	430	1376	2.07	1520	2.24	2901	2.15
33.0	432	1708	2.57	1808	2.66	3519	2.61
33.5	433	1551	2.34	1596	2.35	3152	2.34
34.0	434	1816	2.74	1796	2.64	3617	2.69
34.5	436	1614	2.43	1647	2.42	3265	2.42
35.0	437	1777	2.68	1746	2.57	3525	2.62
35.5	439	1690	2.55	1542	2.27	3234	2.40
36.0	440	1854	2.79	1756	2.58	3614	2.68
36.5	442	1646	2.48	1524	2.24	3172	2.36
37.0	443	1851	2.79	1615	2.38	3469	2.58
37.5	445	1607	2.42	1383	2.04	2990	2.22
38.0	446	1735	2.62	1510	2.22	3247	2.41
38.5	448	1528	2.30	1304	1.92	2834	2.10
39.0	450	1738	2.62	1341	1.97	3081	2.29
39.5	452	1447	2.18	1158	1.70	2607	1.94
40.0	453	1525	2.30	1056	1.55	2583	1.92
40.5	455	1246	1.88	919	1.35	2169	1.61
41.0	457	1331	2.01	867	1.28	2200	1.63
41.5	460	1025	1.55	669	0.98	1695	1.26

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
42.0	462	1061	1.60	586	0.86	1648	1.22
42.5	464	763	1.15	476	0.70	1239	0.92
43.0	467	755	1.14	395	0.58	1151	0.85
43.5	470	512	0.77	268	0.39	780	0.58
44.0	473	502	0.76	223	0.33	726	0.54
44.5	476	306	0.46	157	0.23	463	0.34
45.0	480	273	0.41	111	0.16	384	0.29
45.5	485	143	0.22	57	0.08	200	0.15
46.0	490	117	0.18	48	0.07	165	0.12
46.5	497	52	0.08	20	0.03	72	0.05
47.0	507	43	0.06	9	0.01	52	0.04
47.5	523	8	0.01	5	0.01	13	0.01
48.0	552	11	0.02	3	0.00	14	0.01

Note. The sum of Females and Males is not equal to the total number of students due to missing values in gender.

Table K2. Operational Grade 10 Public School Student Frequency Distributions by Gender and for Total Population – Mathematics

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
0.0	251	1	0.00	1	0.00	2	0.00
0.5	281	0	0.00	0	0.00	0	0.00
1.0	299	1	0.00	4	0.01	5	0.00
1.5	310	0	0.00	0	0.00	0	0.00
2.0	318	6	0.01	19	0.03	26	0.02
2.5	325	0	0.00	0	0.00	0	0.00
3.0	330	36	0.05	41	0.06	80	0.06
3.5	334	2	0.00	0	0.00	2	0.00
4.0	338	64	0.10	78	0.11	143	0.11
4.5	342	6	0.01	4	0.01	10	0.01
5.0	345	107	0.16	157	0.23	268	0.20
5.5	348	10	0.01	8	0.01	18	0.01
6.0	351	202	0.30	276	0.40	486	0.36
6.5	354	29	0.04	14	0.02	43	0.03
7.0	356	345	0.52	403	0.59	757	0.56
7.5	359	55	0.08	50	0.07	106	0.08
8.0	361	430	0.64	588	0.86	1032	0.76
8.5	363	76	0.11	54	0.08	131	0.10
9.0	365	578	0.87	701	1.03	1285	0.95
9.5	367	117	0.18	102	0.15	220	0.16
10.0	369	598	0.90	793	1.16	1408	1.04
10.5	371	170	0.25	124	0.18	297	0.22
11.0	373	706	1.06	859	1.26	1579	1.17
11.5	374	225	0.34	186	0.27	417	0.31
12.0	376	767	1.15	877	1.29	1659	1.23
12.5	378	280	0.42	235	0.34	518	0.38
13.0	380	732	1.10	907	1.33	1650	1.22
13.5	381	343	0.51	235	0.34	582	0.43
14.0	383	841	1.26	883	1.29	1735	1.28
14.5	384	409	0.61	305	0.45	722	0.53
15.0	386	828	1.24	846	1.24	1683	1.24
15.5	387	427	0.64	343	0.50	772	0.57
16.0	389	822	1.23	850	1.25	1680	1.24
16.5	390	464	0.69	393	0.58	862	0.64
17.0	392	828	1.24	870	1.28	1709	1.26
17.5	393	523	0.78	443	0.65	970	0.72
18.0	394	915	1.37	859	1.26	1783	1.32
18.5	396	570	0.85	458	0.67	1032	0.76
19.0	397	907	1.36	878	1.29	1792	1.32
19.5	399	583	0.87	435	0.64	1025	0.76

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
20.0	400	962	1.44	901	1.32	1873	1.38
20.5	401	621	0.93	493	0.72	1118	0.83
21.0	403	972	1.45	897	1.32	1878	1.39
21.5	404	651	0.97	460	0.67	1118	0.83
22.0	405	1027	1.54	922	1.35	1954	1.44
22.5	407	699	1.05	554	0.81	1256	0.93
23.0	408	1036	1.55	954	1.40	1996	1.47
23.5	409	689	1.03	566	0.83	1258	0.93
24.0	410	1018	1.52	983	1.44	2011	1.49
24.5	412	747	1.12	627	0.92	1378	1.02
25.0	413	1054	1.58	960	1.41	2020	1.49
25.5	414	773	1.16	661	0.97	1438	1.06
26.0	416	1135	1.70	1034	1.52	2174	1.61
26.5	417	769	1.15	678	0.99	1449	1.07
27.0	418	1127	1.69	1061	1.56	2194	1.62
27.5	420	800	1.20	670	0.98	1470	1.09
28.0	421	1225	1.83	1127	1.65	2361	1.74
28.5	423	831	1.24	716	1.05	1551	1.15
29.0	424	1225	1.83	1213	1.78	2446	1.81
29.5	425	849	1.27	788	1.16	1639	1.21
30.0	427	1217	1.82	1259	1.85	2479	1.83
30.5	428	943	1.41	809	1.19	1754	1.30
31.0	430	1395	2.09	1254	1.84	2656	1.96
31.5	431	940	1.41	867	1.27	1811	1.34
32.0	433	1407	2.11	1329	1.95	2743	2.03
32.5	434	947	1.42	930	1.36	1882	1.39
33.0	436	1423	2.13	1498	2.20	2923	2.16
33.5	438	1004	1.50	1005	1.47	2012	1.49
34.0	439	1538	2.30	1515	2.22	3057	2.26
34.5	441	921	1.38	1029	1.51	1953	1.44
35.0	443	1587	2.38	1599	2.34	3189	2.36
35.5	444	1030	1.54	994	1.46	2029	1.50
36.0	446	1511	2.26	1682	2.47	3193	2.36
36.5	448	998	1.49	1107	1.62	2107	1.56
37.0	450	1638	2.45	1740	2.55	3382	2.50
37.5	452	973	1.46	1100	1.61	2073	1.53
38.0	454	1602	2.40	1712	2.51	3317	2.45
38.5	456	960	1.44	1069	1.57	2031	1.50
39.0	459	1552	2.32	1764	2.59	3317	2.45
39.5	461	880	1.32	1077	1.58	1959	1.45
40.0	464	1534	2.30	1647	2.41	3183	2.35
40.5	466	818	1.22	981	1.44	1800	1.33
41.0	469	1448	2.17	1628	2.39	3078	2.27

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
41.5	472	626	0.94	899	1.32	1525	1.13
42.0	475	1290	1.93	1564	2.29	2856	2.11
42.5	479	568	0.85	761	1.12	1330	0.98
43.0	483	1080	1.62	1320	1.94	2400	1.77
43.5	488	475	0.71	620	0.91	1095	0.81
44.0	494	875	1.31	1056	1.55	1932	1.43
44.5	502	316	0.47	396	0.58	713	0.53
45.0	512	617	0.92	768	1.13	1385	1.02
45.5	530	158	0.24	248	0.36	406	0.30
46.0	560	326	0.49	432	0.63	758	0.56

Note. The sum of Females and Males is not equal to the total number of students due to missing values in gender.

Table K3. Operational Grade 10 Public School Student Frequency Distributions by Gender and for Total Population – Writing

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
0.0	265	0	0.00	7	0.01	7	0.01
0.5	289	0	0.00	0	0.00	0	0.00
1.0	303	11	0.02	28	0.04	40	0.03
1.5	311	0	0.00	1	0.00	1	0.00
2.0	316	11	0.02	61	0.09	72	0.05
2.5	321	1	0.00	0	0.00	1	0.00
3.0	325	14	0.02	66	0.10	80	0.06
3.5	328	0	0.00	0	0.00	0	0.00
4.0	331	11	0.02	69	0.10	81	0.06
4.5	333	0	0.00	0	0.00	0	0.00
5.0	336	13	0.02	50	0.07	64	0.05
5.5	338	2	0.00	1	0.00	3	0.00
6.0	340	21	0.03	78	0.12	99	0.07
6.5	342	0	0.00	2	0.00	2	0.00
7.0	343	22	0.03	93	0.14	118	0.09
7.5	345	2	0.00	1	0.00	4	0.00
8.0	347	24	0.04	94	0.14	120	0.09
8.5	348	0	0.00	6	0.01	6	0.00
9.0	350	27	0.04	107	0.16	135	0.10
9.5	351	3	0.00	4	0.01	7	0.01
10.0	353	54	0.08	159	0.23	215	0.16
10.5	354	3	0.00	8	0.01	11	0.01
11.0	355	74	0.11	194	0.29	270	0.20
11.5	357	6	0.01	12	0.02	18	0.01
12.0	358	88	0.13	264	0.39	357	0.27
12.5	360	4	0.01	25	0.04	29	0.02
13.0	361	87	0.13	305	0.45	397	0.30
13.5	362	13	0.02	22	0.03	35	0.03
14.0	364	114	0.17	302	0.45	422	0.31
14.5	365	15	0.02	54	0.08	69	0.05
15.0	366	120	0.18	424	0.63	550	0.41
15.5	368	16	0.02	56	0.08	72	0.05
16.0	369	159	0.24	405	0.60	569	0.42
16.5	371	24	0.04	56	0.08	80	0.06
17.0	372	206	0.31	498	0.74	714	0.53
17.5	373	34	0.05	82	0.12	116	0.09
18.0	375	219	0.33	559	0.83	785	0.59
18.5	376	54	0.08	76	0.11	130	0.10
19.0	378	277	0.42	656	0.97	944	0.70
19.5	379	57	0.09	127	0.19	185	0.14
20.0	381	352	0.53	829	1.22	1189	0.89

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
20.5	382	63	0.10	143	0.21	208	0.16
21.0	384	440	0.67	998	1.47	1444	1.08
21.5	385	94	0.14	163	0.24	258	0.19
22.0	387	499	0.76	1099	1.62	1609	1.20
22.5	388	106	0.16	208	0.31	317	0.24
23.0	390	637	0.96	1342	1.98	1991	1.48
23.5	391	148	0.22	222	0.33	371	0.28
24.0	393	797	1.21	1591	2.35	2401	1.79
24.5	395	151	0.23	287	0.42	439	0.33
25.0	396	966	1.46	1798	2.66	2785	2.08
25.5	398	180	0.27	306	0.45	488	0.36
26.0	400	1266	1.92	2143	3.16	3429	2.56
26.5	401	202	0.31	336	0.50	539	0.40
27.0	403	1405	2.13	2465	3.64	3895	2.90
27.5	404	225	0.34	323	0.48	551	0.41
28.0	406	1855	2.81	2744	4.05	4625	3.45
28.5	408	272	0.41	339	0.50	614	0.46
29.0	410	2190	3.32	3102	4.58	5310	3.96
29.5	411	313	0.47	358	0.53	673	0.50
30.0	413	2759	4.18	3454	5.10	6232	4.65
30.5	415	354	0.54	382	0.56	736	0.55
31.0	417	3318	5.02	3990	5.89	7325	5.46
31.5	419	364	0.55	370	0.55	735	0.55
32.0	421	4012	6.07	4423	6.53	8449	6.30
32.5	423	374	0.57	411	0.61	787	0.59
33.0	426	4692	7.10	4658	6.88	9357	6.98
33.5	428	390	0.59	383	0.57	773	0.58
34.0	430	5342	8.09	4737	7.00	10100	7.53
34.5	433	409	0.62	322	0.48	735	0.55
35.0	436	5925	8.97	4716	6.96	10654	7.94
35.5	438	307	0.46	248	0.37	556	0.41
36.0	441	5768	8.73	4272	6.31	10044	7.49
36.5	444	270	0.41	179	0.26	449	0.33
37.0	448	5238	7.93	3213	4.74	8455	6.30
37.5	451	188	0.28	114	0.17	302	0.23
38.0	455	4347	6.58	2468	3.64	6818	5.08
38.5	458	126	0.19	70	0.10	197	0.15
39.0	462	3405	5.16	1674	2.47	5082	3.79
39.5	467	62	0.09	36	0.05	98	0.07
40.0	471	2202	3.33	1002	1.48	3205	2.39
40.5	476	42	0.06	18	0.03	61	0.05
41.0	482	1236	1.87	470	0.69	1706	1.27
41.5	487	14	0.02	10	0.01	24	0.02

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
42.0	493	597	0.90	220	0.32	818	0.61
42.5	500	2	0.00	5	0.01	7	0.01
43.0	508	249	0.38	86	0.13	335	0.25
43.5	517	5	0.01	2	0.00	7	0.01
44.0	526	83	0.13	35	0.05	119	0.09
44.5	537	0	0.00	0	0.00	0	0.00
45.0	547	18	0.03	2	0.00	20	0.01
45.5	556	1	0.00	0	0.00	1	0.00
46.0	566	4	0.01	1	0.00	5	0.00
46.5	575	0	0.00	0	0.00	0	0.00
47.0	587	1	0.00	0	0.00	1	0.00
47.5	604	0	0.00	0	0.00	0	0.00
48.0	630	1	0.00	0	0.00	1	0.00

Note. The sum of Females and Males is not equal to the total number of students due to missing values in gender.

Table K4. Operational Grade 10 Public School Student Frequency Distributions by Gender and for Total Population – Science

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
0.0	216	0	0.00	0	0.00	0	0.00
0.5	253	0	0.00	0	0.00	0	0.00
1.0	275	2	0.00	6	0.01	8	0.01
1.5	288	1	0.00	0	0.00	1	0.00
2.0	297	12	0.02	7	0.01	20	0.01
2.5	305	1	0.00	0	0.00	1	0.00
3.0	311	15	0.02	21	0.03	36	0.03
3.5	316	6	0.01	6	0.01	12	0.01
4.0	321	41	0.06	55	0.08	98	0.07
4.5	325	15	0.02	10	0.01	25	0.02
5.0	329	86	0.13	123	0.18	213	0.16
5.5	333	41	0.06	43	0.06	84	0.06
6.0	336	142	0.21	190	0.28	338	0.25
6.5	339	102	0.15	70	0.10	172	0.13
7.0	342	216	0.32	275	0.40	499	0.37
7.5	345	111	0.17	125	0.18	239	0.18
8.0	347	316	0.47	433	0.64	753	0.56
8.5	350	177	0.26	160	0.23	338	0.25
9.0	352	344	0.51	435	0.64	789	0.58
9.5	355	224	0.34	232	0.34	459	0.34
10.0	357	419	0.63	508	0.75	935	0.69
10.5	359	297	0.44	285	0.42	589	0.44
11.0	361	469	0.70	583	0.86	1061	0.78
11.5	363	382	0.57	376	0.55	766	0.57
12.0	365	493	0.74	574	0.84	1071	0.79
12.5	367	474	0.71	422	0.62	905	0.67
13.0	369	567	0.85	630	0.92	1211	0.89
13.5	371	515	0.77	426	0.63	949	0.70
14.0	373	668	1.00	654	0.96	1332	0.98
14.5	375	575	0.86	520	0.76	1103	0.81
15.0	376	701	1.05	615	0.90	1322	0.98
15.5	378	629	0.94	536	0.79	1173	0.87
16.0	380	712	1.06	659	0.97	1381	1.02
16.5	381	713	1.07	581	0.85	1303	0.96
17.0	383	776	1.16	709	1.04	1488	1.10
17.5	385	798	1.19	587	0.86	1395	1.03
18.0	386	855	1.28	716	1.05	1583	1.17
18.5	388	840	1.26	633	0.93	1481	1.09
19.0	390	897	1.34	702	1.03	1607	1.19
19.5	391	881	1.32	698	1.02	1584	1.17

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
20.0	393	897	1.34	773	1.13	1679	1.24
20.5	394	955	1.43	642	0.94	1603	1.18
21.0	396	999	1.49	816	1.20	1826	1.35
21.5	397	956	1.43	747	1.10	1704	1.26
22.0	399	1050	1.57	836	1.23	1890	1.40
22.5	400	935	1.40	854	1.25	1795	1.33
23.0	402	1128	1.69	831	1.22	1967	1.45
23.5	403	1100	1.65	874	1.28	1978	1.46
24.0	405	1196	1.79	930	1.36	2130	1.57
24.5	406	1181	1.77	915	1.34	2103	1.55
25.0	408	1101	1.65	952	1.40	2057	1.52
25.5	409	1187	1.78	959	1.41	2157	1.59
26.0	411	1186	1.77	1038	1.52	2229	1.65
26.5	412	1207	1.81	987	1.45	2199	1.62
27.0	414	1244	1.86	1067	1.57	2318	1.71
27.5	415	1241	1.86	1097	1.61	2340	1.73
28.0	417	1327	1.98	1110	1.63	2438	1.80
28.5	418	1223	1.83	1210	1.78	2437	1.80
29.0	420	1349	2.02	1172	1.72	2525	1.87
29.5	421	1341	2.01	1177	1.73	2525	1.87
30.0	423	1257	1.88	1267	1.86	2526	1.87
30.5	424	1301	1.95	1207	1.77	2515	1.86
31.0	426	1266	1.89	1196	1.75	2466	1.82
31.5	427	1316	1.97	1285	1.89	2606	1.92
32.0	429	1291	1.93	1356	1.99	2651	1.96
32.5	430	1290	1.93	1319	1.94	2611	1.93
33.0	432	1377	2.06	1362	2.00	2742	2.03
33.5	434	1264	1.89	1405	2.06	2674	1.98
34.0	435	1295	1.94	1335	1.96	2634	1.95
34.5	437	1251	1.87	1409	2.07	2663	1.97
35.0	439	1229	1.84	1469	2.16	2700	1.99
35.5	441	1220	1.82	1427	2.09	2650	1.96
36.0	442	1212	1.81	1377	2.02	2591	1.91
36.5	445	1176	1.76	1488	2.18	2668	1.97
37.0	446	1117	1.67	1472	2.16	2592	1.91
37.5	448	1070	1.60	1390	2.04	2461	1.82
38.0	450	1080	1.62	1379	2.02	2461	1.82
38.5	452	996	1.49	1322	1.94	2318	1.71
39.0	454	973	1.46	1296	1.90	2270	1.68
39.5	457	947	1.42	1260	1.85	2208	1.63
40.0	459	793	1.19	1152	1.69	1945	1.44
40.5	462	742	1.11	1065	1.56	1808	1.34

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
41.0	464	684	1.02	1013	1.49	1698	1.25
41.5	467	638	0.95	889	1.30	1528	1.13
42.0	470	587	0.88	898	1.32	1485	1.10
42.5	473	477	0.71	761	1.12	1238	0.91
43.0	476	409	0.61	647	0.95	1057	0.78
43.5	480	327	0.49	552	0.81	879	0.65
44.0	484	280	0.42	423	0.62	703	0.52
44.5	489	209	0.31	387	0.57	596	0.44
45.0	494	170	0.25	278	0.41	448	0.33
45.5	500	124	0.19	189	0.28	314	0.23
46.0	508	97	0.15	141	0.21	238	0.18
46.5	517	42	0.06	76	0.11	118	0.09
47.0	530	23	0.03	47	0.07	70	0.05
47.5	552	8	0.01	13	0.02	21	0.02
48.0	590	5	0.01	5	0.01	10	0.01

Note. The sum of Females and Males is not equal to the total number of students due to missing values in gender.

Table K5. Operational Grade 10 Public School Student Frequency Distributions by Gender and for Total Population – Social Studies

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
0.0	225	0	0.00	1	0.00	1	0.00
0.5	260	0	0.00	0	0.00	0	0.00
1.0	281	2	0.00	6	0.01	8	0.01
1.5	293	0	0.00	0	0.00	0	0.00
2.0	302	3	0.00	9	0.01	15	0.01
2.5	309	0	0.00	1	0.00	1	0.00
3.0	315	13	0.02	28	0.04	42	0.03
3.5	320	0	0.00	8	0.01	8	0.01
4.0	325	41	0.06	72	0.11	114	0.08
4.5	329	11	0.02	17	0.03	28	0.02
5.0	332	50	0.08	114	0.17	165	0.12
5.5	336	20	0.03	22	0.03	42	0.03
6.0	339	126	0.19	214	0.31	348	0.26
6.5	342	25	0.04	53	0.08	79	0.06
7.0	345	165	0.25	306	0.45	475	0.35
7.5	348	63	0.09	83	0.12	147	0.11
8.0	350	237	0.36	433	0.64	674	0.50
8.5	353	117	0.18	137	0.20	255	0.19
9.0	355	288	0.43	524	0.77	822	0.61
9.5	358	150	0.23	163	0.24	316	0.23
10.0	360	369	0.55	624	0.92	999	0.74
10.5	362	220	0.33	254	0.37	480	0.36
11.0	364	435	0.65	623	0.92	1070	0.79
11.5	366	272	0.41	307	0.45	582	0.43
12.0	368	448	0.67	636	0.94	1097	0.81
12.5	370	283	0.42	348	0.51	636	0.47
13.0	372	500	0.75	638	0.94	1153	0.85
13.5	374	351	0.53	394	0.58	746	0.55
14.0	376	536	0.80	595	0.88	1140	0.84
14.5	377	375	0.56	433	0.64	811	0.60
15.0	379	610	0.92	592	0.87	1209	0.90
15.5	381	458	0.69	439	0.65	901	0.67
16.0	383	685	1.03	581	0.85	1275	0.94
16.5	384	558	0.84	495	0.73	1056	0.78
17.0	386	642	0.96	630	0.93	1279	0.95
17.5	388	595	0.89	521	0.77	1123	0.83
18.0	389	744	1.12	606	0.89	1360	1.01
18.5	391	706	1.06	567	0.83	1281	0.95
19.0	392	796	1.19	716	1.05	1519	1.13
19.5	394	700	1.05	596	0.88	1308	0.97
20.0	396	865	1.30	693	1.02	1566	1.16
20.5	397	780	1.17	617	0.91	1404	1.04
21.0	399	878	1.32	760	1.12	1643	1.22

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
21.5	400	891	1.34	668	0.98	1563	1.16
22.0	402	927	1.39	752	1.11	1689	1.25
22.5	403	893	1.34	733	1.08	1638	1.21
23.0	405	1005	1.51	781	1.15	1792	1.33
23.5	406	930	1.40	744	1.09	1679	1.24
24.0	408	1071	1.61	926	1.36	2002	1.48
24.5	409	1051	1.58	843	1.24	1898	1.41
25.0	411	1045	1.57	917	1.35	1969	1.46
25.5	412	1110	1.67	941	1.38	2055	1.52
26.0	414	1077	1.62	988	1.45	2071	1.53
26.5	415	1162	1.74	965	1.42	2134	1.58
27.0	417	1169	1.75	1026	1.51	2198	1.63
27.5	418	1190	1.79	951	1.40	2145	1.59
28.0	420	1208	1.81	1098	1.62	2315	1.72
28.5	421	1220	1.83	1113	1.64	2337	1.73
29.0	423	1247	1.87	1201	1.77	2453	1.82
29.5	424	1311	1.97	1128	1.66	2444	1.81
30.0	426	1318	1.98	1157	1.70	2475	1.83
30.5	427	1338	2.01	1281	1.88	2625	1.94
31.0	429	1341	2.01	1254	1.84	2601	1.93
31.5	431	1293	1.94	1226	1.80	2522	1.87
32.0	432	1334	2.00	1350	1.99	2689	1.99
32.5	434	1352	2.03	1418	2.09	2773	2.05
33.0	435	1295	1.94	1354	1.99	2652	1.96
33.5	437	1384	2.08	1437	2.11	2824	2.09
34.0	439	1373	2.06	1433	2.11	2808	2.08
34.5	440	1372	2.06	1422	2.09	2796	2.07
35.0	442	1325	1.99	1422	2.09	2749	2.04
35.5	444	1351	2.03	1468	2.16	2826	2.09
36.0	446	1333	2.00	1509	2.22	2845	2.11
36.5	447	1292	1.94	1474	2.17	2767	2.05
37.0	449	1279	1.92	1425	2.10	2705	2.00
37.5	451	1247	1.87	1508	2.22	2758	2.04
38.0	453	1252	1.88	1392	2.05	2646	1.96
38.5	455	1185	1.78	1425	2.10	2611	1.93
39.0	457	1101	1.65	1354	1.99	2456	1.82
39.5	459	1120	1.68	1327	1.95	2448	1.81
40.0	462	1049	1.57	1315	1.93	2364	1.75
40.5	464	991	1.49	1257	1.85	2249	1.67
41.0	466	896	1.34	1161	1.71	2059	1.53
41.5	469	886	1.33	1028	1.51	1914	1.42
42.0	472	786	1.18	973	1.43	1761	1.30
42.5	475	720	1.08	827	1.22	1547	1.15
43.0	478	599	0.90	735	1.08	1334	0.99
43.5	481	543	0.82	619	0.91	1163	0.86
44.0	485	442	0.66	518	0.76	961	0.71

Raw Score	Scaled Score	Female		Male		Total	
		Count	%	Count	%	Count	%
44.5	489	351	0.53	402	0.59	753	0.56
45.0	494	290	0.44	294	0.43	584	0.43
45.5	499	198	0.30	249	0.37	447	0.33
46.0	506	157	0.24	155	0.23	312	0.23
46.5	514	108	0.16	97	0.14	205	0.15
47.0	526	60	0.09	56	0.08	116	0.09
47.5	546	28	0.04	18	0.03	46	0.03
48.0	580	11	0.02	8	0.01	19	0.01

Note. The sum of Females and Males is not equal to the total number of students due to missing values in gender.

APPENDIX L.

Operational Frequency Distributions by Ethnicity

Table L1. Operational Grade 10 Public School Student Frequency Distributions by Ethnicity – Reading

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
0.0	258	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00	0	0.00	0	0.00
0.5	286	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
1.0	303	0	0.00	0	0.00	3	0.01	1	0.04	1	0.00	0	0.00	0	0.00
1.5	313	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
2.0	320	0	0.00	0	0.00	21	0.10	0	0.00	14	0.01	1	0.03	0	0.00
2.5	326	0	0.00	0	0.00	0	0.00	0	0.00	6	0.01	0	0.00	0	0.00
3.0	331	0	0.00	1	0.06	11	0.05	0	0.00	24	0.02	0	0.00	0	0.00
3.5	336	0	0.00	0	0.00	2	0.01	1	0.04	4	0.00	0	0.00	0	0.00
4.0	339	1	0.50	1	0.06	37	0.18	3	0.11	55	0.05	2	0.07	1	0.75
4.5	343	0	0.00	0	0.00	2	0.01	1	0.04	7	0.01	1	0.03	0	0.00
5.0	346	0	0.00	3	0.18	66	0.33	6	0.22	96	0.09	3	0.10	1	0.75
5.5	349	0	0.00	0	0.00	20	0.10	0	0.00	28	0.03	0	0.00	0	0.00
6.0	351	1	0.50	0	0.00	106	0.53	9	0.33	116	0.11	5	0.17	0	0.00
6.5	354	0	0.00	1	0.06	31	0.15	6	0.22	46	0.04	4	0.13	1	0.75
7.0	356	1	0.50	2	0.12	151	0.75	14	0.51	251	0.24	13	0.43	2	1.49
7.5	358	0	0.00	1	0.06	50	0.25	6	0.22	80	0.08	3	0.10	0	0.00
8.0	361	2	1.01	1	0.06	207	1.03	23	0.84	327	0.31	12	0.40	0	0.00
8.5	363	0	0.00	0	0.00	65	0.32	8	0.29	111	0.10	1	0.03	0	0.00
9.0	365	1	0.50	3	0.18	243	1.21	18	0.66	364	0.34	15	0.50	5	3.73
9.5	367	0	0.00	1	0.06	101	0.50	8	0.29	164	0.15	10	0.33	0	0.00
10.0	368	1	0.50	4	0.24	275	1.37	36	1.31	433	0.41	18	0.60	1	0.75
10.5	370	2	1.01	2	0.12	106	0.53	16	0.58	225	0.21	7	0.23	0	0.00
11.0	372	0	0.00	4	0.24	258	1.29	29	1.06	404	0.38	32	1.06	3	2.24
11.5	374	0	0.00	4	0.24	131	0.65	12	0.44	251	0.24	8	0.27	2	1.49
12.0	375	1	0.50	4	0.24	273	1.36	37	1.35	471	0.44	18	0.60	6	4.48
12.5	377	3	1.51	1	0.06	141	0.70	22	0.80	258	0.24	8	0.27	1	0.75
13.0	378	2	1.01	6	0.36	251	1.25	35	1.27	459	0.43	15	0.50	2	1.49
13.5	380	1	0.50	5	0.30	188	0.94	16	0.58	326	0.31	9	0.30	1	0.75
14.0	382	4	2.01	7	0.42	278	1.39	32	1.16	478	0.45	25	0.83	2	1.49
14.5	383	1	0.50	6	0.36	222	1.11	26	0.95	348	0.33	20	0.66	3	2.24
15.0	384	2	1.01	9	0.55	326	1.63	31	1.13	516	0.49	15	0.50	4	2.99
15.5	386	1	0.50	2	0.12	208	1.04	22	0.80	402	0.38	14	0.47	1	0.75
16.0	387	4	2.01	7	0.42	310	1.55	28	1.02	550	0.52	29	0.96	4	2.99
16.5	389	2	1.01	7	0.42	199	0.99	36	1.31	453	0.43	24	0.80	1	0.75
17.0	390	2	1.01	5	0.30	334	1.67	35	1.27	618	0.58	29	0.96	1	0.75
17.5	392	3	1.51	7	0.42	257	1.28	35	1.27	492	0.46	19	0.63	0	0.00
18.0	393	2	1.01	11	0.67	332	1.66	43	1.57	690	0.65	24	0.80	1	0.75

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
18.5	394	2	1.01	8	0.48	291	1.45	25	0.91	568	0.54	20	0.66	1	0.75
19.0	396	3	1.51	7	0.42	357	1.78	24	0.87	733	0.69	37	1.23	3	2.24
19.5	397	1	0.50	11	0.67	301	1.50	34	1.24	610	0.58	30	1.00	1	0.75
20.0	398	0	0.00	15	0.91	379	1.89	40	1.46	798	0.75	47	1.56	0	0.00
20.5	400	3	1.51	13	0.79	301	1.50	38	1.38	680	0.64	26	0.86	2	1.49
21.0	401	1	0.50	15	0.91	394	1.96	27	0.98	945	0.89	37	1.23	2	1.49
21.5	402	3	1.51	12	0.73	314	1.57	38	1.38	806	0.76	27	0.90	0	0.00
22.0	403	3	1.51	18	1.09	412	2.05	35	1.27	1014	0.96	36	1.20	1	0.75
22.5	405	0	0.00	11	0.67	319	1.59	33	1.20	922	0.87	32	1.06	3	2.24
23.0	406	4	2.01	15	0.91	404	2.01	47	1.71	1137	1.07	31	1.03	3	2.24
23.5	407	6	3.02	15	0.91	400	1.99	42	1.53	1040	0.98	37	1.23	0	0.00
24.0	408	4	2.01	19	1.15	407	2.03	50	1.82	1261	1.19	52	1.73	2	1.49
24.5	410	1	0.50	15	0.91	349	1.74	45	1.64	1101	1.04	54	1.79	3	2.24
25.0	411	3	1.51	22	1.33	452	2.25	46	1.67	1484	1.40	53	1.76	2	1.49
25.5	412	2	1.01	19	1.15	373	1.86	33	1.20	1270	1.20	51	1.69	1	0.75
26.0	413	4	2.01	15	0.91	447	2.23	41	1.49	1580	1.49	52	1.73	0	0.00
26.5	415	5	2.51	18	1.09	368	1.83	47	1.71	1455	1.37	34	1.13	1	0.75
27.0	416	5	2.51	19	1.15	413	2.06	65	2.37	1818	1.71	69	2.29	7	5.22
27.5	417	1	0.50	21	1.27	356	1.77	58	2.11	1666	1.57	55	1.83	2	1.49
28.0	419	6	3.02	21	1.27	425	2.12	66	2.40	1988	1.88	54	1.79	5	3.73
28.5	420	3	1.51	29	1.76	390	1.94	45	1.64	1774	1.67	73	2.43	2	1.49
29.0	421	2	1.01	23	1.39	455	2.27	62	2.26	2218	2.09	72	2.39	3	2.24
29.5	422	4	2.01	19	1.15	371	1.85	60	2.18	2010	1.90	63	2.09	2	1.49
30.0	424	3	1.51	23	1.39	423	2.11	49	1.78	2355	2.22	73	2.43	0	0.00
30.5	425	5	2.51	36	2.18	328	1.64	45	1.64	2074	1.96	62	2.06	2	1.49
31.0	426	5	2.51	31	1.88	392	1.95	69	2.51	2498	2.36	71	2.36	2	1.49
31.5	428	1	0.50	31	1.88	334	1.67	52	1.89	2311	2.18	66	2.19	0	0.00
32.0	429	5	2.51	30	1.82	415	2.07	65	2.37	2748	2.59	75	2.49	4	2.99
32.5	430	5	2.51	31	1.88	290	1.45	56	2.04	2436	2.30	63	2.09	3	2.24
33.0	432	2	1.01	46	2.79	362	1.80	69	2.51	2951	2.78	71	2.36	5	3.73
33.5	433	7	3.52	31	1.88	299	1.49	61	2.22	2688	2.54	50	1.66	3	2.24
34.0	434	6	3.02	38	2.30	311	1.55	55	2.00	3106	2.93	88	2.92	3	2.24
34.5	436	2	1.01	36	2.18	283	1.41	44	1.60	2823	2.66	62	2.06	1	0.75
35.0	437	5	2.51	33	2.00	302	1.51	52	1.89	3049	2.88	68	2.26	1	0.75
35.5	439	1	0.50	36	2.18	254	1.27	61	2.22	2811	2.65	62	2.06	2	1.49

RS	SS	American Indian		Asian/ Pacific Islander		Black/ African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
36.0	440	3	1.51	44	2.67	266	1.33	47	1.71	3161	2.98	83	2.76	0	0.00
36.5	442	5	2.51	45	2.73	221	1.10	48	1.75	2779	2.62	62	2.06	2	1.49
37.0	443	3	1.51	53	3.21	234	1.17	54	1.97	3051	2.88	64	2.13	1	0.75
37.5	445	6	3.02	46	2.79	191	0.95	35	1.27	2650	2.50	58	1.93	1	0.75
38.0	446	5	2.51	52	3.15	193	0.96	44	1.60	2869	2.71	74	2.46	3	2.24
38.5	448	4	2.01	41	2.48	177	0.88	43	1.57	2510	2.37	45	1.50	2	1.49
39.0	450	8	4.02	47	2.85	153	0.76	29	1.06	2786	2.63	51	1.69	0	0.00
39.5	452	3	1.51	58	3.52	132	0.66	29	1.06	2319	2.19	59	1.96	2	1.49
40.0	453	4	2.01	42	2.55	125	0.62	24	0.87	2331	2.20	49	1.63	0	0.00
40.5	455	1	0.50	40	2.42	99	0.49	28	1.02	1954	1.84	38	1.26	4	2.99
41.0	457	2	1.01	44	2.67	109	0.54	18	0.66	1983	1.87	37	1.23	2	1.49
41.5	460	1	0.50	38	2.30	68	0.34	16	0.58	1537	1.45	32	1.06	0	0.00
42.0	462	1	0.50	45	2.73	57	0.28	16	0.58	1495	1.41	31	1.03	0	0.00
42.5	464	1	0.50	35	2.12	46	0.23	10	0.36	1124	1.06	22	0.73	0	0.00
43.0	467	2	1.01	42	2.55	37	0.18	9	0.33	1040	0.98	20	0.66	0	0.00
43.5	470	0	0.00	25	1.52	18	0.09	8	0.29	716	0.68	10	0.33	0	0.00
44.0	473	0	0.00	19	1.15	30	0.15	8	0.29	656	0.62	12	0.40	0	0.00
44.5	476	0	0.00	9	0.55	7	0.03	4	0.15	435	0.41	6	0.20	1	0.75
45.0	480	0	0.00	14	0.85	13	0.06	1	0.04	346	0.33	9	0.30	1	0.75
45.5	485	0	0.00	9	0.55	3	0.01	1	0.04	182	0.17	5	0.17	0	0.00
46.0	490	0	0.00	10	0.61	2	0.01	0	0.00	151	0.14	2	0.07	0	0.00
46.5	497	0	0.00	4	0.24	0	0.00	1	0.04	65	0.06	2	0.07	0	0.00
47.0	507	0	0.00	0	0.00	2	0.01	0	0.00	49	0.05	1	0.03	0	0.00
47.5	523	0	0.00	1	0.06	0	0.00	0	0.00	11	0.01	1	0.03	0	0.00
48.0	552	0	0.00	0	0.00	0	0.00	0	0.00	14	0.01	0	0.00	0	0.00

Note. Missing values are coded as Other.

Table L2. Operational Grade 10 Public School Student Frequency Distributions by Ethnicity – Math

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
0.0	251	0	0.00	0	0.00	1	0.00	0	0.00	1	0.00	0	0.00	0	0.00
0.5	281	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
1.0	299	0	0.00	0	0.00	2	0.01	0	0.00	3	0.00	0	0.00	0	0.00
1.5	310	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
2.0	318	0	0.00	0	0.00	16	0.08	1	0.04	6	0.01	2	0.07	0	0.00
2.5	325	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
3.0	330	0	0.00	0	0.00	35	0.17	4	0.14	34	0.03	3	0.10	0	0.00
3.5	334	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00	1	0.03	0	0.00
4.0	338	0	0.00	0	0.00	68	0.33	4	0.14	66	0.06	1	0.03	2	1.48
4.5	342	0	0.00	0	0.00	6	0.03	0	0.00	4	0.00	0	0.00	0	0.00
5.0	345	3	1.49	1	0.06	105	0.51	6	0.21	138	0.13	4	0.13	1	0.74
5.5	348	0	0.00	0	0.00	7	0.03	1	0.04	9	0.01	1	0.03	0	0.00
6.0	351	1	0.50	3	0.18	212	1.04	15	0.54	224	0.21	11	0.36	3	2.22
6.5	354	0	0.00	0	0.00	21	0.10	3	0.11	19	0.02	0	0.00	0	0.00
7.0	356	3	1.49	4	0.24	311	1.52	22	0.79	383	0.36	17	0.56	2	1.48
7.5	359	0	0.00	0	0.00	43	0.21	4	0.14	55	0.05	2	0.07	0	0.00
8.0	361	3	1.49	5	0.30	429	2.10	24	0.86	520	0.49	29	0.96	1	0.74
8.5	363	0	0.00	2	0.12	62	0.30	2	0.07	62	0.06	0	0.00	0	0.00
9.0	365	5	2.49	3	0.18	515	2.52	47	1.68	658	0.62	36	1.19	3	2.22
9.5	367	0	0.00	4	0.24	76	0.37	9	0.32	122	0.11	6	0.20	0	0.00
10.0	369	3	1.49	4	0.24	568	2.77	46	1.65	724	0.68	36	1.19	3	2.22
10.5	371	1	0.50	2	0.12	112	0.55	7	0.25	163	0.15	8	0.26	1	0.74
11.0	373	3	1.49	11	0.66	609	2.97	56	2.01	829	0.78	38	1.25	6	4.44
11.5	374	2	1.00	0	0.00	173	0.85	14	0.50	208	0.20	14	0.46	2	1.48
12.0	376	3	1.49	10	0.60	633	3.09	55	1.97	877	0.83	55	1.81	7	5.19
12.5	378	1	0.50	1	0.06	183	0.89	20	0.72	285	0.27	19	0.63	1	0.74
13.0	380	4	1.99	8	0.48	579	2.83	60	2.15	917	0.86	54	1.78	4	2.96
13.5	381	0	0.00	2	0.12	203	0.99	17	0.61	336	0.32	14	0.46	2	1.48
14.0	383	3	1.49	12	0.72	605	2.96	56	2.01	984	0.93	43	1.42	5	3.70
14.5	384	1	0.50	4	0.24	237	1.16	19	0.68	419	0.39	19	0.63	1	0.74
15.0	386	1	0.50	7	0.42	569	2.78	61	2.19	977	0.92	46	1.52	5	3.70
15.5	387	0	0.00	3	0.18	270	1.32	39	1.40	432	0.41	22	0.72	1	0.74
16.0	389	2	1.00	9	0.54	549	2.68	61	2.19	978	0.92	55	1.81	1	0.74
16.5	390	0	0.00	5	0.30	243	1.19	26	0.93	544	0.51	29	0.96	2	1.48
17.0	392	4	1.99	5	0.30	484	2.36	63	2.26	1079	1.02	47	1.55	4	2.96
17.5	393	2	1.00	3	0.18	301	1.47	26	0.93	600	0.56	29	0.96	0	0.00

		American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		RS	SS	N	%	N	%	N	%	N	%	N	%	N	%
18.0	394	2	1.00	8	0.48	540	2.64	57	2.04	1100	1.04	48	1.58	1	0.74
18.5	396	0	0.00	4	0.24	267	1.30	41	1.47	670	0.63	41	1.35	0	0.00
19.0	397	2	1.00	8	0.48	498	2.43	46	1.65	1159	1.09	56	1.85	5	3.70
19.5	399	0	0.00	8	0.48	280	1.37	36	1.29	667	0.63	23	0.76	2	1.48
20.0	400	7	3.48	7	0.42	470	2.30	62	2.22	1254	1.18	56	1.85	0	0.00
20.5	401	2	1.00	5	0.30	289	1.41	24	0.86	746	0.70	42	1.38	1	0.74
21.0	403	3	1.49	11	0.66	420	2.05	52	1.86	1317	1.24	56	1.85	2	1.48
21.5	404	2	1.00	9	0.54	254	1.24	29	1.04	790	0.74	28	0.92	0	0.00
22.0	405	5	2.49	20	1.20	416	2.03	52	1.86	1386	1.30	54	1.78	3	2.22
22.5	407	2	1.00	5	0.30	287	1.40	38	1.36	875	0.82	39	1.29	1	0.74
23.0	408	3	1.49	21	1.26	401	1.96	47	1.68	1450	1.36	57	1.88	3	2.22
23.5	409	2	1.00	7	0.42	253	1.24	36	1.29	909	0.86	42	1.38	1	0.74
24.0	410	2	1.00	18	1.08	366	1.79	49	1.76	1509	1.42	47	1.55	4	2.96
24.5	412	5	2.49	4	0.24	246	1.20	31	1.11	1029	0.97	49	1.61	0	0.00
25.0	413	3	1.49	16	0.96	356	1.74	50	1.79	1511	1.42	61	2.01	4	2.96
25.5	414	2	1.00	9	0.54	253	1.24	28	1.00	1099	1.03	40	1.32	1	0.74
26.0	416	3	1.49	15	0.90	339	1.66	40	1.43	1721	1.62	46	1.52	3	2.22
26.5	417	2	1.00	16	0.96	227	1.11	46	1.65	1119	1.05	32	1.05	2	1.48
27.0	418	2	1.00	20	1.20	308	1.50	51	1.83	1744	1.64	52	1.71	6	4.44
27.5	420	3	1.49	20	1.20	214	1.05	38	1.36	1151	1.08	40	1.32	0	0.00
28.0	421	6	2.99	21	1.26	349	1.70	61	2.19	1839	1.73	60	1.98	4	2.96
28.5	423	5	2.49	12	0.72	186	0.91	37	1.33	1271	1.20	31	1.02	1	0.74
29.0	424	7	3.48	23	1.38	322	1.57	57	2.04	1965	1.85	53	1.75	3	2.22
29.5	425	5	2.49	12	0.72	212	1.04	35	1.25	1332	1.25	28	0.92	1	0.74
30.0	427	1	0.50	20	1.20	276	1.35	48	1.72	2063	1.94	62	2.04	0	0.00
30.5	428	2	1.00	13	0.78	231	1.13	37	1.33	1423	1.34	41	1.35	0	0.00
31.0	430	6	2.99	22	1.32	296	1.45	47	1.68	2201	2.07	66	2.17	2	1.48
31.5	431	0	0.00	13	0.78	196	0.96	34	1.22	1530	1.44	33	1.09	0	0.00
32.0	433	3	1.49	26	1.56	282	1.38	50	1.79	2312	2.18	53	1.75	2	1.48
32.5	434	5	2.49	22	1.32	197	0.96	37	1.33	1567	1.47	43	1.42	1	0.74
33.0	436	6	2.99	23	1.38	271	1.32	54	1.93	2507	2.36	56	1.85	1	0.74
33.5	438	1	0.50	19	1.14	157	0.77	31	1.11	1764	1.66	33	1.09	1	0.74
34.0	439	5	2.49	41	2.46	231	1.13	43	1.54	2661	2.50	69	2.27	0	0.00
34.5	441	0	0.00	16	0.96	148	0.72	20	0.72	1722	1.62	36	1.19	1	0.74
35.0	443	7	3.48	35	2.10	245	1.20	53	1.90	2784	2.62	52	1.71	0	0.00
35.5	444	3	1.49	23	1.38	165	0.81	28	1.00	1751	1.65	45	1.48	2	1.48
36.0	446	6	2.99	42	2.52	215	1.05	55	1.97	2806	2.64	55	1.81	2	1.48
36.5	448	1	0.50	21	1.26	146	0.71	33	1.18	1856	1.75	41	1.35	2	1.48
37.0	450	0	0.00	57	3.42	196	0.96	39	1.40	3020	2.84	60	1.98	1	0.74

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
37.5	452	4	1.99	36	2.16	124	0.61	32	1.15	1837	1.73	35	1.15	2	1.48
38.0	454	5	2.49	51	3.06	175	0.85	52	1.86	2980	2.81	43	1.42	1	0.74
38.5	456	2	1.00	27	1.62	108	0.53	32	1.15	1820	1.71	36	1.19	1	0.74
39.0	459	5	2.49	55	3.30	152	0.74	42	1.50	2992	2.82	64	2.11	3	2.22
39.5	461	4	1.99	32	1.92	85	0.42	32	1.15	1765	1.66	35	1.15	1	0.74
40.0	464	1	0.50	63	3.78	125	0.61	29	1.04	2914	2.74	45	1.48	0	0.00
40.5	466	3	1.49	42	2.52	66	0.32	15	0.54	1636	1.54	34	1.12	1	0.74
41.0	469	0	0.00	65	3.90	86	0.42	30	1.07	2845	2.68	42	1.38	0	0.00
41.5	472	1	0.50	30	1.80	42	0.21	19	0.68	1407	1.32	22	0.72	1	0.74
42.0	475	2	1.00	62	3.72	76	0.37	21	0.75	2636	2.48	53	1.75	2	1.48
42.5	479	2	1.00	38	2.28	41	0.20	13	0.47	1203	1.13	30	0.99	1	0.74
43.0	483	2	1.00	70	4.20	51	0.25	13	0.47	2224	2.09	38	1.25	0	0.00
43.5	488	0	0.00	50	3.00	22	0.11	13	0.47	992	0.93	16	0.53	0	0.00
44.0	494	3	1.49	64	3.84	33	0.16	7	0.25	1806	1.70	18	0.59	0	0.00
44.5	502	0	0.00	29	1.74	13	0.06	4	0.14	650	0.61	16	0.53	0	0.00
45.0	512	1	0.50	75	4.50	26	0.13	11	0.39	1247	1.17	24	0.79	0	0.00
45.5	530	0	0.00	37	2.22	5	0.02	1	0.04	357	0.34	6	0.20	0	0.00
46.0	560	0	0.00	40	2.40	8	0.04	5	0.18	691	0.65	11	0.36	2	1.48

Note. Missing values are coded as Other.

Table L3. Operational Grade 10 Public School Student Frequency Distributions by Ethnicity – Writing

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
0.0	265	0	0.00	0	0.00	2	0.01	0	0.00	5	0.00	0	0.00	0	0.00
0.5	289	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
1.0	303	0	0.00	0	0.00	20	0.10	4	0.15	13	0.01	0	0.00	1	0.79
1.5	311	0	0.00	0	0.00	1	0.01	0	0.00	0	0.00	0	0.00	0	0.00
2.0	316	1	0.51	1	0.06	31	0.16	6	0.22	31	0.03	2	0.07	0	0.00
2.5	321	0	0.00	0	0.00	1	0.01	0	0.00	0	0.00	0	0.00	0	0.00
3.0	325	1	0.51	0	0.00	32	0.16	7	0.26	37	0.03	1	0.03	1	0.79
3.5	328	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
4.0	331	0	0.00	1	0.06	29	0.15	8	0.29	40	0.04	2	0.07	0	0.00
4.5	333	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5.0	336	0	0.00	0	0.00	26	0.13	5	0.18	30	0.03	1	0.03	1	0.79
5.5	338	0	0.00	0	0.00	2	0.01	0	0.00	1	0.00	0	0.00	0	0.00
6.0	340	1	0.51	0	0.00	45	0.23	5	0.18	43	0.04	2	0.07	1	0.79
6.5	342	0	0.00	0	0.00	0	0.00	1	0.04	1	0.00	0	0.00	0	0.00
7.0	343	1	0.51	2	0.12	49	0.25	2	0.07	58	0.05	3	0.10	0	0.00
7.5	345	0	0.00	0	0.00	2	0.01	0	0.00	2	0.00	0	0.00	0	0.00
8.0	347	0	0.00	1	0.06	44	0.22	7	0.26	64	0.06	3	0.10	0	0.00
8.5	348	0	0.00	0	0.00	2	0.01	0	0.00	4	0.00	0	0.00	0	0.00
9.0	350	2	1.01	2	0.12	43	0.22	6	0.22	76	0.07	1	0.03	3	2.36
9.5	351	0	0.00	0	0.00	5	0.03	0	0.00	2	0.00	0	0.00	0	0.00
10.0	353	0	0.00	2	0.12	78	0.39	6	0.22	114	0.11	9	0.30	0	0.00
10.5	354	0	0.00	0	0.00	7	0.04	0	0.00	4	0.00	0	0.00	0	0.00
11.0	355	2	1.01	0	0.00	81	0.41	14	0.51	158	0.15	8	0.27	1	0.79
11.5	357	0	0.00	0	0.00	7	0.04	1	0.04	9	0.01	1	0.03	0	0.00
12.0	358	0	0.00	3	0.18	117	0.59	17	0.62	203	0.19	8	0.27	2	1.57
12.5	360	0	0.00	0	0.00	6	0.03	0	0.00	23	0.02	0	0.00	0	0.00
13.0	361	1	0.51	1	0.06	145	0.73	16	0.59	219	0.21	8	0.27	2	1.57
13.5	362	0	0.00	1	0.06	14	0.07	2	0.07	17	0.02	1	0.03	0	0.00
14.0	364	0	0.00	2	0.12	143	0.72	17	0.62	244	0.23	7	0.23	3	2.36
14.5	365	1	0.51	0	0.00	27	0.14	4	0.15	36	0.03	1	0.03	0	0.00
15.0	366	2	1.01	7	0.43	190	0.96	18	0.66	300	0.28	17	0.57	1	0.79
15.5	368	0	0.00	0	0.00	22	0.11	2	0.07	46	0.04	2	0.07	0	0.00
16.0	369	0	0.00	1	0.06	176	0.89	26	0.95	342	0.32	11	0.37	3	2.36
16.5	371	0	0.00	1	0.06	28	0.14	6	0.22	42	0.04	3	0.10	0	0.00
17.0	372	1	0.51	9	0.55	207	1.04	26	0.95	441	0.42	12	0.40	3	2.36
17.5	373	0	0.00	3	0.18	36	0.18	6	0.22	68	0.06	2	0.07	1	0.79

		American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		RS	SS	N	%	N	%	N	%	N	%	N	%	N	%
18.0	375	2	1.01	5	0.30	233	1.18	34	1.25	474	0.45	20	0.67	4	3.15
18.5	376	1	0.51	0	0.00	35	0.18	6	0.22	79	0.07	7	0.23	0	0.00
19.0	378	2	1.01	16	0.97	312	1.57	40	1.47	543	0.51	17	0.57	2	1.57
19.5	379	0	0.00	2	0.12	54	0.27	8	0.29	118	0.11	1	0.03	0	0.00
20.0	381	2	1.01	8	0.49	373	1.88	33	1.21	709	0.67	40	1.34	4	3.15
20.5	382	0	0.00	3	0.18	62	0.31	6	0.22	125	0.12	6	0.20	0	0.00
21.0	384	3	1.52	14	0.85	428	2.16	55	2.02	885	0.84	37	1.24	3	2.36
21.5	385	2	1.01	1	0.06	85	0.43	10	0.37	146	0.14	10	0.33	0	0.00
22.0	387	1	0.51	8	0.49	517	2.61	44	1.61	977	0.92	35	1.17	2	1.57
22.5	388	0	0.00	2	0.12	110	0.56	9	0.33	180	0.17	10	0.33	1	0.79
23.0	390	4	2.02	14	0.85	602	3.04	55	2.02	1231	1.16	56	1.87	3	2.36
23.5	391	0	0.00	4	0.24	113	0.57	14	0.51	224	0.21	11	0.37	0	0.00
24.0	393	3	1.52	19	1.15	658	3.32	76	2.78	1538	1.45	74	2.48	2	1.57
24.5	395	0	0.00	5	0.30	120	0.61	16	0.59	286	0.27	10	0.33	0	0.00
25.0	396	5	2.53	20	1.21	716	3.61	96	3.52	1827	1.73	77	2.58	1	0.79
25.5	398	0	0.00	2	0.12	127	0.64	15	0.55	326	0.31	14	0.47	1	0.79
26.0	400	12	6.06	21	1.28	841	4.25	102	3.74	2320	2.19	88	2.94	3	2.36
26.5	401	2	1.01	6	0.36	139	0.70	18	0.66	355	0.34	13	0.43	0	0.00
27.0	403	10	5.05	43	2.61	933	4.71	99	3.63	2668	2.52	102	3.41	4	3.15
27.5	404	1	0.51	5	0.30	148	0.75	13	0.48	368	0.35	9	0.30	2	1.57
28.0	406	10	5.05	37	2.25	970	4.90	94	3.44	3336	3.15	130	4.35	0	0.00
28.5	408	0	0.00	3	0.18	124	0.63	15	0.55	445	0.42	19	0.64	1	0.79
29.0	410	12	6.06	45	2.73	1048	5.29	139	5.09	3847	3.64	165	5.52	10	7.87
29.5	411	2	1.01	9	0.55	152	0.77	20	0.73	469	0.44	13	0.43	0	0.00
30.0	413	11	5.56	60	3.64	1099	5.55	141	5.17	4727	4.47	142	4.75	6	4.72
30.5	415	0	0.00	8	0.49	121	0.61	10	0.37	578	0.55	11	0.37	1	0.79
31.0	417	7	3.54	54	3.28	1210	6.11	161	5.90	5648	5.34	193	6.46	7	5.51
31.5	419	1	0.51	7	0.43	123	0.62	19	0.70	564	0.53	20	0.67	0	0.00
32.0	421	10	5.05	83	5.04	1189	6.00	176	6.45	6744	6.37	198	6.62	11	8.66
32.5	423	1	0.51	8	0.49	105	0.53	12	0.44	638	0.60	19	0.64	1	0.79
33.0	426	11	5.56	91	5.53	1182	5.97	161	5.90	7692	7.27	182	6.09	3	2.36
33.5	428	3	1.52	5	0.30	88	0.44	10	0.37	639	0.60	24	0.80	0	0.00
34.0	430	11	5.56	116	7.04	1056	5.33	169	6.19	8480	8.01	218	7.29	10	7.87
34.5	433	0	0.00	6	0.36	70	0.35	12	0.44	625	0.59	15	0.50	2	1.57
35.0	436	6	3.03	146	8.86	930	4.69	174	6.38	9167	8.66	186	6.22	6	4.72
35.5	438	0	0.00	8	0.49	33	0.17	10	0.37	489	0.46	13	0.43	0	0.00
36.0	441	14	7.07	139	8.44	730	3.68	130	4.76	8805	8.32	197	6.59	4	3.15
36.5	444	2	1.01	6	0.36	44	0.22	7	0.26	379	0.36	10	0.33	0	0.00
37.0	448	13	6.57	128	7.77	506	2.55	105	3.85	7506	7.09	170	5.69	4	3.15

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
37.5	451	1	0.51	7	0.43	23	0.12	5	0.18	261	0.25	4	0.13	0	0.00
38.0	455	4	2.02	114	6.92	333	1.68	96	3.52	6132	5.80	125	4.18	2	1.57
38.5	458	1	0.51	4	0.24	13	0.07	1	0.04	175	0.17	2	0.07	0	0.00
39.0	462	6	3.03	110	6.68	239	1.21	52	1.91	4592	4.34	77	2.58	2	1.57
39.5	467	0	0.00	1	0.06	3	0.02	0	0.00	91	0.09	2	0.07	1	0.79
40.0	471	5	2.53	99	6.01	106	0.54	28	1.03	2906	2.75	58	1.94	1	0.79
40.5	476	0	0.00	0	0.00	4	0.02	0	0.00	55	0.05	2	0.07	0	0.00
41.0	482	1	0.51	54	3.28	62	0.31	15	0.55	1540	1.46	33	1.10	0	0.00
41.5	487	0	0.00	2	0.12	1	0.01	1	0.04	19	0.02	1	0.03	0	0.00
42.0	493	3	1.52	35	2.13	17	0.09	2	0.07	749	0.71	12	0.40	0	0.00
42.5	500	0	0.00	1	0.06	0	0.00	0	0.00	6	0.01	0	0.00	0	0.00
43.0	508	0	0.00	16	0.97	4	0.02	2	0.07	310	0.29	3	0.10	0	0.00
43.5	517	0	0.00	0	0.00	1	0.01	0	0.00	5	0.00	1	0.03	0	0.00
44.0	526	0	0.00	7	0.43	1	0.01	1	0.04	108	0.10	2	0.07	0	0.00
44.5	537	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
45.0	547	0	0.00	1	0.06	0	0.00	0	0.00	19	0.02	0	0.00	0	0.00
45.5	556	0	0.00	0	0.00	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00
46.0	566	0	0.00	1	0.06	0	0.00	0	0.00	4	0.00	0	0.00	0	0.00
46.5	575	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
47.0	587	0	0.00	0	0.00	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00
47.5	604	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
48.0	630	0	0.00	1	0.06	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Note. Missing values are coded as Other.

Table L4. Operational Grade 10 Public School Student Frequency Distributions by Ethnicity – Science

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
0.0	216	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
0.5	253	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
1.0	275	0	0.00	0	0.00	5	0.02	0	0.00	3	0.00	0	0.00	0	0.00
1.5	288	0	0.00	0	0.00	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00
2.0	297	0	0.00	0	0.00	9	0.04	1	0.04	6	0.01	3	0.10	0	0.00
2.5	305	0	0.00	0	0.00	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00
3.0	311	0	0.00	0	0.00	24	0.12	1	0.04	11	0.01	0	0.00	0	0.00
3.5	316	0	0.00	0	0.00	6	0.03	0	0.00	6	0.01	0	0.00	0	0.00
4.0	321	0	0.00	0	0.00	54	0.26	7	0.25	30	0.03	2	0.07	2	1.47
4.5	325	0	0.00	0	0.00	11	0.05	0	0.00	14	0.01	0	0.00	0	0.00
5.0	329	2	1.01	1	0.06	105	0.51	12	0.43	81	0.08	6	0.20	1	0.74
5.5	333	1	0.50	0	0.00	49	0.24	6	0.22	26	0.02	1	0.03	0	0.00
6.0	336	1	0.50	2	0.12	170	0.83	12	0.43	136	0.13	9	0.30	0	0.00
6.5	339	1	0.50	0	0.00	70	0.34	7	0.25	85	0.08	5	0.16	2	1.47
7.0	342	2	1.01	3	0.18	245	1.19	19	0.69	200	0.19	13	0.43	4	2.94
7.5	345	1	0.50	0	0.00	121	0.59	7	0.25	101	0.10	7	0.23	0	0.00
8.0	347	1	0.50	6	0.36	360	1.76	35	1.26	319	0.30	17	0.56	3	2.21
8.5	350	2	1.01	2	0.12	140	0.68	8	0.29	174	0.16	7	0.23	2	1.47
9.0	352	3	1.51	2	0.12	348	1.70	21	0.76	370	0.35	20	0.66	5	3.68
9.5	355	3	1.51	6	0.36	198	0.97	18	0.65	218	0.21	11	0.36	0	0.00
10.0	357	2	1.01	6	0.36	400	1.95	39	1.41	443	0.42	22	0.72	2	1.47
10.5	359	1	0.50	7	0.42	247	1.20	20	0.72	291	0.27	13	0.43	1	0.74
11.0	361	1	0.50	6	0.36	424	2.07	32	1.16	542	0.51	32	1.05	3	2.21
11.5	363	2	1.01	9	0.54	266	1.30	39	1.41	410	0.39	28	0.92	0	0.00
12.0	365	2	1.01	6	0.36	401	1.96	36	1.30	577	0.54	33	1.09	4	2.94
12.5	367	0	0.00	3	0.18	347	1.69	39	1.41	472	0.44	26	0.86	2	1.47
13.0	369	2	1.01	11	0.66	457	2.23	44	1.59	627	0.59	39	1.28	3	2.21
13.5	371	1	0.50	8	0.48	371	1.81	31	1.12	503	0.47	24	0.79	3	2.21
14.0	373	0	0.00	10	0.60	497	2.42	47	1.70	712	0.67	44	1.45	3	2.21
14.5	375	0	0.00	5	0.30	415	2.02	35	1.26	609	0.57	26	0.86	2	1.47
15.0	376	2	1.01	6	0.36	464	2.26	44	1.59	756	0.71	27	0.89	3	2.21
15.5	378	2	1.01	5	0.30	398	1.94	41	1.48	695	0.65	21	0.69	1	0.74
16.0	380	0	0.00	12	0.72	476	2.32	47	1.70	793	0.75	33	1.09	2	1.47
16.5	381	1	0.50	9	0.54	410	2.00	44	1.59	780	0.73	39	1.28	2	1.47
17.0	383	5	2.51	6	0.36	484	2.36	49	1.77	882	0.83	45	1.48	3	2.21
17.5	385	2	1.01	5	0.30	414	2.02	46	1.66	862	0.81	47	1.55	1	0.74

		American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		RS	SS	N	%	N	%	N	%	N	%	N	%	N	%
18.0	386	3	1.51	13	0.78	463	2.26	35	1.26	1002	0.94	49	1.61	2	1.47
18.5	388	4	2.01	19	1.14	413	2.01	47	1.70	942	0.89	32	1.05	6	4.41
19.0	390	2	1.01	18	1.08	454	2.21	57	2.06	1013	0.95	39	1.28	1	0.74
19.5	391	2	1.01	16	0.96	402	1.96	50	1.81	1057	0.99	44	1.45	2	1.47
20.0	393	3	1.51	16	0.96	444	2.17	49	1.77	1093	1.03	51	1.68	2	1.47
20.5	394	3	1.51	17	1.02	389	1.90	43	1.55	1098	1.03	39	1.28	5	3.68
21.0	396	2	1.01	10	0.60	416	2.03	54	1.95	1270	1.20	55	1.81	1	0.74
21.5	397	3	1.51	20	1.20	352	1.72	56	2.02	1206	1.14	46	1.52	4	2.94
22.0	399	4	2.01	19	1.14	427	2.08	47	1.70	1329	1.25	47	1.55	1	0.74
22.5	400	3	1.51	15	0.90	348	1.70	46	1.66	1325	1.25	48	1.58	1	0.74
23.0	402	4	2.01	13	0.78	383	1.87	65	2.35	1436	1.35	48	1.58	2	1.47
23.5	403	5	2.51	20	1.20	383	1.87	31	1.12	1467	1.38	57	1.88	0	0.00
24.0	405	4	2.01	20	1.20	392	1.91	52	1.88	1590	1.50	56	1.84	2	1.47
24.5	406	2	1.01	20	1.20	381	1.86	59	2.13	1586	1.49	46	1.52	0	0.00
25.0	408	4	2.01	15	0.90	343	1.67	43	1.55	1593	1.50	51	1.68	2	1.47
25.5	409	4	2.01	22	1.32	312	1.52	47	1.70	1703	1.60	50	1.65	0	0.00
26.0	411	5	2.51	18	1.08	343	1.67	44	1.59	1753	1.65	55	1.81	2	1.47
26.5	412	4	2.01	21	1.26	326	1.59	49	1.77	1724	1.62	62	2.04	4	2.94
27.0	414	4	2.01	25	1.50	325	1.58	54	1.95	1832	1.72	63	2.08	1	0.74
27.5	415	3	1.51	15	0.90	279	1.36	49	1.77	1934	1.82	46	1.52	0	0.00
28.0	417	2	1.01	23	1.38	309	1.51	41	1.48	1998	1.88	53	1.75	2	1.47
28.5	418	1	0.50	21	1.26	301	1.47	44	1.59	2000	1.88	56	1.84	2	1.47
29.0	420	5	2.51	32	1.92	277	1.35	37	1.34	2110	1.99	54	1.78	2	1.47
29.5	421	5	2.51	17	1.02	278	1.36	47	1.70	2099	1.98	66	2.17	2	1.47
30.0	423	3	1.51	28	1.68	266	1.30	50	1.81	2104	1.98	61	2.01	0	0.00
30.5	424	5	2.51	25	1.50	225	1.10	44	1.59	2150	2.02	58	1.91	1	0.74
31.0	426	2	1.01	31	1.86	209	1.02	25	0.90	2130	2.00	53	1.75	5	3.68
31.5	427	3	1.51	37	2.22	243	1.19	42	1.52	2207	2.08	51	1.68	5	3.68
32.0	429	5	2.51	38	2.29	207	1.01	46	1.66	2282	2.15	57	1.88	0	0.00
32.5	430	3	1.51	39	2.35	178	0.87	47	1.70	2273	2.14	59	1.94	2	1.47
33.0	432	1	0.50	30	1.80	190	0.93	47	1.70	2397	2.26	59	1.94	1	0.74
33.5	434	3	1.51	30	1.80	191	0.93	40	1.44	2348	2.21	50	1.65	2	1.47
34.0	435	6	3.02	37	2.22	153	0.75	43	1.55	2334	2.20	47	1.55	1	0.74
34.5	437	5	2.51	32	1.92	151	0.74	39	1.41	2357	2.22	75	2.47	1	0.74
35.0	439	3	1.51	31	1.86	165	0.80	36	1.30	2401	2.26	50	1.65	3	2.21
35.5	441	4	2.01	36	2.16	138	0.67	36	1.30	2367	2.23	60	1.98	0	0.00
36.0	442	3	1.51	31	1.86	118	0.58	33	1.19	2356	2.22	45	1.48	2	1.47
36.5	445	5	2.51	52	3.13	114	0.56	38	1.37	2409	2.27	43	1.42	0	0.00
37.0	446	5	2.51	36	2.16	104	0.51	28	1.01	2376	2.24	35	1.15	2	1.47

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
37.5	448	2	1.01	31	1.86	95	0.46	24	0.87	2267	2.13	40	1.32	0	0.00
38.0	450	1	0.50	37	2.22	91	0.44	26	0.94	2264	2.13	37	1.22	2	1.47
38.5	452	1	0.50	32	1.92	98	0.48	26	0.94	2115	1.99	46	1.52	0	0.00
39.0	454	1	0.50	42	2.53	78	0.38	25	0.90	2083	1.96	36	1.19	1	0.74
39.5	457	2	1.01	44	2.65	72	0.35	22	0.79	2028	1.91	36	1.19	1	0.74
40.0	459	4	2.01	37	2.22	61	0.30	23	0.83	1790	1.68	27	0.89	0	0.00
40.5	462	2	1.01	38	2.29	43	0.21	13	0.47	1676	1.58	35	1.15	1	0.74
41.0	464	2	1.01	32	1.92	39	0.19	19	0.69	1578	1.49	26	0.86	0	0.00
41.5	467	1	0.50	34	2.04	35	0.17	12	0.43	1417	1.33	24	0.79	2	1.47
42.0	470	2	1.01	36	2.16	29	0.14	13	0.47	1375	1.29	23	0.76	1	0.74
42.5	473	3	1.51	43	2.59	28	0.14	4	0.14	1139	1.07	20	0.66	0	0.00
43.0	476	0	0.00	33	1.98	19	0.09	5	0.18	977	0.92	18	0.59	2	1.47
43.5	480	0	0.00	32	1.92	18	0.09	8	0.29	805	0.76	15	0.49	0	0.00
44.0	484	0	0.00	24	1.44	5	0.02	7	0.25	654	0.62	13	0.43	0	0.00
44.5	489	0	0.00	23	1.38	4	0.02	4	0.14	554	0.52	10	0.33	1	0.74
45.0	494	0	0.00	20	1.20	5	0.02	4	0.14	415	0.39	4	0.13	0	0.00
45.5	500	0	0.00	11	0.66	4	0.02	3	0.11	290	0.27	6	0.20	0	0.00
46.0	508	1	0.50	13	0.78	2	0.01	3	0.11	217	0.20	2	0.07	0	0.00
46.5	517	0	0.00	4	0.24	0	0.00	1	0.04	112	0.11	1	0.03	0	0.00
47.0	530	0	0.00	2	0.12	1	0.00	0	0.00	66	0.06	1	0.03	0	0.00
47.5	552	0	0.00	0	0.00	0	0.00	0	0.00	21	0.02	0	0.00	0	0.00
48.0	590	0	0.00	1	0.06	0	0.00	0	0.00	9	0.01	0	0.00	0	0.00

Note. Missing values are coded as Other.

Table L5. Operational Grade 10 Public School Student Frequency Distributions by Ethnicity – Social Studies

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
0.0	225	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00	0	0.00	0	0.00
0.5	260	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
1.0	281	0	0.00	0	0.00	7	0.03	0	0.00	1	0.00	0	0.00	0	0.00
1.5	293	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
2.0	302	0	0.00	1	0.06	6	0.03	1	0.04	7	0.01	0	0.00	0	0.00
2.5	309	0	0.00	0	0.00	1	0.00	0	0.00	0	0.00	0	0.00	0	0.00
3.0	315	0	0.00	0	0.00	21	0.10	1	0.04	19	0.02	0	0.00	0	0.00
3.5	320	0	0.00	0	0.00	1	0.00	0	0.00	7	0.01	0	0.00	0	0.00
4.0	325	0	0.00	0	0.00	51	0.25	6	0.22	53	0.05	3	0.10	0	0.00
4.5	329	0	0.00	0	0.00	11	0.05	0	0.00	15	0.01	2	0.07	0	0.00
5.0	332	0	0.00	0	0.00	72	0.36	3	0.11	79	0.07	7	0.23	0	0.00
5.5	336	0	0.00	1	0.06	9	0.04	2	0.07	30	0.03	0	0.00	0	0.00
6.0	339	1	0.51	1	0.06	135	0.67	13	0.47	172	0.16	11	0.36	3	2.24
6.5	342	0	0.00	0	0.00	27	0.13	2	0.07	47	0.04	1	0.03	0	0.00
7.0	345	3	1.52	2	0.12	177	0.88	21	0.75	244	0.23	18	0.59	3	2.24
7.5	348	1	0.51	1	0.06	44	0.22	4	0.14	91	0.09	2	0.07	0	0.00
8.0	350	2	1.01	6	0.36	243	1.20	24	0.86	361	0.34	21	0.69	0	0.00
8.5	353	0	0.00	0	0.00	81	0.40	7	0.25	154	0.15	9	0.30	1	0.75
9.0	355	2	1.01	5	0.30	271	1.34	27	0.97	474	0.45	23	0.76	4	2.99
9.5	358	1	0.51	0	0.00	107	0.53	7	0.25	190	0.18	6	0.20	0	0.00
10.0	360	1	0.51	7	0.42	354	1.75	39	1.40	556	0.52	26	0.86	4	2.99
10.5	362	0	0.00	2	0.12	153	0.76	20	0.72	290	0.27	8	0.26	0	0.00
11.0	364	3	1.52	4	0.24	356	1.76	25	0.90	633	0.60	28	0.92	3	2.24
11.5	366	0	0.00	1	0.06	209	1.04	15	0.54	337	0.32	16	0.53	0	0.00
12.0	368	1	0.51	4	0.24	336	1.66	45	1.62	655	0.62	25	0.82	5	3.73
12.5	370	0	0.00	3	0.18	204	1.01	31	1.11	373	0.35	12	0.40	1	0.75
13.0	372	1	0.51	3	0.18	373	1.85	40	1.44	684	0.64	26	0.86	2	1.49
13.5	374	0	0.00	6	0.36	227	1.12	29	1.04	451	0.42	22	0.73	3	2.24
14.0	376	4	2.02	11	0.66	342	1.69	35	1.26	696	0.66	36	1.19	2	1.49
14.5	377	0	0.00	6	0.36	248	1.23	31	1.11	485	0.46	32	1.06	1	0.75
15.0	379	2	1.01	8	0.48	349	1.73	44	1.58	757	0.71	25	0.82	3	2.24
15.5	381	1	0.51	2	0.12	261	1.29	27	0.97	580	0.55	19	0.63	0	0.00
16.0	383	5	2.53	11	0.66	360	1.78	42	1.51	799	0.75	33	1.09	5	3.73
16.5	384	4	2.02	6	0.36	298	1.48	32	1.15	689	0.65	22	0.73	1	0.75
17.0	386	0	0.00	12	0.72	367	1.82	41	1.47	806	0.76	36	1.19	2	1.49
17.5	388	4	2.02	9	0.54	283	1.40	31	1.11	744	0.70	34	1.12	2	1.49

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
18.0	389	0	0.00	8	0.48	344	1.70	47	1.69	908	0.86	29	0.96	4	2.99
18.5	391	2	1.01	13	0.78	342	1.69	39	1.40	850	0.80	18	0.59	1	0.75
19.0	392	2	1.01	9	0.54	389	1.93	48	1.73	1009	0.95	48	1.58	3	2.24
19.5	394	3	1.52	7	0.42	332	1.64	25	0.90	891	0.84	24	0.79	3	2.24
20.0	396	6	3.03	11	0.66	389	1.93	40	1.44	1061	1.00	46	1.52	1	0.75
20.5	397	4	2.02	13	0.78	357	1.77	34	1.22	945	0.89	38	1.25	1	0.75
21.0	399	1	0.51	12	0.72	395	1.96	61	2.19	1124	1.06	33	1.09	2	1.49
21.5	400	6	3.03	10	0.60	352	1.74	57	2.05	1080	1.02	43	1.42	2	1.49
22.0	402	2	1.01	10	0.60	397	1.97	42	1.51	1177	1.11	45	1.48	4	2.99
22.5	403	0	0.00	9	0.54	359	1.78	42	1.51	1166	1.10	48	1.58	0	0.00
23.0	405	2	1.01	16	0.96	382	1.89	49	1.76	1285	1.21	42	1.39	2	1.49
23.5	406	5	2.53	13	0.78	347	1.72	39	1.40	1232	1.16	35	1.15	1	0.75
24.0	408	4	2.02	20	1.20	389	1.93	52	1.87	1463	1.38	56	1.85	4	2.99
24.5	409	3	1.52	19	1.14	377	1.87	51	1.83	1386	1.31	47	1.55	2	1.49
25.0	411	5	2.53	21	1.26	366	1.81	43	1.55	1466	1.38	53	1.75	2	1.49
25.5	412	3	1.52	17	1.02	362	1.79	54	1.94	1550	1.46	49	1.62	2	1.49
26.0	414	2	1.01	14	0.84	363	1.80	56	2.01	1554	1.46	63	2.08	2	1.49
26.5	415	2	1.01	17	1.02	365	1.81	41	1.47	1653	1.56	40	1.32	1	0.75
27.0	417	4	2.02	20	1.20	352	1.74	49	1.76	1680	1.58	79	2.61	1	0.75
27.5	418	3	1.52	20	1.20	314	1.56	57	2.05	1681	1.58	50	1.65	3	2.24
28.0	420	4	2.02	19	1.14	337	1.67	50	1.80	1828	1.72	52	1.72	3	2.24
28.5	421	4	2.02	24	1.44	295	1.46	46	1.65	1892	1.78	57	1.88	4	2.99
29.0	423	5	2.53	22	1.32	331	1.64	48	1.73	1982	1.87	54	1.78	1	0.75
29.5	424	2	1.01	22	1.32	315	1.56	64	2.30	1971	1.86	55	1.81	2	1.49
30.0	426	3	1.52	21	1.26	338	1.67	42	1.51	2002	1.89	58	1.91	5	3.73
30.5	427	3	1.52	23	1.38	345	1.71	52	1.87	2104	1.98	79	2.61	4	2.99
31.0	429	5	2.53	25	1.51	301	1.49	54	1.94	2149	2.02	49	1.62	3	2.24
31.5	431	5	2.53	24	1.44	287	1.42	52	1.87	2077	1.96	67	2.21	0	0.00
32.0	432	3	1.52	27	1.63	307	1.52	53	1.91	2234	2.10	53	1.75	1	0.75
32.5	434	2	1.01	27	1.63	296	1.47	30	1.08	2342	2.21	69	2.28	1	0.75
33.0	435	4	2.02	39	2.35	298	1.48	41	1.47	2194	2.07	58	1.91	2	1.49
33.5	437	4	2.02	32	1.93	285	1.41	47	1.69	2394	2.26	51	1.68	0	0.00
34.0	439	2	1.01	32	1.93	252	1.25	50	1.80	2396	2.26	64	2.11	1	0.75
34.5	440	6	3.03	36	2.17	233	1.15	44	1.58	2396	2.26	72	2.37	0	0.00
35.0	442	2	1.01	36	2.17	258	1.28	38	1.37	2342	2.21	63	2.08	2	1.49
35.5	444	6	3.03	33	1.99	274	1.36	53	1.91	2407	2.27	41	1.35	3	2.24
36.0	446	3	1.52	29	1.75	212	1.05	40	1.44	2502	2.36	45	1.48	6	4.48
36.5	447	2	1.01	33	1.99	184	0.91	32	1.15	2457	2.31	55	1.81	0	0.00
37.0	449	9	4.55	37	2.23	200	0.99	37	1.33	2363	2.23	55	1.81	0	0.00

RS	SS	American Indian		Asian/Pacific Islander		Black/African American		Hispanic		White		Multi-Ethnic		Other	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
37.5	451	3	1.52	51	3.07	191	0.95	34	1.22	2410	2.27	62	2.04	0	0.00
38.0	453	3	1.52	55	3.31	176	0.87	41	1.47	2319	2.18	46	1.52	2	1.49
38.5	455	3	1.52	55	3.31	167	0.83	29	1.04	2296	2.16	55	1.81	0	0.00
39.0	457	1	0.51	36	2.17	131	0.65	32	1.15	2214	2.09	35	1.15	1	0.75
39.5	459	3	1.52	49	2.95	143	0.71	34	1.22	2165	2.04	47	1.55	2	1.49
40.0	462	2	1.01	43	2.59	148	0.73	29	1.04	2107	1.99	31	1.02	0	0.00
40.5	464	0	0.00	44	2.65	112	0.55	24	0.86	2026	1.91	39	1.29	1	0.75
41.0	466	0	0.00	51	3.07	86	0.43	25	0.90	1853	1.75	40	1.32	1	0.75
41.5	469	3	1.52	35	2.11	97	0.48	15	0.54	1731	1.63	30	0.99	0	0.00
42.0	472	3	1.52	56	3.37	81	0.40	12	0.43	1578	1.49	26	0.86	1	0.75
42.5	475	2	1.01	47	2.83	62	0.31	16	0.58	1385	1.30	33	1.09	0	0.00
43.0	478	1	0.51	38	2.29	55	0.27	8	0.29	1208	1.14	21	0.69	1	0.75
43.5	481	0	0.00	33	1.99	41	0.20	6	0.22	1062	1.00	19	0.63	1	0.75
44.0	485	0	0.00	41	2.47	31	0.15	6	0.22	865	0.81	18	0.59	0	0.00
44.5	489	3	1.52	24	1.44	24	0.12	9	0.32	678	0.64	13	0.43	0	0.00
45.0	494	1	0.51	26	1.57	12	0.06	6	0.22	528	0.50	11	0.36	0	0.00
45.5	499	1	0.51	14	0.84	7	0.03	5	0.18	415	0.39	5	0.16	0	0.00
46.0	506	0	0.00	13	0.78	4	0.02	2	0.07	284	0.27	8	0.26	0	0.00
46.5	514	0	0.00	7	0.42	6	0.03	3	0.11	187	0.18	2	0.07	0	0.00
47.0	526	0	0.00	6	0.36	3	0.01	2	0.07	102	0.10	3	0.10	0	0.00
47.5	546	0	0.00	4	0.24	2	0.01	0	0.00	39	0.04	1	0.03	0	0.00
48.0	580	0	0.00	1	0.06	1	0.00	0	0.00	16	0.02	1	0.03	0	0.00

Note. Missing values are coded as Other.

APPENDIX M.

Operational Subscale Reliability and Passing Bands

Table M1. Operational Subscale Reliabilities and Passing Bands for Grade 10 Public School Students – Reading

Content Standard	Raw Score Bands			Possible Score	Alpha
	Below	At	Above		
Acquisition of Vocabulary (AV)	0 – 3.0	3.5 – 5.0	5.5 – 8.0	0 – 8.0	0.56
Informational Text (IT)	0 – 6.5	7.0 – 9.0	9.5 – 18.0	0 – 18.0	0.73
Literary Text (LT)	0 – 3.5	4.0 – 6.0	6.5 – 12.0	0 – 12.0	0.62
Reading Process (RP)	0 – 5.5	6.0 – 7.5	8.0 – 10.0	0 – 10.0	0.66

Table M2. Operational Subscale Reliabilities and Passing Bands for Grade 10 Public School Students – Mathematics

Content Standard	Raw Score Bands			Possible Score	Alpha
	Below	At	Above		
Data Analysis and Probability (DA)	0 – 5.0	5.5 – 7.5	8.0 – 11.0	0 – 11.0	0.76
Geometry and Spatial Sense (GS)	0 – 2.5	3.0 – 4.5	5.0 – 8.0	0 – 8.0	0.52
Measurement (ME)	0 – 2.5	3.0 – 5.0	5.5 – 8.0	0 – 8.0	0.69
Number, Number Sense, and Operations (NS)	0 – 2.5	3.0 – 5.0	5.5 – 9.0	0 – 9.0	0.73
Patterns, Function, and Algebra (PA)	0 – 4.5	5.0 – 6.5	7.0 – 10.0	0 – 10.0	0.70

Table M3. Operational Subscale Reliabilities and Passing Bands for Grade 10 Public School Students – Writing

Content Standard	Raw Score Bands			Possible Score	Alpha
	Below	At	Above		
Writing Applications (WA)	0 – 10.0	11.0 – 12.0	13.0 – 24.0	0 – 24.0	0.79
Writing Conventions (WC)	0 – 9.0	10.0 – 11.0	12.0	0 – 12.0	0.78
Writing Processes (WP)	0 – 6.0	6.5 – 8.0	8.5 – 12.0	0 – 12.0	0.63

**Table M4. Operational Subscale Reliabilities and Passing Bands for Grade 10
Public School Students – Science**

Content Standard	Raw Score Bands			Possible Score	Alpha
	Below	At	Above		
Earth and Space Sciences (ES)	0 – 5.5	6.0 – 8.0	8.5 – 12.0	0 – 12.0	0.66
Life Sciences (LS)	0 – 5.0	5.5 – 7.5	8.0 – 12.0	0 – 12.0	0.73
Physical Sciences (PS)	0 – 5.0	5.5 – 7.5	8.0 – 12.0	0 – 12.0	0.67
Scientific Processes (SP)	0 – 4.5	5.0 – 7.0	7.5 – 12.0	0 – 12.0	0.63

**Table M5. Operational Subscale Reliabilities and Passing Bands for Grade 10
Public School Students – Social Studies**

Content Standard	Raw Score Bands			Possible Score	Alpha
	Below	At	Above		
Economics, Government, and Citizenship (EG)	0 – 6.0	6.5 – 8.5	9.0 – 13.0	0 – 13.0	0.75
History (HI)	0 – 5.0	5.5 – 7.5	8.0 – 14.0	0 – 14.0	0.73
People in Societies and Geography (SG)	0 – 4.5	5.0 – 6.5	7.0 – 12.0	0 – 12.0	0.57
Social Studies Skills and Methods (SO)	0 – 4.5	5.0 – 6.5	7.0 – 9.0	0 – 9.0	0.69

APPENDIX N.

Operational Frequency Distributions for Subscales

Table N1. Operational Grade 10 Public School Student Frequency Distribution for Subscales – Reading

Raw Score	AV		IT		LT		RP	
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent
0.0	614	0.46	154	0.11	960	0.71	324	0.24
0.5	0	0.00	23	0.02	34	0.03	51	0.04
1.0	2817	2.09	729	0.54	2861	2.12	1079	0.80
1.5	0	0.00	191	0.14	239	0.18	222	0.16
2.0	6568	4.88	1524	1.13	5034	3.74	2143	1.59
2.5	0	0.00	491	0.36	644	0.48	496	0.37
3.0	11809	8.77	2200	1.63	6732	5.00	3215	2.39
3.5	0	0.00	951	0.71	1344	1.00	802	0.60
4.0	18881	14.02	2719	2.02	8226	6.11	4564	3.39
4.5	0	0.00	1437	1.07	2338	1.74	1183	0.88
5.0	26605	19.76	3208	2.38	9500	7.05	6863	5.10
5.5	0	0.00	1970	1.46	3788	2.81	1598	1.19
6.0	30468	22.63	3814	2.83	10878	8.08	10905	8.10
6.5	0	0.00	2584	1.92	5346	3.97	2363	1.75
7.0	25463	18.91	4665	3.46	12113	9.00	17886	13.28
7.5	0	0.00	3330	2.47	6565	4.88	2906	2.16
8.0	11435	8.49	5746	4.27	12575	9.34	26196	19.45
8.5			4003	2.97	7090	5.27	2763	2.05
9.0			6922	5.14	11251	8.36	30403	22.58
9.5			4904	3.64	6094	4.53	1308	0.97
10.0			8079	6.00	8164	6.06	17390	12.91
10.5			5536	4.11	4164	3.09		
11.0			8668	6.44	4833	3.59		
11.5			6118	4.54	1787	1.33		
12.0			8993	6.68	2100	1.56		
12.5			6082	4.52				
13.0			8542	6.34				
13.5			5223	3.88				
14.0			7108	5.28				
14.5			4014	2.98				
15.0			5384	4.00				
15.5			2689	2.00				
16.0			3241	2.41				
16.5			1227	0.91				
17.0			1486	1.10				
17.5			310	0.23				
18.0			395	0.29				

Note. AV: Acquisition of Vocabulary; IT: Informational Text; LT: Literary Text; RP: Reading Process

Table N2. Operational Grade 10 Public School Student Frequency Distribution for Subscales – Mathematics

Raw Score	DA		GS		ME		PA		NS	
	Freq	Percent								
0.0	560	0.41	1400	1.03	1774	1.31	1971	1.46	671	0.50
0.5	14	0.01	154	0.11	61	0.05	174	0.13	9	0.01
1.0	1918	1.42	6896	5.09	6447	4.76	7136	5.27	2587	1.91
1.5	109	0.08	841	0.62	277	0.20	1070	0.79	41	0.03
2.0	4137	3.06	11544	8.53	12208	9.02	12008	8.87	5031	3.72
2.5	329	0.24	1954	1.44	604	0.45	2769	2.05	139	0.10
3.0	6015	4.44	13782	10.18	16122	11.91	12704	9.38	7315	5.40
3.5	576	0.43	2631	1.94	739	0.55	3485	2.57	363	0.27
4.0	7481	5.53	17729	13.09	18365	13.56	12123	8.95	9178	6.78
4.5	1011	0.75	3048	2.25	790	0.58	3376	2.49	722	0.53
5.0	8630	6.37	24594	18.16	19670	14.53	12904	9.53	11077	8.18
5.5	1527	1.13	2633	1.94	903	0.67	3135	2.32	1199	0.89
6.0	9559	7.06	24599	18.17	21824	16.12	13762	10.16	13496	9.97
6.5	2022	1.49	1784	1.32	1128	0.83	3038	2.24	1884	1.39
7.0	11166	8.25	7958	5.88	21992	16.24	14544	10.74	16112	11.90
7.5	2896	2.14	1221	0.90	1068	0.79	2653	1.96	2478	1.83
8.0	13547	10.01	12631	9.33	11427	8.44	14229	10.51	18735	13.84
8.5	4099	3.03					1411	1.04	2782	2.05
9.0	16643	12.29					12907	9.53	20486	15.13
9.5	5435	4.01							1894	1.40
10.0	18305	13.52							19200	14.18
10.5	5506	4.07								
11.0	13914	10.28								

Note. DA: Data Analysis and Probability; GS: Geometry and Spatial Sense; ME: Measurement; NS: Number, Number Sense, and Operations; PA: Patterns, Functions, and Algebra

Table N3. Operational Grade 10 Public School Student Frequency Distribution for Subscales – Writing

Raw Score	WA		WC		WP	
	Freq	Percent	Freq	Percent	Freq	Percent
0.0	389	0.29	389	0.29	90	0.07
0.5	0	0.00	0	0.00	6	0.00
1.0	0	0.00	0	0.00	433	0.32
1.5	0	0.00	0	0.00	42	0.03
2.0	385	0.29	345	0.26	1170	0.87
2.5	0	0.00	0	0.00	137	0.10
3.0	145	0.11	178	0.13	2019	1.51
3.5	0	0.00	0	0.00	352	0.26
4.0	1128	0.84	1235	0.92	3037	2.26
4.5	0	0.00	0	0.00	680	0.51
5.0	1059	0.79	1449	1.08	4325	3.22
5.5	0	0.00	0	0.00	1042	0.78
6.0	1971	1.47	2173	1.62	6630	4.94
6.5	0	0.00	0	0.00	1403	1.05
7.0	2878	2.15	3460	2.58	10210	7.61
7.5	0	0.00	0	0.00	1588	1.18
8.0	7560	5.64	7631	5.69	14958	11.15
8.5	0	0.00	0	0.00	1844	1.37
9.0	8129	6.06	10725	8.00	20236	15.09
9.5	0	0.00	0	0.00	1722	1.28
10.0	12904	9.62	16131	12.03	24097	17.96
10.5	0	0.00	0	0.00	1342	1.00
11.0	13916	10.37	27157	20.25	23500	17.52
11.5	0	0.00	0	0.00	537	0.40
12.0	24133	17.99	63265	47.16	12738	9.50
12.5	0	0.00				
13.0	17795	13.27				
13.5	0	0.00				
14.0	15532	11.58				
14.5	0	0.00				
15.0	11173	8.33				
15.5	0	0.00				
16.0	8347	6.22				
16.5	0	0.00				
17.0	3829	2.85				
17.5	0	0.00				
18.0	1862	1.39				
18.5	0	0.00				
19.0	684	0.51				
19.5	0	0.00				
20.0	262	0.20				
20.5	0	0.00				
21.0	44	0.03				

Raw Score	WA		WC		WP	
	Freq	Percent	Freq	Percent	Freq	Percent
21.5	0	0.00				
22.0	11	0.01				
22.5	0	0.00				
23.0	1	0.00				
23.5	0	0.00				
24.0	1	0.00				

Note. WA: Writing Applications; WC: Writing Conventions; WP: Writing Process

Table N4. Operational Grade 10 Public School Student Frequency Distribution for Subscales – Science

Raw Score	ES		LS		PS		SP	
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent
0.0	455	0.34	601	0.44	305	0.23	1084	0.80
0.5	73	0.05	62	0.05	82	0.06	282	0.21
1.0	1468	1.08	2390	1.77	1480	1.09	3189	2.36
1.5	397	0.29	352	0.26	326	0.24	1072	0.79
2.0	2995	2.21	5395	3.98	3582	2.65	4568	3.37
2.5	1099	0.81	827	0.61	807	0.60	2264	1.67
3.0	4562	3.37	7926	5.85	6592	4.87	5506	4.07
3.5	1848	1.36	1474	1.09	1364	1.01	3791	2.80
4.0	6351	4.69	9540	7.05	9811	7.25	6282	4.64
4.5	2771	2.05	2133	1.58	1867	1.38	5303	3.92
5.0	8135	6.01	10018	7.40	12663	9.35	7440	5.50
5.5	3552	2.62	2705	2.00	2233	1.65	7158	5.29
6.0	10059	7.43	10570	7.81	14848	10.97	8574	6.33
6.5	4576	3.38	3225	2.38	2462	1.82	8541	6.31
7.0	11368	8.40	10619	7.84	16416	12.13	9727	7.18
7.5	5368	3.96	3633	2.68	2588	1.91	9293	6.86
8.0	12433	9.18	11186	8.26	16490	12.18	9956	7.35
8.5	5745	4.24	3969	2.93	2591	1.91	9111	6.73
9.0	12797	9.45	11534	8.52	14789	10.92	8483	6.27
9.5	5583	4.12	4365	3.22	2217	1.64	7334	5.42
10.0	12096	8.93	11504	8.50	11330	8.37	6054	4.47
10.5	4598	3.40	4006	2.96	1611	1.19	4330	3.20
11.0	9355	6.91	9623	7.11	6342	4.68	3252	2.40
11.5	2575	1.90	2383	1.76	787	0.58	1799	1.33
12.0	5128	3.79	5347	3.95	1804	1.33	994	0.73

Note. ES: Earth and Space Sciences; LS: Life Sciences; PS: Physical Sciences; SP: Scientific Processes: Inquiry, Technology, and Ways of Knowing

Table N5. Operational Grade 10 Public School Student Frequency Distribution for Subscales – Social Studies

Raw Score	EG		HI		SG		SO	
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent
0.0	198	0.15	479	0.35	499	0.37	919	0.68
0.5	10	0.01	91	0.07	104	0.08	47	0.03
1.0	1075	0.80	2020	1.50	1768	1.31	2855	2.12
1.5	59	0.04	524	0.39	458	0.34	197	0.15
2.0	2823	2.09	4199	3.11	3235	2.40	4953	3.67
2.5	230	0.17	1255	0.93	1171	0.87	436	0.32
3.0	4711	3.49	5937	4.40	4947	3.67	7047	5.22
3.5	496	0.37	2308	1.71	2487	1.84	1093	0.81
4.0	6226	4.61	6907	5.12	7340	5.44	9812	7.27
4.5	981	0.73	3174	2.35	4827	3.58	2358	1.75
5.0	7044	5.22	7305	5.41	10243	7.59	13558	10.05
5.5	1580	1.17	3804	2.82	7967	5.90	4945	3.66
6.0	7687	5.70	7145	5.29	12416	9.20	18932	14.03
6.5	2393	1.77	4340	3.22	10001	7.41	9563	7.09
7.0	8276	6.13	7159	5.30	12778	9.47	22930	16.99
7.5	3163	2.34	4738	3.51	9766	7.24	14334	10.62
8.0	9218	6.83	7414	5.49	11473	8.50	13527	10.02
8.5	3977	2.95	5201	3.85	7834	5.80	4596	3.41
9.0	10413	7.72	7620	5.65	8287	6.14	2868	2.12
9.5	4670	3.46	5403	4.00	4981	3.69		
10.0	11601	8.60	7699	5.70	5403	4.00		
10.5	5008	3.71	5428	4.02	2402	1.78		
11.0	12825	9.50	7583	5.62	2409	1.78		
11.5	4334	3.21	5185	3.84	985	0.73		
12.0	12919	9.57	6884	5.10	1189	0.88		
12.5	2798	2.07	3866	2.86				
13.0	10255	7.60	5002	3.71				
13.5			2625	1.94				
14.0			3675	2.72				

Note. EG: Economics, Government, Citizenship Rights & Responsibilities; HI: History; SG: People in Societies & Geography;
SO: Social Studies Skills & Methods

APPENDIX O.

Operational Subscale Intercorrelations

Table O1. Operational Subscale Intercorrelations for Grade 10 Public School Students – Reading

		Acquisition of Vocabulary (AV)	Informational Text (IT)	Literary Text (LT)
Reading	Informational Text (IT)	0.64	--	--
	Literary Text (LT)	0.61	0.71	--
	Reading Process (RP)	0.60	0.69	0.65

Table O2. Operational Subscale Intercorrelations for Grade 10 Public School Students – Math

		Data Analysis and Probability (DA)	Geometry and Spatial Sense (GS)	Measurement (ME)	Number, Number Sense, and Operations (NS)
Math	Geometry and Spatial Sense (GS)	0.68	--	--	--
	Measurement (ME)	0.72	0.66	--	--
	Number, Number Sense, and Operations (NS)	0.74	0.68	0.72	--
	Patterns, Function, and Algebra (PA)	0.74	0.67	0.70	0.72

Table O3. Operational Subscale Intercorrelations for Grade 10 Public School Students – Writing

		Writing Applications (WA)	Writing Conventions (WC)
Writing	Writing Conventions (WC)	0.73	--
	Writing Processes (WP)	0.57	0.62

Table O4. Operational Subscale Intercorrelations for Grade 10 Public School Students – Science

		Earth and Space Sciences (ES)	Life Sciences (LS)	Physical Sciences (PS)
Science	Life Sciences (LS)	0.71	--	--
	Physical Sciences (PS)	0.68	0.69	--
	Scientific Processes (SP)	0.67	0.67	0.63

Table O5. Operational Subscale Intercorrelations for Grade 10 Public School Students – Social Studies

		Economics, Government, and Citizenship (EG)	History (HI)	People in Societies and Geography (SG)
Social Studies	History (HI)	0.75	--	--
	People in Societies and Geography (SG)	0.67	0.67	--
	Social Studies Skills and Methods (SO)	0.71	0.69	0.64